

SYLLABUS  
FOR  
CLASSES XI & XII



BHUTAN HIGHER SECONDARY  
EDUCATION CERTIFICATE  
(BHSEC)

# **SYLLABUS**

## **FOR 11 & 12**

### **BHUTAN HIGHER SECONDARY EDUCATION CERTIFICATE (BHSEC)**



**Royal Education Council (REC)**  
**and**  
**Bhutan Board of Examinations (BBE)**  
**Royal Government of Bhutan**  
**Thimphu**

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## **FOREWORD**

Education is central to our development philosophy of promoting Gross National Happiness. The Ministry of Education is striving to fulfill the Royal Government's need to make education meaningful for our children. We are pleased that our endeavours have strengthened the introduction of Bhutan Higher Secondary Education Certificate (BHSEC) examination. The conduct of the Class XII examinations by the Bhutan Board of Examinations starting in December 2006 will be a major step in pursuance of the Government directive in this regard.

It is gratifying to see that the revised English curriculum for Classes IX through XII and revised Mathematics curriculum for Classes XI and XII under separate curriculum reform projects for English and Mathematics are now completed. Therefore, the implementation of the new English and Mathematics curriculum will commence in Class XI in 2006.

This document is intended to facilitate the conduct of Class XII examinations by the Bhutan Board of Examinations (BBE) in December 2007. With this move, we will have established our own system of examination for all schools in the country. This is a testimony to the teamwork between the Bhutan Board of Examinations and the Curriculum and Professional Support Division (CAPSD), as well as the continued support and co-operation that we have received from the Council for the Indian School Certificate Examinations.

This document is expected to help both the students and teachers understand the courses including the learning objectives, learning outcomes, and the examination rules and regulations for Classes XI and XII. It is also hoped that this document would be useful for parents as they support their children in attaining the learning objectives.

It is in the nature of curriculum to be dynamic and forward-looking. Therefore, some of the provisions in this syllabus document will change as per the needs of the time and the requirements of the society so that the learning outcomes attained by our students match the needs of the society.

Tashi Delek.

**Thinley Gyamtsho**  
**MINISTER**  
**Ministry of Education**

## INTRODUCTION

The syllabus for Classes XI and XII includes all fourteen courses that were offered under the Indian Secondary Certificate (ISC) syllabus of the Council for Indian School Certificate Examinations. *Rigzhung*, as an Elective Dzongkha, has been offered as the fifteenth subject since 2005.

Literature in English, Physics, Chemistry, Biology, and Accountancy are modified versions of the ISC syllabuses. While Dzongkha has been further improved to take care of the language skills, *Rigzhung*, which is a Dzongkha Elective, is a completely new subject prepared for those having greater interest in Dzongkha. Similarly, Computer Science has been improved taking into account the new developments in and practical relevance of the subject to the world of work. Further, History, Geography, Economics, and Commerce have a considerable Bhutanese content to make the study of these subjects more relevant to the Bhutanese students.

Having completed the revision of curriculum in English for Classes IX through XII and Mathematics, including Business Mathematics for Classes XI and XII, under separate curriculum reform projects, the new English and Mathematics curriculum are included in this document.

The syllabus is structured in a way that reflects the rationale, aims, learning experiences, learning outcomes, structure of the course, mode of assessment, examination specifications and list of textbooks and references. The scope of the syllabus is also included for each subject to help the teachers gauge the depth and extent of the content areas to be treated in the teaching-learning processes. The document also contains rules and regulations of the examination. As far as the implementation of the revised English and Mathematics are concerned, the teachers are expected to follow the *Curriculum Guides for Teachers* closely. Teachers of other subjects may also practise the procedures and activities along the lines presented in the *Guides*, with modifications relevant to their own subjects.

It must be noted that while the modes of assessment for the Bhutan Higher Secondary Education Certificate remain similar to that of the Indian Secondary Certificate, the modes of assessment for the new English and Mathematics curriculum and examination specification are substantially different which necessitates a closer study of the provisions for the implementation of the curriculum.

**Secretary**  
**Bhutan Board of Examinations**

**Chief Curriculum Officer**  
**Curriculum and Professional Support Division**

## **RULES AND REGULATIONS**

### **SECTION A**

#### **Bhutan Board of Examinations**

The Bhutan Board of Examinations (BBE) secretariat was established in 1986. Since the seventies, all the high schools in the country were affiliated to the Council for the Indian School Certificate Examinations (CISCE) New Delhi and they conducted class X (ICSE) and XII (ISC) examinations. The CISCE and the BBE started conducting joint examinations from March 1996. The examination was named the BB-ICSE. From 2001, the BBE fully took over the conduct of class X examination (BCSE). The conduct of examination for class XII is being taken over from the Council from 2006.

#### **Endorsement for Localization**

The localization of class XII examination from December 2006 was first endorsed by the 13<sup>th</sup> BBE Board meeting held at NIE, Paro on March 14<sup>th</sup>, 2004.

The University Council of the Royal University of Bhutan (RUB) in its second University Council Meeting held on May 26, 2004 also endorsed the localization of the Class 12 examination to be conducted by the Bhutan Board of Examinations from December 2006 as per the letter of the Vice Chancellor, RUB, No. RUB/ADM-19/2004/-01 dated 01 July 2004.

Endorsement from the Association of Indian Universities (AIU), AIU House, 16 Kotla Marg, New Delhi-110002 with reference to their letter No. EV/II(461)/2004/1225 dated 13 October 2004 considered by the appropriate authorities at their meeting held on 27<sup>th</sup> September, 2004 resolved as under:

*“Recommended that Bhutan Certificate of Secondary Education and Bhutan Higher Secondary Education/School Certificate Examination of the Bhutan Board of Examinations (BBE), Ministry of Education, Royal Government of Bhutan be equated with 10 Year Secondary School Certificate and 12 Year Senior Secondary/Higher secondary/Intermediate/Pre-University Certificate of an Indian Board.”*

#### **Administration**

The BBE secretariat established in 1993 is under the administrative jurisdiction of the Ministry of Education. In 1996, BBE Board was formed consisting of members who are the heads of the Departments and Institutes within the Ministry of Education, relevant division heads and the representatives of Dzongkhags and schools changed on a yearly basis. The Secretary, Ministry of Education is the Chairman and the Secretary of Examinations is the member secretary of the BBE Board. The Board meets every year and gives directions on policy issues and examination related matters needing approval.

#### **Examinations**

The BBE conducts the Lower Secondary School Certificate Examination (LSSCE) for class VIII, Bhutan Certificate of Secondary Education (BCSE) for class X, Bhutan Higher Secondary Education Certificate (BHSEC) Examination for class XII and Class XII Rigzhung for the Institute of Language and Cultural Studies (ILCS) Semtokha.

The syllabuses are prepared by the Curriculum and Professional Support Division (CAPSD), Department of School Education, Ministry of Education in consultation with BBE on subject-wise content weighting, modes of assessment and examination rules and regulations.

## SECTION B

### 1. **Bhutan Higher Secondary Education Certificate (BHSEC) Examination for 2006**

The BBE has taken over the conduct of class XII examination from the CISCE, New Delhi from 2006. Under the Council, the examination was named Indian School Certificate (ISC) Examination. It is being named Bhutan Higher Secondary Education Certificate (BHSEC) Examination. It is a two-year course beyond the Bhutan Certificate of Secondary Education (class X) Examination or its equivalent. Examinations in all subjects are written in the medium of English except the national language.

### 2. **Conditions of eligibility for admission to class XI**

#### 2.1 **For Bhutanese Candidates**

Candidates who have been awarded Pass Certificate in the Bhutan Certificate of Secondary Education (BCSE) with passes in five subjects including English and Dzongkha are eligible to be admitted for preparation in courses of study leading to the BHSEC. However, the number of candidates to be admitted in schools will be determined by the cut off points set for the particular year.

#### 2.2 **For Foreign Candidates**

Candidates who have been awarded Pass Certificate in the Bhutan Certificate of Secondary Education (BCSE) with Passes in five subjects including English are eligible to be admitted for preparation in courses of study leading to the BHSEC. However, the number of candidates to be admitted in schools will be determined by the cut off points set for the particular year.

#### 2.3 **For Candidates from Other Boards**

The eligibility of candidates who have been awarded Pass Certificates in the equivalent examination conducted by another Examining Board will be decided by the BBE. The conditions of the eligibility are as follows:

2.3.1 The candidate must have been awarded a Pass Certificate in accordance with the requirements of the Board at an equivalent examination taken at one and the same sitting, and subject to provisions 2.3.2 and 2.4.

2.3.2 The candidate must have obtained pass marks in accordance with the regulations of the Board in (i) English (ii) a Second Language (as alternate courses) and (iii) three other written subjects, accepted by BBE (Under Section C Elective subjects).

#### 2.4 **Eligibility Certificates**

Head of the school should submit the list of all the candidates admitted in Class XI by the end of March to the BBE and the BBE will issue Eligibility Certificates to schools by the end of May.

### 3. **Exemption from study of a Second Language**

Candidates coming from foreign Boards that do not have provision for the teaching of a Second Language, may enroll for the BHSEC (12) examination without having to pass in Second Language at the Class X level examination. The Heads of the concerned Schools are required to write to the BBE with full details for the grant of exemption to these candidates.

### 4. **Conditions of Entry**

Entry to BHSEC in the case of eligible candidates who are being entered for the first time is restricted to candidates with a minimum of 90% attendance of the working days during each year of the two year course at school(s) affiliated to the BBE and registered for BHSEC.

Candidates may be entered only by the school they are attending in this respect; the decision of the Head of the school is final.

4.1 Candidates entered as school candidates in accordance with 4.1 above and who are not awarded Pass Certificates will be permitted to reappear for the examination once only in the year following their failure but not thereafter, without further attendance at an affiliated and registered school.

They must apply on the special form provided for each purpose, which will be obtainable from the BBE secretariat, through the Principals of schools from which the candidates appeared for the examination in the previous year and failed.

4.2 Candidates who have been awarded Pass Certificates will be permitted to enter for a Supplementary Pass Certificate in all the subjects offered for the BHSEC examination earlier by a candidate without further attendance at an affiliated and registered school. They must apply on a special form provided for the purpose, which will be obtainable from the BBE secretariat through the Principal of the schools from which the candidates appeared originally for the examination.

4.3 There is no age limit for the candidates taking the examination.

## **5. Minimum Attendance Required**

Candidates whose attendance is below 90% of the working days are ordinarily not eligible to sit for examination. However, the BBE has the authority to condone the shortage in case of candidates whose minimum attendance is not less than 80% of the working days. Heads of the Schools present to the BBE cases of candidates who deserve special consideration for condonation provided that the attendance of such a candidate is not less than 80% of the working days.

## **6. Withdrawal of Candidates**

Candidates may be withdrawn at any time prior to the commencement of the examination, provided that, once the entries have been acknowledged and accepted by the BBE secretariat.

Heads of school may only withdraw candidates:

- On account of illness of the candidates certified by a registered medical practitioner; or
- Under any special circumstances.

Application for withdrawals will be submitted on the special form to be supplied from the BBE secretariat. Heads of the Schools should as far as possible discourage the withdrawal of candidates from their schools.

## **7. Syllabus**

The regulations and syllabuses of the BHSEC Examination are included in this document and are obtainable from Education Central Stores, Phuntsholing.

## **8. Disqualification**

If any of the regulations made for the conduct of the examination is disobeyed, the candidate or candidates concerned may be disqualified.



## SECTION C

**IMPORTANT NOTE:** The responsibility for the correct selection of subjects to meet university or professional requirements of a candidate or candidates will be that of the school.

### A. Subjects of Examination

#### Part I: External Examination

##### Compulsory Subjects

1. English
2. Dzongkha (For nationals)

##### Elective Subjects

1. Rigzhung
2. Literature in English
3. History
4. Geography
5. Economics
6. Commerce
7. Accountancy
8. Mathematics
9. Physics
10. Chemistry
11. Biology
12. Computer Studies
13. Business Mathematics

#### Part II: Internal Examination

Socially Useful Productive Work (compulsory)

Exemption from Socially Useful Productive Work requirement may be made, in special cases, by the BBE.

### B. Scheme of Examination

1. (a) The syllabuses in English (compulsory) have not been bifurcated. Questions will be set from the entire syllabus for the year-12 examination.  
(b) The syllabuses in Dzongkha have been bifurcated. But questions will be set from the entire syllabus for the year-12 examination.  
(c) The syllabuses in Elective subjects are prescribed separately for Class XI and Class XII. The syllabuses prescribed for Class XI will be examined internally by the school and the syllabuses for Class XII will be examined externally by the BBE.
2. The examination at the end of Class XI will be conducted by the schools and the promotion of candidates from Class XI to Class XII will be the responsibility of the Heads of the Schools and in this respect; the decision of the Head of the College/School is final.
3. The prescribed syllabus for Class XII will be examined externally by the BBE on papers on the subject matter of the syllabus.
4. The result of the BHSEC will be based on the external examination at the end of Class XII and on Socially Useful Productive Work evaluated internally by the School.

### C. Choice of Subject

All candidates for the *Pass Certificate* must enter and sit for English and Dzongkha (compulsory) with three or four elective subjects and must have been evaluated internally by the School in Socially Useful Productive Work.

#### Note:

1. A candidate may not enter for more than six subjects including the compulsory subject English and Dzongkha (for Bhutanese nationals).
2. A school may not enter candidates for subjects for the teaching of which no provision is made by the School.
3. The responsibility for the correct selection of subjects to meet university or professional requirements of a candidate or candidates will be that of the school.
4. Certain subjects have practical papers. Candidates opting for such subjects must also take the practical examination; otherwise the subject in question will be considered **incomplete**.

### D. Awards and Conditions for Awards

1. **PASS CERTIFICATES** will be awarded to candidates who at one and the same examination attain the pass standard in four or more subjects which must include the subject English.

Provided that no candidate, except as otherwise exempted by the BBE, shall be awarded a Pass Certificate unless in addition to fulfilling the conditions above, and he/she has attained grade D in the SUPW examined/assessed internally by the school.

2. **SUPPLEMENTARY PASS CERTIFICATES** will be awarded to candidates who have obtained PASS CERTIFICATES and who appear in a subsequent examination and reach the pass standard in all as per D-1 above.
3. **STATEMENTS OF MARKS** will be issued to all candidates who appeared the examination.

**The pass mark for each subject is 40%.**

### E. Issue of Results

All results will be issued through the Heads of Schools, to whom results will be sent within two weeks after the results have been declared. The result sheets show the result in the examination as a whole and also indicate the standard reached in each subject taken, except Socially Useful Productive Work by grades from 1 to 9, 1 being the highest and 9 the lowest. Grade 1, 2, 3, 4, 5 or 6 indicates a **pass with credit**, 7 or 8 indicates a **pass** and 9 a **failure**. **Very good** is indicated by 1 or 2.

The standard reached in Socially Useful Productive Work (internally assessed) will be shown on the result sheets by grades A, B, C, D or E: A being the highest, and E the lowest. A, B, C or D indicates a pass and E a failure.

### F. Certificates, etc.

1. *Pass Certificates/Supplementary Pass Certificates* will be issued through the Heads of schools as soon as possible after the declaration of results.
2. Duplicates of *Pass Certificates/Supplementary Pass Certificates* are not issued.
3. Duplicates of Statements of Marks will be issued on application accompanied by a certificate countersigned by the Head of School concerned, stating that the original Statement of Marks had been actually lost, and on payment of special charges to BBE.
4. *Migration Certificates* will be issued at the request of Heads of Schools concerned to candidates who have been awarded Pass Certificates.

## **G. Detailed Information**

Refer to **Guidelines for the Conduct of Public examinations in Bhutan 2004** for detailed information on the following areas:

1. Conduct of examinations
2. Dishonesty, Malpractice and Maladministration
3. Examination Results
4. Enquiries about Examination Results
5. Special Arrangements and Special Consideration

## TIME AND PERIOD ALLOCATION

Number of periods and time in hours per week

SUBJECTS		XI	XII
<b>Dzongkha</b>	Period Time	5 (4.10)	5 (4.10)
<b>English</b>	Period Time	6 (5.00)	6 (5.00)
<b>Mathematics</b>	Period Time	5 (4.10)	5 (4.10)
<b>Physics</b>	Period Time	5 (4.10)	5 (4.10)
<b>Chemistry</b>	Period Time	5 (4.10)	5 (4.10)
<b>Biology</b>	Period Time	5 (4.10)	5 (4.10)
<b>Rigzhung</b>	Period Time	5 (4.10)	5 (4.10)
<b>Literature in English</b>	Period Time	5 (4.10)	5 (4.10)
<b>Economics</b>	Period Time	5 (4.10)	5 (4.10)
<b>History</b>	Period Time	5 (4.10)	5 (4.10)
<b>Geography</b>	Period Time	5 (4.10)	5 (4.10)
<b>Commerce</b>	Period Time	5 (4.10)	5 (4.10)
<b>Accountancy</b>	Period Time	5 (4.10)	5 (4.10)
<b>Business Mathematics</b>	Period Time	5 (4.10)	5 (4.10)
<b>Computer Science</b>	Period Time	5 (4.10)	5 (4.10)
<b>Values/Health/CEC</b>	Period Time	1 (0.50)	1 (0.50)
<b>Library</b>	Period Time	1 (0.50)	1 (0.50)
<b>SUPW</b>	Period Time	1 (0.50)	1 (0.50)
<b>Total</b>	<b>Period Time</b>	<b>31+3 (28.20)</b>	<b>31+3 (28.20)</b>

This period allocation is worked out based on 50 minute periods. Period durations may vary from school to school but it is expected that time allocated for each of the subjects is as close to the one indicated here.

## TABLE OF CONTENTS

<u>Rules and Regulations</u> .....	v
<u>Time and Period Allocation</u> .....	xi
<u>English</u> .....	1
<u>Rigzhung</u> .....	27
<u>Literature in English</u> .....	43
<u>Mathematics</u> .....	51
<u>Physics</u> .....	69
<u>Chemistry</u> .....	85
<u>Biology</u> .....	117
<u>History</u> .....	137
<u>Geography</u> .....	149
<u>Economics</u> .....	159
<u>Commerce</u> .....	167
<u>Accountancy</u> .....	177
<u>Computer Studies</u> .....	201
<u>Socially Useful and Productive Work</u> .....	215

# English

## **READING & LITERATURE STRAND**

### **RATIONALE**

Literature embodies an experience of life expressed in a language that appeals. Literature reflects and expresses the human imagination. It brings understanding and enrichment to readers' lives. Through the study of literature, students learn to respond to ideas, issues, perspectives and actions of others more critically and analytically. It also enables students to understand the structure and intent of a variety of literary forms. At this level, students must learn to explore the techniques used by authors to convey messages, persuade and influence, evoke responses and feelings and connect literature to their own lives and daily experiences.

The literature in the syllabus provides the material to teach students how to read, while at the same time permitting them to read some of the best literature available in English. Students have to learn how to make meaning by themselves and to have met some of the best writers and their works in the course of their studies. If we can build classroom communities where that can be arranged, our readers will be drawn to travel through new worlds of experience whose horizons keep expanding.

### **AIMS**

The English literature course aims to help students to:

1. Read with fluency and confidence.
2. Evaluate how authors achieve their effects by the use of linguistic, structural and presentational devices – point of view, figurative language, flashback, parallel argument, and symbol and image patterns.
3. Select and analyze information from a variety of texts to support their responses.
4. Demonstrate an increased familiarity with major writers and their works.
5. Show genuine interest in reading.
6. Come to new understanding of the human condition – what it is like to be in love, struggle with notions of spirituality, the death of loved ones.
7. Show a deepened sense of justice and fair play.

### **LEARNING EXPERIENCES**

Through the study of literature, students will:

1. Gain exposure to different types of literary texts.
2. Prepare speeches for public performance; stage plays; and produce radio scripts and computer presentations.
3. Continue to use the reading strategies learned at each of the earlier levels as they read a wide range of texts, fiction and non-fiction.
4. Select, analyze, and synthesize information from a variety of sources to develop and support their responses to texts.
5. Understand and evaluate how authors achieve their effects in their writing with the use of linguistic, presentational and structural devices, point of view, flashback, figurative language, parallel arguments, and image and symbol patterns.
6. Synthesize information which they collect from other sources to support their views about major writers and their works.
7. Read, talk about and write about the works of major writers.
8. Reflect and engage regularly in debates and discussions about the ideas and values, such as beauty and truth as discussed in major literary works.

## LEARNING OUTCOMES

As a result of these learning experiences students will be able to:

1. Read fiction and non-fiction texts with fluency and confidence using the features and purposes of different kinds of texts as a strategy for making meaning.
2. Analyse how authors achieve their effects by the use of linguistic, structural and presentational devices – points of view, figurative language, flashback, parallel argument, symbols and image patterns – and use this information to make meaning with the text.
3. Select and analyse information from a variety of texts to support their points of view.
4. Come to a new understanding of the human condition through their readings – the notions of spirituality, love, understanding, impermanence, tolerance, patriotism, the impact of modern technology, aging, self-knowledge, and language and culture.
5. Demonstrate a heightened sense of beauty and harmony.
6. Assess their own values in the light of what they encounter in the literature they study to enrich their personal, cultural, and national beliefs.
7. Talk and write about Bhutanese writers as well as major classical and modern writers and their works.
8. Distinguish the best pieces of literature and make choices for their personal collection.
9. Build their vocabulary and practise pronunciation skills.

## TOPICS FOR STUDY

### 1. DRAMA

Drama for Study in Class XI

Title	Author	Form
<i>Once Upon a Greek Stage</i>	Beth McMaster	One Act Play

Drama for Study in Class XII

Title	Author	Form
<i>Episode in the Life of an Author</i>	Jean Anouilh	One Act Play

### 2. POETRY

Poetry for Study in Class XI

Sl.No.	Title	Author	Form
1.	<i>Sonnets 18 &amp; 29</i>	William Shakespeare	Traditional Sonnet
2.	<i>Ode to Autumn</i>	John Keats	Traditional Ode
3.	<i>My Last Duchess</i>	Robert Browning	Dramatic Monologue
4.	<i>Where the Mind is Without Fear</i>	Rabindranath Tagore	An Apostrophe: A Prayer
5.	<i>The River Merchant's Wife: A Letter</i>	Ezra Pound	Modern Lyric
6.	<i>Reflections on a Gift of Watermelon Pickle</i>	John Tobias	Modern Lyric
7.	<i>Quarantine</i>	Eavan Boland	Modern Lyric/ Ballad
8.	<i>Gaylong Sumdar Tashi (Songs of Sorrow):</i> <i>(i) A Change of Fate (ii) Departure</i> <i>(iii) Liberation</i>	Sonam Kinga	Lyrical Ballad

Supplementary Poetry for Class XI

Sl.No.	Title	Author	Form
1.	<i>A Poet's Advice to Students</i>	E.E. Cummings	An Essay



2.	<i>Nothing Gold can Stay</i>	Robert Frost	Lyric
3.	<i>Paper Boats</i>	R a b i n d r a n a t h Tagore	Lyric
4.	<i>To a Daughter Leaving Home</i>	Linda Pastan	Lyric
5.	<i>Before Two Portraits of my Mother</i>	Emilie Nelligan	Lyric
6.	<i>Girl's Eye-view of Relatives</i>	Phyllis Mcginley	Lyric

### Poetry for Study in Class XII

Sl.No.	Title	Author	Form
1.	<i>Digging</i>	Seamus Heaney	Modern Lyric
2.	<i>We Are Seven</i>	William Wordsworth	Traditional Ballad
3.	<i>Ulysses</i>	Lord Alfred Tennyson	Monologue
4.	<i>From The Lyrical Ballad of Pemi Tshewang Tashi: Why Must I Go To War?</i>	Karma Ura	Lyrical Ballad
5.	<i>Mirror</i>	Sylvia Plath	Modern Lyric
6.	<i>As It Is</i>	Doriane Laux	Modern Lyric
7.	<i>The King Speaks to the Scribe</i>	Keki N. daruwalla	Dramatic Monologue
8.	<i>Sonnets 55 and 60</i>	William Shakespeare	Sonnets

### Supplementary Poetry for Class XII

Sl.No.	Title	Author
1.	<i>Warren Pryor</i>	Alden Nowlan
2.	<i>Follower</i>	Seamus Heaney
3.	<i>Lines Written in Early Spring</i>	William Wordsworth
4.	<i>Thought Fox</i>	Ted Hughes
5.	<i>This is a Photograph of Me</i>	Margaret Atwood
6.	<i>Floating Lanterns</i>	Iri Maruki and Toshi Maruki
7.	<i>Hiroshima Exit</i>	Joy Kogawa

**NB:** The teachers are advised to teach the poems that are listed above only. This is done so that you will have time to teach the content prescribed for the language component and also the Essays in the Non Fiction category.

## 3. SHORT STORIES

### Short Stories for Study in Class XI

Sl.No.	Title	Author	Form
1.	<i>Leaving</i>	M.G. Vassangi	Contemporary Realistic Fiction
2.	<i>The Accursed House</i>	Emile Gaboriau	Traditional Realistic Fiction
3.	<i>Too Bad</i>	Isaac Asimov	Contemporary Science Fiction
4.	<i>Nothing Spoils the Taste of Peanut Butter Like Unrequited Love</i>	Clark Gesner	Contemporary Realistic Fiction
5.	<i>Jamaican Fragment</i>	A.L. Hendrik	Contemporary
6.	<i>Simple Arithmetic</i>	Virginia Moriconi	Contemporary Realistic Fiction
7.	<i>The Open Window</i>	Saki	Traditional Realistic Fiction (humour)

### Supplementary Short Stories for Class XI

Sl.No.	Title	Author
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1.	<i>Sunday in the Park</i>	Bell Kaufman
2.	<i>A Matter of Balance</i>	W.D. Valgardson
3.	<i>A Day in the Year 2060</i>	Rae Corelli
4.	<i>Supermarket Soliloquy</i>	Moira Crosbie Lovell
5.	<i>Best Friend</i>	Helen J. Rosta
6.	<i>There Will Come Soft Rains</i>	Ray Bradbury
7.	<i>To Set Our House in Order</i>	Margaret Laurence
8.	<i>Marriage is a Private Affair</i>	Chinua Achebe
9.	<i>A Taste of Melon</i>	Borden Deal

### Short Stories for Study in Class XII

Sl.No.	Title	Author	Form
1.	<i>Bluffing</i>	Gail Helgason	Contemporary Realistic Fiction
2.	<i>The Secret Life of Walter Mitty</i>	James Thurber	Traditional Realistic Fiction (fantasy/humour)
3.	<i>The Elephant</i>	Slawomir Mrozek	Contemporary Realistic Fiction
4.	<i>Mirror Image</i>	Lena Coakley	Contemporary Science Fiction
5.	<i>Woman Unkown</i>	Rabindranath Tagore	Traditional Realistic Fiction
6.	<i>Lamb to the Slaughter</i>	Roald Dahl	Contemporary Realistic Fiction
7.	<i>Test</i>	Theodore Thomas	Contemporary Fantasy Fiction

### Supplementary Short Stories for Class XII

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4.	<i>Supermarket Soliloquy</i>	Moira Crosbie Lovell
5.	<i>Best Friend</i>	Helen J. Rosta
6.	<i>There Will Come Soft Rains</i>	Ray Bradbury
7.	<i>To Set Our House in Order</i>	Margaret Laurence
8.	<i>Marriage is a Private Affair</i>	Chinua Achebe
9.	<i>A Taste of Melon</i>	Borden Deal

## 4. ESSAYS

### Essays for study in Class XI

Sl.No.	Title	Author	Form
1.	<i>Mother Tongue</i>	Amy Tan	Argumentative
2.	<i>What's in This Toothpaste?</i>	David Bodanis	Expository
3.	<i>Values and Development (GNH)</i>	Lyonpo Jigmi Y. Thinley	Expository
4.	<i>English Zindabad vs Angrezi Hatao</i>	Khuswant Singh	Argumentative
5.	<i>African Noel</i>	Mark Patinkin	Narrative
6.	<i>The Skier</i>	Nancy Dorey	Descriptive

### Supplementary Essays for Class XI

Sl.No.	Title	Author	Form
1.	<i>Drukgyel's Destiny</i>	Tashi Pem	Persuasive
2.	<i>New Times</i>	Kuensel Editorial	Expository
3.	<i>At War With Oneself</i>	Ali Hossaini	Reflective
4.	<i>The Pleasure of Gardening</i>	H.C. Mahajan	Descriptive
5.	<i>The Legend of Olympics</i>	Charlie Lovett	Expository
6.	<i>National Day</i>	Kuensel Editorial	Persuasive
7.	<i>How to Rule</i>	C. Trungpa	Expository
8.	<i>The Love That Will Not Die</i>	Pema Chodron	Expository

### Essays for study in Class XII

Sl.No.	Title	Author	Form
1.	<i>Looking at the Media</i>	Cam McPherson	Expository
2.	<i>What I Have Lived For</i>	Bertrand Russell	Argumentative
3.	<i>Arming the Spirit</i>	George Faludy	Narrative
4.	<i>The Shack</i>	Margaret Laurence	Descriptive
5.	<i>Overcoming Arrogance</i>	Chogyam Trungpa	Expository
6.	<i>In the Beginning</i>	Katie Hickman	Narrative

### Supplementary Essays for Class XII

Sl.No.	Title	Author	Form
1.	<i>Gross National Happiness</i>	T.S. Powdyel	Persuasive
2.	<i>Stereotypes are for "Others"</i>	M.C. Maclean	Reflective
3.	<i>Classroom Without Walls</i>	M. MacLuhan	Argumentative
4.	<i>Drukyl's Destiny</i>	Dechen Dolkar	Persuasive
5.	<i>The Heart of the Country</i>	Joanna Lumley	Descriptive
6.	<i>Informing Ourselves to Death</i>	Neil Postman	Argumentative
7.	<i>I am a Native of North America</i>	Chief Dan George	Persuasive

## **LANGUAGE STRAND**

### **RATIONALE**

Every living being strives to communicate with its own kind. One of the ways in which this need is fulfilled is by expressing thoughts in the medium of language. Language is the bridge between individuals that tells them they are needed, that they are not alone. Language thus gives us self-expression and, by extension, identity. It gives shape to thoughts and emotions, and communicates these to intended audiences. It is the basic element with which the history of the world has been recorded. It is a time capsule that allows us to view and re-view any moment in the past of literate man. It is a repository of information that envelops all recorded knowledge and so acts as a gateway to development. It allows peoples of the world to understand different cultures as well as belief systems, and to share ideas. In this regard, no other language has proved more useful than English.

Proficiency in English is therefore seen as a necessity in both academic and professional life. The proper study of English entails detailed study of grammar and conventions of usage, along with other language competencies (listening, speaking, reading, and writing).

In Bhutan where English is used as a second language and students use English frequently only in school, it is of utmost importance that our students receive direct teaching in the grammar, pronunciation and syntax of English in a consistent, thorough, and interactive manner.

### **AIMS**

The language course aims to help students to:

1. Use grammatical conventions with accuracy and confidence
2. Use syntactical patterns with accuracy.
3. Select appropriate language to express concrete and abstract ideas.
4. Demonstrate the use of a sophisticated vocabulary and expression.
5. Show an awareness of the common theories of language acquisition and development.
6. Discuss some of the characteristics features of human language.

### **LEARNING EXPERIENCES**

Through the study of Language, students will:

1. Engage in activities and discussions in which they try to imagine a world without language; invent a language of their own; take advantage of the multi-lingual nature of Bhutanese classrooms to show how the same idea can be expressed in different languages and structures.
2. Engage in activities in which they practise language for formal and informal situations; discussions on the use of slang; to arrive an understanding of how a language changes over time to meet new demands particularly language that is sensitive to gender and age.
3. Explore the relationship between language and grammar.
4. Learn the conventions of standard English.
5. Students will practise English sounds; examine the structures in which sounds appear – letter, syllable, word, sentence, paragraph – to hear the changes each structures brings to sounds in the light of intonation, vocality, and context.
6. Students will learn standard English word order and how it differs from the other languages they speak. Teachers need to take advantage of the fact that students speak several languages to show how language works.

## **LEARNING OUTCOMES**

As a result of these learning experiences students will be able to:

1. Know and use transitive and intransitive verbs appropriately.
2. Use literal and figurative language appropriately.
3. Use the dictionary to find out the number of syllables in a word and the stress given to each syllable.
4. Know and distinguish archaic words, derogative, slang and obsolete language and know when to use them appropriately.
5. Discuss the origin of words (etymology) and how they become a part of the language or how they become obsolete.
6. Know and discuss the common theories of language acquisition and development, for example, the opposing theories that language is innate versus language is acquired.
7. Know and discuss some of the characteristic features of human language, for example, that it is diverse and has common features such as fixed word order and grammar; that it reflects the culture of people who use it; that it is a means of communication, and is a way to express creativity.
8. Discuss the purposes of language.

## **TOPICS FOR STUDY IN CLASSES XI & XII**

### **For Class XI**

1. Dictionary use: meaning, spelling, phonetic symbols, and syllabic structure.
2. Transitive and intransitive verbs.
3. Literal and figurative language.
4. The origin of words (etymology).
5. Common theories of language acquisition and development.

### **For Class XII**

1. Distinguish archaic words, derogative, slang and obsolete language.
2. Characteristic features of language.
3. Purposes of language.

## WRITING

### RATIONALE

The capacity of human beings to write down what they have thought, dreamed of and spoken about makes their language abilities unique. Thoughts expressed in writing can take on a life of their own. They can continue to engage the reader in discussions about ideas long after the writer has departed.

Writing is a way of thinking and learning. It is a process with which thoughts are refined and the language in which they are written made more precise. Writers draft what they want to say. That first draft is a rehearsal of the ideas and the structures in which they have chosen to present them. They will go on to draft and redraft their ideas in writing, to edit them, modify them after they have shared their ideas with their colleagues, and polish their language, until they arrive at a concise statement of what they want to say. Out of this matrix of thinking, drafting and redrafting, editing and modifying, emerges an understanding of the topic, which is much clearer and more precise than when the writers began. Now when the writers engage in conversations or debates on the topic, they can contribute to the discussion in concise ways.

Writers write for many different reasons. There is a need to write to friends. There are other kinds of personal writing as well. Journals, diaries, notebooks, wishes and dreams are written down for the writer alone to read. Writers write to do business with people whom they do not know. They write to explain their research to colleagues whom they have not met; to argue a position, to try to persuade people whom they do not know to accept their services. Writers write to delight their readers with imaginary people, lovable animals characters and worlds different but similar to their own.

Students need to practise so that they develop their abilities and skills in each of these kinds of writing, the personal, the transactional and the creative or poetic. They have to be exposed to the stages of writing and to the many strategies that writers use to make their writing say what they want it to say. Students will find tactics that work for them and incorporate these into their repertoire of writing strategies. They will discover that certain strategies work better for specific writing tasks while others work for them almost all the time. As they write they become more aware of their own writing processes, they will take control of their writing and become effective writers.

### AIMS

The Writing course aims to help students to:

1. Use vocabulary and grammar to make fine distinctions and achieve emphasis.
2. Show a clear grasp of the use of paragraphing and punctuation.
3. Write non-fiction that is coherent and gives clear points of view.
4. Write fiction that shows control of characters, events, settings and uses a variety of structures.
5. Write poetry that shows control of the different forms.
6. Take notes and prepare reports from their notes.
7. Demonstrate a clear understanding of the criteria for good writing.
8. Use the writing process effectively and build their portfolio.

### LEARNING EXPERIENCES

Through the study of Writing, students will:

1. Write regularly for a wide range of purposes, not only to answer questions posed by the teacher.
2. Use *the writing process*.
3. Study examples of good writing selected from the general categories of fiction and non-fiction, which

illustrate good models in each of – personal, transactional and poetic writing.

4. Present their writing publicly to a variety of audiences – classmates, schoolmates, parents and other groups.
5. Build a *portfolio* of their best work in each of poetic, personal and transactional writing.
6. Evaluate their own writing using the criteria for good writing.
7. Help with the editing of the work of their fellow students.
8. Have fun as they create their own work to entertain, inform and delight others.

## **LEARNING OUTCOMES**

As a result of these learning experiences students will be able to:

1. Write a short story in which they show control of the elements of the short story form.
2. Write an expository essay.
3. Write an argumentative essay.
4. Write lyric poetry in the modern idiom, which uses contemporary ideas of language, cadence, and image.
5. Begin and complete a research paper in which they show understanding and control of the conventions of academic writing.
6. (This paper will be begun in Class XI - see Objective 4, Class XI. It will be completed in Class XII – see Objective 7, Class XII)
7. Respond in writing to examination questions and homework assignments at an acceptable level.
8. Know the purposes and structures of the texts they are studying in Reading & Literature and use them in their writing.
9. Explore personal, cultural, and national beliefs in their writing.
10. Demonstrate that they can make fine distinctions in grammar and diction to achieve precision in their writing
11. Complete and present their portfolios which contain their best examples of personal, transactional, and poetic writing.

## **TOPICS FOR STUDY IN CLASSES XI & XII**

### **Writing to be done in Class XI:**

1. A short story.
2. An expository essay.
3. Begin a research paper.
4. Responses to examination questions and homework assignments.

### **Writing to be done in Class XII:**

1. Lyric poetry in the modern idiom.
2. Short Stories.
3. Argumentative essays.
4. Responses to examination questions and homework assignments.
5. Complete the research paper begun in Class XI.



## **LISTENING & SPEAKING STRAND**

### **RATIONALE**

We are born into the world capable not only of speaking any language but also capable of listening to the language that we hear around us so that we can learn how to use it to communicate our thoughts and feelings. As we listen, we acknowledge the presence of people around us and learn to make sense of the sounds they make. The practice of the skill of listening, and the growing necessity to express what we need, think, feel and understand, leads us naturally to learn to use the spoken world.

To listen well is a skill that assists us in all aspects of our relationships with others. To listen with empathy allows us to share both messages and feelings. To listen well is to honour the thoughts of others and accept their contributions to the well being of our community. To listen well is to learn new ideas and perceptions, words and structures. To listen is to learn from good speakers their skills at rhetoric and gesture so we can use them for ourselves when we speak.

To speak is an art which we all practice. It is one of the important ways by which people know us. To learn to do it well gives us confidence in ourselves and gives others confidence in us. We need to learn to speak with ease and clarity so that we can, as people in the workplace, members of family, and citizens in our communities make contributions to the common good. Conversations of all kinds sharpen our understanding. They draw us closer, fulfilling the need for companionship as we share what we understand about what it is to be human.

In sum, we listen and speak for a variety of purposes on both formal and informal occasions. Whatever the circumstance, we need to learn to listen and speak well. The skills of Listening and Speaking are to be taught directly and practiced so that we become better at using them to help us in our quest for understanding the world we live in.

### **AIMS**

The Listening and Speaking course aims to help students to:

1. Demonstrate an apt use of vocabulary.
2. Use language that is accurate in grammar and free from errors in pronunciation.
3. Lead routine meetings and manage interactions in small groups.
4. Make a range of contributions which show that they have listened perceptively to the development of a discussion.
5. Explain their position on and understanding of complex issues.
6. Maintain and develop their talk purposely in a range of contexts.
7. Participate in a variety of contexts, public or otherwise, using appropriate intonation and emphasis.

### **LEARNING EXPERIENCES**

Through the study of Listening and Speaking students will:

1. Have regular and consistent practice in pronouncing sounds, words and sentences.
2. Engage in purposeful conversations, dialogues, and informal debates regularly.
3. Respond respectfully to those who express views different to their own.
4. Practice in building on the talk of others and modifying ideas through conversation.
5. Listen to examples of good oral presentations as they are delivered, either live or on tape, which demonstrate a range of purpose and tone.



6. Practise recounting and commenting on what has been listened to.
7. Practise speaking and listening regularly in small groups, first on simple topics and then gradually on more complex issues and themes.
8. Listen for signals that indicate a speaker's tone, intent and message
9. Learn tone, language and messages which are appropriate for different audiences and purposes.
10. Participate as members of small task groups and then leaders of those groups, to learn language and behaviour appropriate to these roles.
11. Observe appropriate body language which accompanies formal and informal speech acts.
12. Build their own speeches for use in public.
13. Speak in public for various purposes: debates, explanations, reports, advertisements, eulogies, introduction of visitors, toasts at parties, responses to questions from an audience.

### **LEARNING OUTCOMES**

As a result of these learning experiences students will be able to:

1. Speak using correct question tag.
2. Talk about major classical and modern writers (including Bhutanese writers) and their works.
3. Organise and participate in a panel discussion.
4. Use public speaking skills such as conventions of address, methods of introduction of a topic or theme, timing, pace, tone, intonation, gestures and closure to speak effectively in different contexts.
5. Listen to and gather information from different kinds of oral presentations.
6. Analyse different kinds of speeches and use them as models for their own.
7. Deliver speeches incorporating literary quotations, allusions, and imagery.
8. Use negotiation skills to resolve diplomatically conflicts that arise among members of groups.
9. Speak with clear pronunciation.

### **TOPICS FOR STUDY IN CLASSES XI & XII**

#### **For Class XI**

1. Talking about major classical and modern writers.
2. Using correct question tags.
3. Organizing and participating in a panel discussion.
4. Using public speaking skills such as conventions of address, methods of introduction of a topic or theme, timing, pace, tone, intonation, gestures and closure.
5. Listening to and gathering information from different kinds of oral presentations.
6. Analysing different kinds of speeches.

#### **For Class XII**

1. Talking about major classical and modern writers.
2. Using correct question tags.
3. Using negotiation skills to resolve diplomatically conflicts that arise among members of groups.
4. Delivering speeches.
5. Using proper pronunciation

## TEXTBOOKS

1. *English Curriculum Guide for Teachers: Class XI*. CAPSD/MoE, 2005.
2. *English Curriculum Guide for Teachers: Class XII*. CAPSD/MoE, 2005.
3. *English: Reading & Literature Texts for Class XI*. CAPSD/MoE, 2005.
4. *English: Reading & Literature Text for Class XII*. CAPSD/MoE, 2005.
5. *English: Curriculum Framework for Classes PP-XII*. CAPSD/MoE, 2005.
6. *Language Aloud Allowed*. Gwen Mowbray.
7. *Exploring Grammar in Context: Grammar reference and practice upper-intermediate and advanced*, Cambridge University Press, 2000 - Ronald Carter, Rebecca Hughes and Michael McCarthy. (Students copy for Classes XI and XII)

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2. *The Short Oxford History of English Literature*, Andrew Sanders OUP
3. *Essays and Dissertations*, Chris Mounsey, OUP
4. *Oxford Concise Dictionary of Literary Terms*, Chris Baldick, OUP
5. *Cambridge International Dictionary of Phrasal Verbs*, CUP
6. *Practical English Usage*, Micheal Swan, OUP
7. *A Practical English Grammar*, A.V.Martinet, OUP
8. *Reading and Study Strategies*, Nirmala Ballara, OUP
9. *Punctuation*, Robert Allen, OUP
10. *Spelling*, Robert Allen, OUP
11. *Oxford Practise Grammar*, Eastwood, OUP
12. *Intermediate English Grammar*, Raymond Murphy, OUP
13. *ISC English Practice*, J.A.Mason, OUP
14. *A Critical History of English Literature* – David Daiches – four volumes – available in Indian Editions.
15. *History of English Literature by Arthur Crompton Rickett* – available in Indian Editions
16. *History of English Literature* by Legouis and Cazamian
17. *Dictionary of Literary Terms* by M.H Abrahms
18. *Dictionary of fables and phrases*
19. *An Introduction to English Literature* by William Henry Hudson
20. *A Handbook to Literature* by William Harmon and C. Hugh Hormon – Prentice Hall
21. *Language and Linguistics: An Introduction* – John Lyons. Cambridge University Press, 1981.
22. *A Biography of the English Language* – C.M Millward, Harcourt Brace College Publishers, 1996
23. *Current English Grammar and Usage with Composition* – R.P Sinha, OUP, 2002

## TIME ALLOCATION FOR TEACHING OF ENGLISH CLASSES XI & XII

This is a suggested annual timeline. It assumes a school year with 180 teaching days, exclusive of holidays and examination time. It assumes a school year divided into 2 terms of fifteen weeks each. It assumes that 80 classes of 50 minutes length will be allotted to Reading & Literature, 50 classes of 50 minutes length to Writing, 30 classes of 50 minutes length to Language and 20 classes of 50 minutes length to Listening and Speaking. It assumes as well, that 6 periods of 50 minutes will be allotted to the implementation of the English curriculum.

### TIMETABLE (TOTAL = 180 periods)

<i>Reading and Literature</i>	80 periods	<i>Writing</i>	50 periods
<i>Language</i>	30 periods	<i>Listening and Speaking</i>	20 periods

### TERM ONE

Weeks	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	Reading& Literature	Reading& Literature	Reading & Literature	Writing	Writing	Language
2	Do	Do	Do	Do	Listening& Speaking	Do
3	Do	Do	Writing	Do	Do	Do
4	Do	Do	Reading& Literature	Do	Writing	Do
5	Do	Do	Do	Do	Listening& Speaking	Do
6	Do	Do	Writing	Do	Do	Do
7	Do	Do	Reading& Literature	Do	Writing	Do
8	Do	Do	Do	Do	Listening& Speaking	Do
9	Do	Do	Writing	Do	Do	Do
10	Do	Do	Reading& Literature	Do	Writing	Do
11	Do	Do	Do	Do	Listening& Speaking	Do
12	Do	Do	Writing	Do	Do	Do
13	Do	Do	Reading& Literature	Do	Writing	Do
14	Do	Do	Do	Do	Listening& Speaking	Do
15	Do	Do	Writing	Do	Do	Do
<b>Total</b>	<b>15</b>	<b>15</b>	<b>Reading &amp; Literature=10 Writing=5</b>	<b>15</b>	<b>Listening &amp; Speaking=10 Writing=5</b>	<b>15</b>

## TERM TWO

Weeks	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
16	Reading& Literature	Reading& Literature	Reading & Literature	Writing	Writing	Language
17	Do	Do	Do	Do	Listening& Speaking	Do
18	Do	Do	Writing	Do	Do	Do
19	Do	Do	Reading& Literature	Do	Writing	Do
20	Do	Do	Do	Do	Listening& Speaking	Do
21	Do	Do	Writing	Do	Do	Do
22	Do	Do	Reading& Literature	Do	Writing	Do
23	Do	Do	Do	Do	Listening& Speaking	Do
24	Do	Do	Writing	Do	Do	Do
25	Do	Do	Reading& Literature	Do	Writing	Do
26	Do	Do	Do	Do	Listening& Speaking	Do
27	Do	Do	Writing	Do	Do	Do
28	Do	Do	Reading& Literature	Do	Writing	Do
29	Do	Do	Do	Do	Listening& Speaking	Do
30	Do	Do	Writing	Do	Do	Do
<b>Total</b>	<b>15</b>	<b>15</b>	<b>Reading&amp; Literature=10 Writing = 5</b>	<b>15</b>	<b>Listening&amp; Speaking=10 Writing = 5</b>	<b>15</b>

30 weeks of instructional time in a year.

30 weeks × 6 periods = 180 periods in an academic year.

## **MODES OF ASSESSMENT**

### **MODES OF ASSESSMENT - CLASS XI**

#### **STANDARDS**

The Standards are statements of what the public can expect students to know and be able to do in English when they graduate from the school system (The Silken Knot: *Standards for English for schools in Bhutan*). The Standards for Writing and Language are listed in the English Curriculum Framework Document – Pre-primary to Class XII. These are the overall objectives that students are expected to achieve when they graduate from the particular grade or class.

#### **LEARNING OBJECTIVES**

The Learning Objectives will serve as indicators of achievement at each class level in reference to the Standards. The assessment is guided by the Learning Objectives.

#### **ASSESSMENT OBJECTIVES**

The objectives are listed under the Learning Objectives for Class XI under Language and Writing Strand in the English Curriculum Framework document. These objectives are inter-related and it will not normally be possible or desirable to test them in isolation.

#### **SCHEME OF ASSESSMENT**

The overall assessment during the year will consist of the following:

- Continuous Formative Assessment
- Continuous Summative Assessment (CSA),
- Examinations
  - Mid-term examinations
  - Annual Examinations

#### **CONTINUOUS FORMATIVE ASSESSMENT**

The Continuous Formative Assessment (CFA) is an assessment of student's learning that is carried out throughout the academic year involving a variety of organised, both formal and informal learning activities to facilitate quality teaching and learning in schools.

The main aims of Continuous Formative Assessment (CFA) are to:

- provide opportunities to both the teacher and the learner to reflect on the learning process and on the level of achievement
- help teachers to find out what teaching methods and materials work best
- help teachers pay attention to individual differences and learning styles of the learners
- make learners realize how well they can do certain types of work and what they need to improve
- enable learners to see the connection between efforts and results
- allow the learners to evaluate themselves and also in peer group
- enable learners to take on multiple roles – as learners, helpers, evaluators and reviewers of the learning processes
- enable learners to appreciate each other's talents and accept the weaknesses
- develop and tap the higher level thinking and problem solving skills of learners

The following are some of the suggested Continuous Formative Assessment activities:

- Ask series of questions to the class verbally as the teaching is going on
- In pair provide opportunities for peer assessment among students
- Provide individual students with the opportunities for self assessment
- In group/pair work, observe students and keep notes
- In writing activities, keep ample time for corrections and giving feedback to students
- Rubrics can be used for assessing students' writing, class participation, listening speaking and reading skills
- Keep literacy Portfolios for both reading and writing activities
- Teachers could keep anecdotal records, observation notes and conference diaries for students as part of CFA, and follow the FA activities that are suggested in the teachers' manuals under various genres.

## **CONTINUOUS SUMMATIVE ASSESSMENT**

The Continuous Summative Assessment consists of the internal school-based assessment on the Listening and Speaking Strand and the two written examinations.

### **1. Internal Assessment**

The following are suggested modes of assessment for awarding internal assessment (CSA) marks for Class XI:

#### **Listening and Speaking - 20 marks:**

❖ Suggested Listening and Speaking activities for assessment purposes:

- Extempore speeches
- Panel discussions
- Listening exercises
- Debates
- Presentations and reports, etc.,

Detailed Listening and Speaking Activities are suggested in the Teachers' Guides Classes XI and XII.

### **2. Written Examinations**

There are two written examinations for Class XI: The Mid-term Examination conducted in the first term will be marked out of 30%. The Annual Examination conducted at the end of the year will be marked out of 80%

## **PAPER I: LANGUAGE AND WRITING**

In Paper I the Assessment will consist of writing portfolio and the written examination.

The Writing Portfolio includes-Journal writing for books read and the best written pieces selected by the students on teacher's guidance, based on the good writing criteria. The portfolio is to be maintained for each student and must be assessed and awarded 20% marks as the part of CA

#### **Writing Portfolio: 20%**

- Best pieces of writing selected by the students
- Best pieces selected by the teacher
- Journal writing for books read
- Consider process while assessing the quality of work
- Teacher needs to consider the number and types of genre

There will be two papers for the Examination. Paper I will consist of Language and Writing strands. The time allotted for the written examination is as given below:

**Time: 3 hours for writing and 15 minutes for reading the questions**

**Weighting: 100marks (60 marks for writing and 40 marks for Language)**

**Question Format:**

The Paper I will have two sections-Section A and Section B

**SECTION A**

Section A is for Writing and it will be marked out of 60%. This section will test students' writing skills through extended response questions. This section will have two questions.

**Question 1:**

Students are required to choose and write persuasive essay from the three choices provided. It will be worth 25 marks.

**Question 2:**

Students are required to write any original work and demonstrate their understanding of how to create character, establish setting, develop a plot and show that they can handle the elements of short stories. It will be worth 30 marks.

**SECTION B**

The questions under section B will test students' language skills through short answer questions. It will be worth 40marks.

**Question 1:10 marks**

The students will be examined on their understanding of origin of words (etymology) and common theories of language acquisition.

**Question 2: 30 marks**

There will be questions on grammar which will require students to correct, rewrite, edit, and complete sentences. It will be worth 30 marks.

**Examination weighting for:****Writing**

Essay	30%
Story Writing	30%

**Language**

Nature of Language	10%
Grammar Structure	30%

**Total** **100%**

**Suggested break up of CA and Examination Weightings**

	TERM ONE		TERM TWO		Total
	C o n t i n u o u s Assessment	Examination	C o n t i n u o u s Assessment	Trial Examination	
<b>Class XI</b>	10 % Writing Portfolio	30%	10 % Writing Portfolio	50%	100%

**NOTE:**

- The schools should conduct term one examination out of 100 % and convert it to 30%, similarly the term two examination should be conducted out of 100% and convert it to 50%. By adding 20% CA for Writing Portfolio for Paper I, the overall weighting will be 100%.

## PAPER II: READING & LITERATURE

In Paper II the Assessment will consist of Reading Portfolio, Listening & Speaking and the Written Examinations.

The Reading Portfolio includes - Reading Record for books read, critical responses, text talk or book talk, and book reviews by the students on teacher's guidance based on the criteria.

The portfolio is to be maintained for each student and must be assessed and awarded marks as the part of CA.

The Listening & Speaking includes- Listening skills exercises, Reports, Debates, Extempore speeches, Presentations, and Book talk.

The Reading Portfolio carries 10%, Listening & Speaking carries 10% and the written examinations (Term 1 and Term 2) are of 80%.

(Under the Research Paper students will learn simple steps or procedures in conducting a small action research. With teacher's guidance students will select their own topics and will write a research paper. The paper will be submitted after they complete grade XII. Assessment will be based on the students' content knowledge on action research, interviewing skills and questionnaire development skills.)

Reading Portfolio : 10%	Listening & Speaking : 10%
<ul style="list-style-type: none"><li>• Record of reading</li><li>• Critical response to book read</li><li>• Text talk or book talk</li></ul>	<ul style="list-style-type: none"><li>• Listening skills excercises</li><li>• Reports</li><li>• Debates</li><li>• Extempore speeches</li><li>• Presentation of their written pieces</li><li>• Book talk</li></ul>

The second part is the written examination on the Reading & Literature strand.

The time allotted for the written examination is as given below:

**Time: 3 hours for writing and 15 minutes for reading**

### Weightings:

Short Stories: 25 marks

Essay: 25 marks

Poetry: 25 marks

Novel: 25 marks

### Question Format:

In Paper II there will be four sections as shown below:

Section A: Short Stories

Section B: Essay

Section C: Poetry

Section D: Novel

In each Section there will be two sets of questions of which either set I or set II to be attempted. However students must attempt at least one set II (Extended Response) questions from any of the four sections.



## ASSESSMENT SCHEME AND QUESTION PATTERN:

### Section A: Short Stories

#### Set I: 25 marks

Multiple Choice Questions - 5 marks

Short Answer Questions – 20 marks

#### Set II: 25 marks

Extended Response Questions – Two questions: 10+15=25marks

*Note: In section A questions will be set on seen texts.*

### Section B: Essay

#### Set I: 25 marks

Multiple Choice Questions - 5 marks

Short Answer Questions – 20 marks

#### Set II: 25 marks

Extended Response Questions – Two questions: 10+15=25marks

*Note: In section B questions will be set on unseen texts.*

### Section C: Poetry

#### Set I: 25 marks

Multiple Choice Questions - 5 marks

Short Answer Questions – 20 marks

#### Set II: 25 marks

Extended Response Questions – Two questions: 10+15=25marks

*Note: In section C questions will be set on unseen texts.*

### Section C: Novel

#### Set I: 25 marks

Multiple Choice Questions - 5 marks

Short Answer Questions – 20marks

#### Set II: 25 marks

Extended Response Questions – Two questions: 10+15=25marks

*Note: In section D questions will be set on seen text.*

In each genre, the questions will test the students' ability to:

- Understand the text
- Give relevant interpretations of the contents in their own words
- Identify elements, points of view, themes, ideas, and analyse, synthesize, evaluate the texts and apply the ideas.

### Suggested break up of CA and Examination Weightings

	TERM ONE		TERM TWO		
	Continuous Assessment	Examination	Continuous Assessment	Trial Examination	Total
Class XI	5% Reading Portfolio	30%	5% Reading Portfolio	50%	100%
	5% Listening & Speaking		5% Listening & Speaking		

**Note:** The schools should conduct term one examination out of 100% and convert it to 30%, similarly the term two examination should be conducted out of 100% and convert it to 50%. By adding 20% CA for Reading Portfolio and Listening & Speaking strand to Paper II, the overall weighting will be 100%.

## **MODES OF ASSESSMENT FOR CLASS XII**

### **STANDARDS**

The Standards are statements of what the public can expect students to know and be able to do in English when they graduate from the school system (The Silken Knot: *Standards for English for schools in Bhutan*). The Standards for Writing and Language are listed in the English Curriculum Framework Document – Pre-primary to Class XII.

### **LEARNING OBJECTIVES**

The Learning Objectives will serve as indicators of achievement at each class level in reference to the Standards. The assessment is guided by the Learning Objectives.

### **ASSESSMENT OBJECTIVES**

The objectives are listed under the Learning Objectives for Class XI under Language and Writing in the English Curriculum Framework document. These objectives are inter-related and it will not normally be possible or desirable to test them in isolation.

### **SCHEME OF ASSESSMENT**

The overall assessment during the year will consist of the following:

- Continuous Formative Assessment
- Continuous Summative Assessment (CSA),
- Examinations
  - Mid-term examinations
  - Annual Examinations

### **CONTINUOUS FORMATIVE ASSESSMENT**

The Continuous Formative Assessment (CFA) is an assessment of student's learning that is carried out throughout the academic year involving a variety of organised, both formal and informal learning activities to facilitate quality teaching and learning in schools.

The main aims of Continuous Formative Assessment (CFA) are to:

- provide opportunities to both the teacher and the learner to reflect on the learning process and on the level of achievement
- help teachers to find out what teaching methods and materials work best
- help teachers pay attention to individual differences and learning styles of the learners
- make learners realize how well they can do certain types of work and what they need to improve
- enable learners to see the connection between efforts and results
- allow the learners to evaluate themselves and also in peer group
- enable learners to take on multiple roles – as learners, helpers, evaluators and reviewers of the learning processes
- enable learners to appreciate each other's talents and accept the weaknesses
- develop and tap the higher level thinking and problem solving skills of learners

The following are some of the Learning Continuous Formative Assessment activities:

- Ask series of questions to the class verbally as the teaching is going on
- In pair provide opportunities for peer assessment among students
- Provide individual students with the opportunities for self assessment
- In group/pair work, observe students and keep notes
- In writing activities, keep ample time for corrections and giving feedback to students
- Rubrics can be used for assessing students' writing, class participation, listening speaking and reading skills
- Keep literacy Portfolios for both reading and writing activities
- Teachers could keep anecdotal records, observation notes and conference diaries for students as part of CFA, and follow the FA activities that are Learning in the teachers' manuals under various genres.

## **CONTINUOUS SUMMATIVE ASSESSMENT:**

The Continuous Summative Assessment consists of the internal school-based assessment on the Listening and Speaking Strand and the two written examinations.

### **1. Internal Assessment**

The following are Learning modes of assessment for awarding internal assessment (CSA) marks for Class XII:

#### **Listening and Speaking - 20 marks:**

- ❖ Learning Listening and Speaking activities for assessment purposes:
  - Extempore speeches
  - Panel discussions
  - Listening exercises
  - Debates
  - Presentations and reports, etc.,

Detailed Listening and Speaking Activities are Learning in the Teachers' Guides Classes XI and XII.

### **2. Written Examinations**

There are two written examinations for Class XII: The Mid-term Examination conducted in the first term will be marked out of 30%. The Annual Examination conducted at the end of the year will be marked out of 80%

## **PAPER I: LANGUAGE AND WRITING**

In Paper I the Assessment will consist of writing portfolio and the written examination. The Writing Portfolio includes-Journal writing for books read and the best written pieces selected by the students on teacher's guidance, based on the good writing criteria. The portfolio is to be maintained for each student and must be assessed and awarded 20% marks as the part of CA

<b>Writing Portfolio : 20%</b>
<ul style="list-style-type: none"><li>• Best pieces of writing selected by the students</li><li>• Best pieces selected by the teachers</li><li>• Journal writing for books read</li><li>• Consider process while assessing the quality of work</li><li>• Teacher needs to consider the number and types of genre</li></ul>

There will be two papers for the Examination. Paper I will consist of Language and Writing strands. The time allotted for the written examination is as given below:

**Time: 3 hours for writing and 15 minutes for reading the questions**

**Weighting: 100marks (60 marks for writing and 40 marks for Language)**

**Question Format:**

The Paper I will have two sections-Section A and Section B

**SECTION A**

Section A is for Writing and it will be marked out of 60%. This section will test students' writing skills through extended response questions. This section will have two questions.

**Question 1:**

Students are required to choose and write an argumentative essay from the three choices provided. It will be worth 25 marks.

**Question 2:**

Students are required to write any original work and demonstrate their understanding of how to create character, establish setting, develop a plot and show that they can handle the elements of short stories. It will be worth 30 marks.

**SECTION B**

The questions under section B will test students' language skills through short answer questions. It will be worth 40marks.

**Question 1:10 marks**

The students will be examined on their understanding of origin of words (etymology) and common theories of language acquisition.

**Question 2: 30 marks**

There will be questions on grammar which will require students to correct, rewrite, edit, and complete sentences. It will be worth 30 marks.

**Examination weighting for:****Writing**

Essay	30%
Story Writing	30%

**Language**

Origin of words, purposes of language and its features	10%
Grammar Structure	30%

**Total** **100%**

**Suggested break up of CA and Examination Weightings**

	TERM ONE		TERM TWO		
	Continuous Assessment	Examination	Continuous Assessment	Trial Examination	Total
<b>Class XII</b>	10 % Writing Portfolio	30%	10 % Writing Portfolio	50%	100%

**Note:** The schools should conduct term one examination out of 100% and convert it to 30%, similarly the term two examination should be conducted out of 100% and convert it to 50%. By adding 20% CA for Writing Portfolio, the overall weighting will be 100%.

## PAPER II: READING AND LITERATURE

In Paper II the Assessment will consist of Reading Portfolio, Listening & Speaking and the Written Examinations.

The Reading Portfolio includes - Reading Record for books read, critical responses, text talk or book talk, and book reviews by the students on teacher's guidance based on the criteria.

The portfolio is to be maintained for each student and must be assessed and awarded marks as the part of CA.

The Listening & Speaking includes- Listening skills exercises, Reports, Debates, Extempore speeches, Presentations, and Book talk.

The Reading Portfolio carries 10%, Listening & Speaking 10% and the written examinations (Term 1 and Term 2) are of 80%.

(Under the Research Paper students will learn simple steps or procedures in conducting a small action research. With teacher's guidance students will select their own topics and will write a research paper. The paper will be submitted after they complete grade XII. Assessment will be based on the students' content knowledge on action research, interviewing skills and questionnaire development skills.)

Reading Portfolio : 10%	Listening & Speaking : 10%
<ul style="list-style-type: none"><li>• Record of reading</li><li>• Critical response to book read</li><li>• Text talk or book talk</li></ul>	<ul style="list-style-type: none"><li>• Listening skills exercises</li><li>• Reports</li><li>• Debates</li><li>• Extempore speeches</li><li>• Presentation of their written pieces</li><li>• Book talk</li></ul>

The second part is the written examination on the Reading & Literature strand.

The time allotted for the written examination is as given below:

**Time: 3 hours for writing and 15 minutes for reading**

### Weightings:

Short Stories: 25 marks

Essay: 25 marks

Poetry: 25 marks

Drama: 25 marks

### Question Format:

In Paper II there will be four sections as shown below:

Section A: Short Stories

Section B: Essay

Section C: Poetry

Section D: Drama

In each Section there will be two sets of questions of which either set I or set II to be attempted.

However students must attempt at least one set II (Extended Response) questions from any of the four sections.

### ASSESSMENT SCHEME AND QUESTION PATTERN:

#### Section A: Short Stories

##### Set I: 25 marks

Multiple Choice Questions - 5 marks

Short Answer Questions – 20 marks

**Set II: 25 marks**

Extended Response Questions – Two questions: 10+15=25marks

*Note: In section A questions will be set on seen texts.*

**Section B: Essay****Set I: 25 marks**

Multiple Choice Questions - 5 marks

Short Answer Questions – 20 marks

**Set II: 25 marks**

Extended Response Questions – Two questions: 10+15=25marks

*Note: In section B questions will be set on unseen texts.*

**Section C: Poetry****Set I: 25 marks**

Multiple Choice Questions - 5 marks

Short Answer Questions – 20 marks

**Set II: 25 marks**

Extended Response Questions – Two questions: 10+15=25marks

*Note: In section C questions will be set on unseen texts.*

**Section C: Novel****Set I: 25 marks**

Multiple Choice Questions - 5 marks

Short Answer Questions – 20 marks

**Set II: 25 marks**

Extended Response Questions – Two questions: 10+15=25marks

*Note: In section D questions will be set on seen text.*

In each genre, the questions will test the students' ability to:

- Understand the text
- Give relevant interpretations of the contents in their own words
- Identify elements, points of view, themes, ideas, and analyse, synthesize, evaluate the texts and apply the ideas.

**Suggested break up of CA and Examination Weightings**

	TERM ONE		TERM TWO		
	Continuous Assessment	Examination	Continuous Assessment	Trial Examination	Total
<b>Class XII</b>	5% Reading Portfolio	30%	5% Reading Portfolio	50%	100%
	5% Listening & Speaking		5% Listening & Speaking		

**Note:** The schools should conduct term one examination out of 100% and convert it to 30%, similarly the term two examination should be conducted out of 100% and convert it to 50%. By adding 20% CA for Reading Portfolio and Listening & Speaking strand to Paper II, the overall weighting will be 100%.



# Rigzhung



# རིག་གཞུང་ཚོས་ཚན།

དགོས་དོན།

རྫོང་ཁའདི་ ང་བཅས་རའི་རྒྱལ་ཁབ་ཀྱི་ ཐུན་མོང་མ་ཡིན་པའི་ ལ་སྐད་དོ་མ་ཅིག་ཡིན་རུང་ ཡིག་ཐོག་ལུ་འབྲིམ་ད་ ཡི་གཱའི་སློབ་བུ་ཚུ་ ཚོས་སྐད་ལུ་  
གཞི་བཞག་ཞིན་མ་ལས་ རྫོང་ཁའི་ངག་གཞིས་དང་བསྐྱེད་ཏེ་ བཟོ་བཅོས་འབད་འབདམ་ཅིག་ཡིན། འདི་གིས་འབད་ རྫོང་ཁའི་སྐད་ཡིག་ཤེས་པ་ཅིན་  
ཚོས་སྐད་ཀྱི་གཞི་འགྲམ་འཐོབ་པའི་ཁར་ ཚོས་སྐད་ཤེས་རུང་ རྫོང་ཁའི་སྐད་ཡིག་ཤེས་ནི་ལ་ ཕན་ཐབས་སློམ་ཡོད་པ་ཡིན།

ང་བཅས་རའི་རྒྱལ་ཁབ་ནང་ ཉན་པ་སངས་རྒྱས་པའི་ ཚོས་དང་འཛིག་རྟེན་གྱི་ ཚུ་མ་རིག་གཞུང་ལགས་ཚུ་ ཚོས་སྐད་ཀྱི་ཐོག་ལས་ དར་ཁྲབ་སོང་  
སྟེ་ཡོད་པ་ལས་ རང་གི་མི་ཚེ་ཉན་ ཚོས་སྐད་ནང་ཡོད་པའི་ གཞུང་ རིག་གནས་ལུ་ ཐོས་བསམ་འབད་ནི་དང་ ཐོས་པའི་ཉམས་སྲོལ་རྒྱ་ཚུ་ཚེད་གས་  
འབད་ ཐོབ་ཚུགས་པ་ལས་ མ་འོངས་ཕག་ལུ་ ལ་གཡོག་གི་རིག་པ་དང་ ཤེས་ཡོན་འཕྲོ་མཐུན་དེ་ལྟ་བུ་ནི་ ཤེས་ཡོན་གཞན་ལུ་ ཁངས་གཏུགས་འབད་  
ནི་འི་རིག་རྩལ་ ལ་སོགས་པའི་ གོ་སྐབས་མང་རབས་ སློ་སྤྲེལ་ཚུགས་པའི་ཐབས་ལུ་ ཚུ་མ་རིག་གཞུང་ལུ་ སྤྱིང་བ་འབད་དགོ་པ་ ག་ནི་ལས་གལ་ཚེ།

ཁྱད་པར་དུ་ ཉན་པའི་རྩོམ་རིག་གཞུང་ལགས་ལུ་ ཐོས་བསམ་འབདམ་ལས་ གཞན་ཕན་ ཞི་དུ་ལུ་གི་སེམས་དང་ལྷན་པའི་ཁར་ རང་ལུ་དང་རྒྱལ་  
ཁབ་ལུ་ ཐང་མ་ཚིག་ལྟ་མེད་ཀྱི་ཐོག་ལས་ ཕྱག་སྤྲོད་ལྷུ་ཚུགས་པའི་ ལ་རབས་བཟང་སྤོད་དང་ལྷན་པའི་ གང་ཟག་ཅིག་ལུ་ འགྱུར་ཚུགས་པའི་རུས་  
པ་ཡང་ཡོད།

འདི་འབདམ་ལས་ སློབ་རིམ་ ༡༢ པའི་ སློབ་ཕྲུག་ཨ་ལོ་ཚུ་གི་རྒྱུད་ལུ་ ཚོས་སྐད་ཀྱི་གཞི་རྟེན་འདི་བཅུགས་ཏེ་ ཚོས་སྐད་སློབ་སློབ་འབད་ནི་ལུ་ སློ་  
བ་དང་ དང་འདོད་བསྐྱེད་ཚུགས་དགོ་པ་མ་ཚང་ ཚོས་དང་འཛིག་རྟེན་གཞིས་མ་ར་གི་གཞི་རྟེན་ རིག་གཞུང་གི་ ཡོན་ཏན་གོང་འཕེལ་བཏང་སྟེ་ ཤེས་  
ཡོན་གྱི་ཐོས་རྒྱ་ གོང་འཕེལ་གཏང་ཚུགས་དགོ་པ་ཡིན།

## དམིགས་ཡུལ།

སློབ་རིམ་བཅུ་གཉིས་པ་ མཐར་འཁྲུལ་མཁན་ སློབ་ཕྲུག་ཚུ་གི་རྒྱུད་ལུ་:-

- ༡ ཚོས་སྐད་སློབ་སློབ་འབད་ནི་ལུ་ སློབ་དང་ དང་འདོད་བསྐྱེད་ཚུགས་ནི།
- ༢ ཚོས་སྐད་ཀྱི་མིང་ཚིག་ཐ་སྐད་མ་འདྲམ་དང་ གཞུང་གི་གོ་དོན་ཚུ་རྟོགས་ཚུགས་ནི།
- ༣ རང་གི་བསམ་འཆར་ཚུ་ ཚིག་རྒྱུན་ཐོག་ ཚིག་སློབ་ ཕན་སམ་ཚོར་ཏོག་ཏོ་འབད་ ཚུ་མ་འབྲི་འབད་ཚུར་ནི།
- ༤ མ་ལས་པ་གཞན་གྱི་སྐབ་རྩོམ་ཚུ་གི་ རྒྱུ་ཚུ་དོས་འཛིན་འབད་དེ་ ཚུ་མ་ཚིག་གི་ གོ་དོན་རྟོགས་ཚུགས་ནི།
- ༥ ཚུ་མ་རིག་གི་གཞུང་ལགས་ཚུ་ནང་གི་ འཆར་གཞི་ གཞུང་དོན་ རིག་རྩལ་ སྤོད་རྒྱུ་ འབྲུང་རིམ་ཚུ་ དོས་འཛིན་འབད་དེ་ གོ་རྟོགས་དང་  
ལག་ལེན་འཐབ་ཚུགས་ནི།

- ༤ ལྷ་ལུག་གི་རང་བཞིན་ལ་ དེས་ཤིང་དང་ དེ་དོན་ཚུ་ ལྷ་ཚིག་གི་ལམ་ལས་ བརྒྱ་སྟོང་འབད་ཚུགས་ནི།
- ༥ རིག་གཞུང་གི་ ཡོན་ཏན་གོང་འཕེལ་བཏང་སྟེ་ ཤེས་ཡོན་འཕྲོ་མཐུན་ལྷ་བཞི་དང་ གཞུང་སྐོར་གྱི་ལྷ་གཡོག་ཚུ་ནང་ བཅའ་མར་གཏོགས་ ཚུགས་པའི་ ལྷོགས་གྲུབ་ཡར་སང་འགྲོ་ཚུགས་ནི།
- ༦ མི་སྲིད་ནང་ གཞན་པམ་གྱི་བསམ་བཟང་དང་ ཞི་དུལ་ བཟོད་སེམས་ལྷན་པའི་ ཡར་བས་ཅན་གྱི་ གང་ཟག་ཅིག་ལ་ འགྱུར་ཚུགས་ནི།

ལྷ་བཞིའི་ཉམས་སྤོང་ཐོབ་ཚུལ།

སྟོང་འཇུག་དང་ ལྷ་རང་གི་དཔེ་དེབ་ཚུ་ ལག་ལེན་འཐབ་ཐོག་ལས་ འོག་ལ་བཀོད་དེ་ཡོད་དོ་བཟམ་ སྟོབ་ཕྱག་ཚུ་ལ་ གནས་སྤངས་དང་ དུས་སྐབས་སོ་སོ་ལ་ ལས་རིམ་དང་ སྟོང་ལ་མ་འདྲམ་ཚུ་ འགོ་འདྲེན་འཐབ་སྟེ་ སྟོབ་སྟོང་གི་གོ་སྐབས་ གང་མང་བྱིན་དགོ།

- ༡ ལྷ་བའི་གཞུང་དོན་གྱི་ཐོག་ ལྷོད་བསྐྱར་འབད་བཅུག་ནི།
- ༢ ལེག་སྤྱར་བཏང་མ་དཔེ་དང་ དུས་རྒྱུན་སྟོབ་པའི་སྐབས་ དཔེ་ཚའི་རྩ་བ་ཚུ་ ལང་འབད་འདྲེན་ཏེ་ སྟོབ་བཅུག་ནི།
- ༣ ལག་ཚེ་བའི་རྩ་ཚིག་ཚུ་ ཁོང་ལ་བཟང་བཅུག་ནི་དང་ རྩ་ཚིག་གི་ གོ་དོན་འགྲེལ་བཤད་རྒྱབ་བཅུག་ནི།
- ༤ འཆར་རྩོམ་དང་དངོས་རྩོམ་གྱི་ རྩོམ་རིག་མ་འདྲམ་ཚུ་ལྷག་བཅུག་སྟེ་ གོ་དོན་དང་འབྲི་ཚུལ་ཚུ་ ག་བསྐྱར་འབད་བཅུག་ནི།
- ༥ ཚོས་སྐད་དང་ རྩོང་ལའི་ཐོག་ལས་ ལྷན་རྩོམ་གྱི་དཔེ་བརྗོད་ཚུ་ རྒྱབ་བཅུག་ནི།
- ༦ རྩོམ་འབྲིལ་གཞན་གྱིས་ བྲིས་པའི་རྩོམ་རིག་ རྩོམ་ཐར་ རྟོགས་བརྗོད་ གཏམ་རྒྱུས་ མགར་མ་ འཕྲབ་སྤྱང་ ལ་སོགས་པ་ཚུ་ལྷག་སྟེ་ རྩོམ་འབྲིལ་འཕམ་དོན་དང་ མཐོ་ལགས་ཚུ་གི་ གོ་དོན་རྟོགས་ཐབས་འབད་ནི་དང་ རྩོམ་འབྲིལ་སྐོར་ལས་ རྟོགས་བརྗོད་འབྲིལ་བཅུག་ བློ།
- ༧ མཁས་པ་གཞན་གྱིས་བྲིས་པའི་ ལྷན་རྩོམ་ཚུ་ནང་གི་རྒྱུན་ཚུ་ ངོས་འཛིན་འབད་བཅུག་ནི།
- ༨ ལང་སྟོགས་སོ་སོའི་ ལམ་ལགས་དང་མཐུན་པའི་ ཞབས་ཁྲད་ སྟོ་བེ་ གཙང་མོ་ དུས་སྟོན་ ལམ་སྟོལ་ལ་སོགས་པ་ ཚུ་གི་སྐོར་ལས་ ལས་འགུལ་འབད་བཅུག་ནི།
- ༩ རང་བཞིན་སྤང་བའི་ཡལ་ལེགས་པ་ མཛེས་པ་ བདེན་པའི་ཚུལ་ཡིད་ཆེས་དང་ རིག་ཚོར་གྱི་ཉམས་སྤོང་ཚུ་ ཚིགས་ས་བཅད་པ་དང་ ལྷག་ པ་ སྟོལ་མའི་ཐོག་ལ་ བཤད་བཅུག་ནི།
- ༡༠ རྩོམ་རིག་གི་གཞུང་དོན་ཚུ་ནང་གི་ སྤང་གི་འཆར་གཞི་དང་ སྤིང་དོན་ རིག་རྩལ་ འབྲུང་རིམ་ སྤང་རྩེད་པ་ཚུ་ ངོས་འཛིན་འབད་བཅུག་ནི།
- ༡༡ ལྷ་བའི་གཞུང་དང་འབྲེལ་བའི་ རྒྱབ་རྟེན་དཔེ་དེབ་ གང་མང་ལ་ ཁངས་གཏུགས་འབད་བཅུག་ནི།
- ༡༢ རྩོམ་རིག་ཚུ་ འཕྲབ་སྤྱང་འབད་བཟོ་ནི་དང་ འཕྲབ་རྩེད་བཟོ་སྟེ་ ཚབ་རྩེད་འབད་བཅུག་ནི།
- ༡༣ ཉིན་བསྐྱར་བཞིན་དུ་ ཨ་ལོ་གསལ་དེ་དེལ་ རྩོམ་རིག་ཐུང་གུ་ཅིག་ ལྷག་བཅུག་སྟེ་དབྱེད་ཕྱད་འབད་བཅུག་ནི།
- ༡༤ ཨ་ལོ་སྐོར་རྒྱབ་འབད་ ཚིགས་བཅད་དང་ ལྷག་པ་འབད་ཡོད་པའི་ རྩོམ་རིག་ཚུ་ སྐད་བཏོན་ཏེ་ ལྷག་བཅུག་ནི།

༡༥ འཕྲུལ་འཕྲུལ་སྐབས་ དཔེར་ན་ བག་ཡོད་བསྟན་པའི་ལེའ་ལས་ ཚེ་རི་སྐད་ཅིག་བསྐྱབ་བཞེ། ལས་ཤི་ཐང་ཅིག་བསྐྱབ་པོ་བཞིན། བདག་གི་  
 སྡོད་པ་འདི་འདྲས་ནི། མི་ཡི་ལས་ཀྱང་འཐོབ་མི་འགྱུར། ཟེར་བའི་སྐབས་ ཚེ་འདི་དང་ལས་འདི་ གཅི་བཟམ་ཅིག་འདུག ? བདག་གི་  
 སྡོད་པ་འདི་འདྲས་ནི། ཟེར་བའི་སྐབས་ རང་གི་སྡོད་པ་ནི་ ཏུས་རྒྱུན་ གཅི་བཟམ་རང་འབད་དོ་ག ? ཏུས་ཡན་སྐར་མ་ ༣ དེ་ཅིག་  
 མིག་ཏོ་བཅའ་སྟེ་ མཚོ་བསམ་བཏང་སྟེ་ ཉམས་སྲོང་སད་བཅག་ནི།

སློབ་སྡོད་ཀྱི་འབྲས་ལས།

སློབ་རིམ་བཅུ་གཉིས་པ་ མཐར་འཁྲུལ་པ་ད་ སློབ་སྤྲུག་ཚུ་གིས་:-

- ༡ ཚོས་སྐད་ནང་ཡོད་པའི་ ཚུམ་རིག་ཚུ་ལྟག་སྟེ་ གཞུང་གི་གོ་དོན་ཚུ་ རྟོགས་ཚུགས།
- ༢ སྟན་ངག་གི་དཔེར་བརྗོད་ཚུ་ རྒྱན་པོག་པའི་ཁར་ ཚིག་སྡོད་པ་ལྟ་སམ་ཚོགས་ཏོག་ཏོ་འབད་འབྲི་ཚུགས།
- ༣ མཁས་པ་གཞན་གྱི་ སྟན་ཚུ་ཚུ་ནང་གི་ རྒྱན་ཚུ་དོས་འཛིན་འབད་དེ་ ཚུམ་ཚིག་གི་ གོ་དོན་ཚུ་རྟོགས་ཚུགས།
- ༤ ཚུམ་རིག་གི་གཞུང་ཚུ་ནང་ཡོད་པའི་ གཞུང་དོན་ རིག་རྒྱལ་ འབྲུང་རིམ་ཚུ་ གོ་རྟོགས་འབད་ཚུ།
- ༥ བེས་ཡོན་འཕྲོ་མཐུན་ལྟ་བུ་ཚུགས་པ་མ་ཚད་ གཞུང་སྐེར་གྱི་ལྟ་གཤམ་ཚུ་ནང་ འབྲི་ཚུམ་གྱི་ལྟོགས་ཀྱི་བདེ་ལཱ་ལྟ་བུ་འདི་སློབ་པ་ བཅའ་མར་  
 གཏོར་ཚུགས།
- ༦ མི་སྟེའི་ནང་ སན་རྒྱལ་མེ་བའི་ཁར་ ཞི་དུལ་ བཅོད་སེམས་ལྷན་པའི་ གང་ཟག་ཅིག་ལཱ་འགྱུར་ཚུགས།

སློབ་སྡོད་གི་རྩེ་དོན།

བྱང་ཆུབ་སེམས་དཔའི་སྡོད་པ་ལ་འཇགས། (ཏུས་ཡན་ཚུ་ཚོད་ ༥༤)

སློབ་སྡོད་འཇགས་གི་གཞུང་ནི་ གཞུང་བརྒྱུམ་པ་ལ་འཇགས་པའི་རྒྱ་ ཐོག་མར་དགོ་བ་ཀྱང་གྱི་དོན། བརྒྱུམ་བྱའི་བསྟན་བཅོས་ལས་ཀྱི་རང་བཞིན་ བར་  
 དུ་དགོ་བ་གཞུང་གི་དོན། བརྒྱུམ་པ་མཐར་ཕྱིན་པ་ ཐམར་དགོ་བ་འཇགས་གི་དོན་དང་གསལ་ལས་ གཞུང་བརྒྱུམ་པ་ལ་འཇགས་པའི་རྒྱ་ ཐོག་མར་དགོ་བ་  
 ཀྱང་གྱི་དོན་ལ་:-

- ༡ རང་དོན་དུ་ མཚོད་པར་བརྗོད་ཅིང་ བཤད་པར་དམ་བཅའ་བ།
- ༢ གཞན་དོན་དུ་ ཁེངས་པ་བསྐྱུངས་ཤིང་ སློབ་བསྐྱེད་པ།

བརྒྱུམ་བྱའི་བསྟན་བཅོས་ལས་ཀྱི་རང་བཞིན་ བར་དུ་དགོ་བ་གཞུང་གི་དོན་ལ་ བྱང་ཆུབ་སེམས་མཚོག་རིན་པོ་ཆེ། མ་སྐྱེས་པ་རྣམས་སྟེ་གྱུར་ཅིག།  
 སྐྱེས་པ་ཉམས་པ་མེད་པ་དང་། གོང་ནས་གོང་དུ་འཕེལ་བར་ཤོག། ཟེར་གསུངས་ཡོད་པ་བཞིན་དུ་:-

- ༡ བྱང་ཆུབ་ཀྱི་སེམས་རིན་པོ་ཆེ་རང་རྒྱུད་ལ་ མ་སྐྱེས་པ་སྟེད་པར་བྱེད་པའི་ལེའ་གསལ་ནི།  
 ༡.༡ སློབ་སྐྱེད་པ་ སན་ཡོན་གྱི་ལེའ།

- 1.2 མི་མཐན་ཕྱོགས་ སྤྲིག་པ་བཤགས་པའི་ལེའ།
- 1.3 མཐན་ཕྱོགས་ བྱང་ཆུབ་ཀྱི་སེམས་ ཡོངས་སུ་བཟང་བའི་ལེའ།

- 2 བྱང་ཆུབ་ཀྱི་སེམས་རིན་པོ་ཆེ་རང་རྒྱུད་ལ་ སྐྱེས་པ་མི་ཉམས་པར་བྱེད་པའི་ལེའ་གསུམ་ནི།
  - 2.1 འཇགས་ལྡོག་གི་གནས་ལ་ གཞོན་པ་ལྟར་ལེན་པ་ བག་ཡོད་ཀྱི་ལེའ།
  - 2.2 ལས་སེམས་ལ་ ཡང་ཡང་བརྟག་པ་ ཤེས་བཞིན་ཀྱི་ལེའ།
  - 2.3 འགལ་རྐྱེན་གྱིས་ མི་འཁྲགས་པ་ བཟོད་པའི་ལེའ།

- 3 བྱང་ཆུབ་ཀྱི་སེམས་རིན་པོ་ཆེ་རང་རྒྱུད་ལ་ མི་ཉམས་པ་གོང་ནས་གོང་དུ་འཕེལ་བའི་ལེའ་གསུམ་ནི།
  - 3.1 བྱང་ཆུབ་ཀྱི་སེམས་ གཉིས་ཀ་སྤྲེལ་བ་ གྲོགས་བརྩོན་འགྲུས་ཀྱི་ལེའ།
  - 3.2 ཀུན་རྫོབ་བྱང་སེམས་སྤྲེལ་བ་ བསམ་གཏན་གྱི་ལེའ།
  - 3.3 རོན་དམ་བྱང་སེམས་སྤྲེལ་བ་ ཤེས་རབ་ཀྱི་ལེའ།

གོང་གི་ལེའ་དགུ་པོ་གར་ དགོ་རྒྱུ་གཞན་རོན་དུ་གཏོང་བ་ བསྐྱོ་བའི་ལེའ་བཅས་ ལེའ་བཅུ་ཐམས་ཡོད་པའི་ནང་ལས་ གཞུང་བརྩམ་པ་ལ་འཇགས་པའི་  
 རྒྱ་ ཐོག་མར་དགོ་བ་ཀླད་ཀྱི་རོན་ལས་འགོ་བཙགས་ཏེ་ མི་ཉམས་པ་གོང་ནས་གོང་དུ་འཕེལ་བའི་ལེའ་གསུམ་ལས་ བྱང་ཆུབ་ཀྱི་སེམས་གཉིས་ཀ་སྤྲེལ་  
 བ་ གྲོགས་བརྩོན་འགྲུས་ཀྱི་ལེའ་འདི་རྩེས་ཏེ་ ལེའ་བདུན་སྟོན་དགོ་པ་ཡིན།

- 1 སྤོ་བ་སྦྱང་པ་ བཅོམ་ལུགས་ཀྱི་ལེའ་ལས།
  - ཀ ལས་སེམས་ཀྱི་རྟེན་ རྟེན་པར་དཀའ་བས་ མདོར་བསྟན་པ།
  - ཁ བརྟེན་པ་ བྱང་ཆུབ་སེམས་ཀྱི་ བཅོམ་ལུགས་པར་བཤད་པ་ལ།
    - 1 སྤོན་འཇགས་ཐོང་གི་ཕན་ཡོན་ དཔེ་རོན་དུགས་བསྟན་པ།
    - 2 སོ་སོའི་ཕན་ཡོན་ ལང་རིགས་ཀྱིས་སྐྱབ་པ།
      - 2.1 སྤོན་འཇགས་སོ་སོའི་ མཚན་ཉིད་སྤྱིར་བསྟན་པ།
      - 2.2 སྤོན་སེམས་ཀྱི་ཕན་ཡོན་ བྱེ་བྲག་ཏུ་བཤད་པ།
      - 2.3 འཇགས་སེམས་ཀྱི་ཕན་ཡོན་ བྱེ་བྲག་ཏུ་བཤད་པ།
  - ག སེམས་བསྐྱེད་རྒྱུད་ལྡན་གྱི་ བཤེས་གཉེན་ལ་བསྐྱུགས་པས་ མཇག་བསྐྱབ་པ།
    - 1 སྤོན་སེམས་ཀྱི་སྤོན་སེམས་བསྐྱུགས་པ།

- 2 འཇགས་སེམས་ཀྱི་སྒོ་ནས་བསྐྱབས་པ།
- 3 དེ་ལྟར་བསྐྱབས་པའི་རྩེ་མཚན་བསྟན་པ།

- 2 མི་མཐན་ཕྱོགས་ སྤྲིག་པ་བཤགས་པའི་ལེའ་གི་གཞུང་ལས།
  - ཀ ཀུན་ཏུ་དགོངས་ གཉེན་པོ་ཀུན་སྤོད་ཀྱི་སྟོབས།
    - 1 མཚོན་པ་ཕལ་བའི་ཡན་ལག།
      - 1.1 དངོས་སུ་འབྱོར་བའི་མཚོན་པ།
      - 1.2 ཡིད་ཀྱིས་སྐྱལ་པའི་མཚོན་པ།
      - 1.3 སྟོན་ལམ་སྟོབས་ཀྱི་མཚོན་པ།
      - 1.4 སྤྲོད་པ་དབྱེས་ཀྱི་མཚོན་པ།
    - 2 ཕྱག་འཚལ་བའི་ཡན་ལག།
    - 3 སྐྱབས་སུ་འགྲོ་བའི་ཡན་ལག།
  - ཁ སྤར་བྱས་ལ་ འགྲོད་པ་བསམ་འབྱེན་གྱི་སྟོབས།
  - ག སྐྱབས་སུ་འགྲོ་བ་ རྟེན་གྱི་སྟོབས།
  - ང་ ཕྱིན་ཆད་སྟོམ་སེམས་ སོར་ཆད་ཀྱི་སྟོབས།

- 3 མཐན་ཕྱོགས་ བྱང་ཆབ་ཀྱི་སེམས་ ཡོངས་སུ་བབས་པའི་ལེའ་ལས།
  - ཀ ཡན་ལག་ལྷག་མ་བཞི་ སྟོན་དུ་འགྲོ་བ།
  - ཁ ཉེར་ལེན་གྱི་སྟོན་འགྲོས་ སྟོ་སྐྱབས་པ།
  - ག དངོས་གཞི་བྱང་སེམས་ ཡོངས་སུ་བབས་པ།
  - ང་ མཇགས་ རང་གཞན་ དགའ་བ་སྟོམ་པ།

- ༤ འཇགས་ལྗོགས་གི་གནས་ལ་ གཞོབ་པ་ལྟར་ལེན་པ་ བག་ཡོད་ཀྱི་ལེའ་ལས།
  - ཀ རྩེ་མཚན་མདོར་བསྟན་པས་ བག་ཡོད་པར་བྱ་བ།

- ཁ བསྐྱེད་བྱ་ བསྐྱེད་པ་ལ་བསམས་ཏེ་ བག་ཡོད་པར་བྱ་བ།
- ག རྟོན་ དལ་འགྲུབ་ལ་བསམས་ཏེ་ བག་ཡོད་པར་བྱ་བ།
- ང་ སྤང་བྱ་ ཉོན་མོངས་པ་ལ་བསམས་ཏེ་ བག་ཡོད་པར་བྱ་བ།
- ཅ མཇུག་བསྐྱེད་པ་ཚུན་སྟོན་དགོ།

- ༥ ལས་སེམས་ལ་ ཡང་ཡང་བརྟག་པ་ ཤེས་བཞིན་གྱི་ལེའ་ལས།
  - ༦ རྩེ་མཚན་མདོར་བསྟན་པ།
  - ཁ བསྐྱེད་གཞི་ ལེགས་ཉེས་སེམས་ས་བསྐྱེད་ཚལ།
  - ག སྤང་བྱེད་ དྲན་ཤེས་རྒྱུད་ལ་བསྟེན་ཚལ།
  - ང་ བསྐྱེད་བྱ་ ལྷག་པའི་ཚལ་གྱི་མས་སྤང་ཚལ།
    - ༡ ཉེས་སྟོན་སྟོམ་པའི་ ཚལ་གྱི་མས།
    - ༢ དགོ་བ་ཚོས་སྤྱད་གྱི་ ཚལ་གྱི་མས།
    - ༣ སེམས་ཅན་དོན་བྱེད་གྱི་ ཚལ་གྱི་མས།
  - ཅ ཤེས་བཞིན་གྱི་ངོ་བོ་ མཇུག་བསྐྱེད་པ་ཚུན་སྟོན་དགོ།

- ༦ འགལ་རྒྱུན་གྱིས་ མི་འཁྲུགས་པ་ བཟོད་པའི་ལེའ་ལས།
  - ༧ སྤང་བྱ་ ཁོང་ཁོ་སྤོང་ཚལ།
  - ཁ གཉེན་པོ་ བཟོད་པ་སྟོམ་ཚལ་ལ་ཡང་།
    - ༡ བཟོད་ཡལ་ ངོས་བཟང་བ།
    - ༢ སྤྱུག་བསྐྱེད་ དང་ལེན་གྱི་བཟོད་པ།
    - ༣ གཞོད་བྱེད་ལ་ ཇི་མི་སྟོམ་པའི་བཟོད་པ།
    - ༤ ཚོས་ལ་ ངེས་པར་སེམས་པའི་བཟོད་པ།
  - ག བཟོད་ཡལ་ སེམས་ཅན་ལ་གསུམ་ཚལ།

༧ བྱང་ཆུབ་གྱི་སེམས་ཅིན་པོ་ཆེ་རང་རྒྱུད་ལ་ མི་ཉམས་པ་གོང་ནས་གོང་དུ་འཕེལ་བའི་ལེའ་གསུམ་གྱི་  
ནང་གསེས་ བྱང་ཆུབ་གྱི་སེམས་གཉིས་ཀ་སྟེལ་བ་ གོགས་བརྩོན་འགྲུས་གྱི་ལེའ་ལས།

ཀ སྤང་གཉེན་གྱི་དོ་བོ་དོས་བཟང་ཚུལ།

ཁ སྤང་བྱ་ལེ་ལོ་གསལ་གྱི་སྤང་ཚུལ།

༡ ལེ་ལོ་གསལ་གྱི་རྩུ་འབྲས་མདོར་བསྟན་པ།

༢ སྟོམ་ལས་འཛིན་པའི་ལེ་ལོ།

༣ བྱ་བ་རན་ཞེན་གྱི་ལེ་ལོ།

༤ སྦྱིད་ལག་བདག་ཉིད་བརྟམས་པའི་ལེ་ལོ།

ག གཉེན་པོ་བརྩོན་འགྲུས་སྤེལ་བའི་རྩུ་དྲུག་བསྟན་པ།

༡ རྩུ་དྲུག་མདོར་བསྟན་པ།

༢ དཔང་བཞི་རིམ་པར་བསལ་པ།

༢.༡ མོས་པའི་དཔང་ དེད་དཔོན་གྱིས་ མོར་བ་ལེན་པ་ལྟ་བུ།

༢.༢ བརྟན་པའི་དཔང་ དཔང་བོ་གཡུལ་དུ་ འཇག་པ་ལྟ་བུ།

༢.༣ དགའ་བའི་དཔང་ བྱིས་པ་རྩེད་མོ་ལ་ འཇག་པ་ལྟ་བུ།

༢.༤ དོར་བའི་དཔང་ སྟོམ་བ་ངལ་གསོ་ལ་ མཁས་པ་ལྟ་བུ།

༣ གཉེན་པོ་ལྟར་ལེན་པའི་སྟོབས།

༤ བདག་ཉིད་ དབང་བསྐྱར་བའི་སྟོབས་གཉིས།

སྟན་ངག་མེ་ལོང་ལ། (དུས་ཡུན་ཚུ་ཚོད་ ཡུ)

༡ སྟན་ངག་གི་ལས་རྣམས་གཞག་ མདོར་བསྟན།

༢ སྟན་ངག་རྩོམ་དགོས་པ་དང་ རྩོམ་ཚུལ་ རྩོམ་པ་པོའི་ རྟོགས་བརྩོད་མདོར་བསྟན།

༣ སྟན་ངག་ལེའ་ ཐོག་མཐའ་བར་གསལ་ཡོད་མི་ནང་ལས་ ལེའ་བར་པའམ་ ལེའ་གཉིས་པ་ལས།

༣.༡ མཐའ་མོང་བའི་རྩུ་སྤྱིར་བཤད་པ།

༣.༢ དོན་རྩུན་གྱི་དོ་བོ་བཤད་པ།

༣.༣ དོན་རྩུན་གྱི་དབྱེ་བ་བཤད་པ་ལས།

ཀ དང་པོ་ རང་བཞིན་བརྩོད་པ།

༡ རང་བཞིན་བརྩོད་པའི་རྩུན་བཤད་པ།

༢ རང་བཞིན་བརྗོད་པའི་རྒྱན་བཞིའི་ཁྱད་པར་མདོར་བསྡུས་ཏེ་བཤད་པ།

ཁ མཚངས་པ་གསལ་བྱེད་གྱི་སྒྲིབ་བཤད་པ། (མཚངས་པ་གསལ་བྱེད་གྱི་སྒྲིབ་ ཉེ་མ་ལས་སྟོན་དགོ་མི་འདི་ དཔེ་རྒྱན་སྟོན་ པའི་སྐབས་ མཚངས་པ་གསལ་བྱི་ཤད་ཚུ་ ལག་ལེན་འཐབ་ཚུགས་ནིའི་དོན་ལ་ཨིན།)

ག གཉིས་པ་ དཔེ་རྒྱན་༣༢ བཤད་པ།

༡ དཔེ་དོན་སྐྱར་ཚུལ་གྱི་སྟོན་ཡོན་བཤད་པ།

ང གསལ་པ་ གཞུགས་རྒྱན་༢༠ བཤད་པ།

༥ ལྷན་དག་དཔེར་བརྗོད་ལ་གཙོ་བོར་བཏོན་དགོས་ལས་ ཉུང་ཤོས་དཔེར་བརྗོད་ ༣ རེ་རྒྱབ་བཅུག།

༥ དཔེར་བརྗོད་གྱི་ རྒྱན་ངོས་འཛིན་གྱི་དོན་ལ་ གཞན་གྱིས་རྩོམ་ཡོད་པའི་ དཔེར་བརྗོད་མ་འདྲམ་ ༥ ལྷག་སྟེ་ རྒྱན་ངོས་འཛིན་འབད་བཅུག།

༦ རྩོམ་ཤོ་ལོ་ཀ་གཅིག་གི་ནང་ལ་ དཔེ་དང་ དོན་གཉིས་སམ་ ཡང་ན་ སྐྱར་གཞི་དང་ སྐྱར་ཚུལ་ཚུ་ ངོས་འཛིན་འབད་ནི་དང་ རྩོམ་པ་པོ་ འདི་གི་ མཚོ་དོན་འདི་ ག་ཅི་ཨིན་ན་ བཤད་ཚུགས་ནི།

མདོན་བརྗོད་རྒྱ་མཚོའི་ཚུ་ཐེགས། (དུས་ཡུན་ཚུ་ཚོད་ ༡༦)

༡ གཙོ་གནས་བསྟུན་པའི་མཚོད་པར་བརྗོད་པ།

༢ འཁོར་འདས་བརྟན་གཡོའི་སོགས་ བརྟམས་པར་དམ་བཅའ་བ།

༣ གཞུང་དངོས་ལ་འཇགས་པ་ལས་:-

ཀ མཐོ་རིས་གྱི་སྤྲེའོ་ཚན་ ཡན་ལག་དང་ བཅས་པར་བཤད་པ།

ཁ ས་འོག་གི་སྤྲེའོ་ཚན་ ཡན་ལག་དང་ བཅས་པར་བཤད་པ།

ག ས་གཞིའི་སྤྲེའོ་ཚན་ ཡན་ལག་དང་ བཅས་པར་བཤད་པ།

༥ འཕགས་ཡལ་འཆི་མེད་སོགས་ མཇག་བྱང་།



ལོ་འཁོར་གཅིག་གི་ རིག་གཞུང་ཚོས་ཚན་ སློབ་སློན་གྱི་ཆ་ཚོད་ བལོ་བཤའི་དཔེ།

ཨང་	སློབ་རིམ་ ༡༡ པ།		སློབ་རིམ་ ༡༢ པ།	
	ཚོས་ཚན་	ཆ་ཚོད་	ཚོས་ཚན་	ཆ་ཚོད་
༡	སློབ་འཇགས་ལས་སློན་དགོས། ལེའ་དང་པ་ བྱང་ཆུབ་སེམས་སྤྱི་ ཕན་ཡོན་ བཤད་པའི་ལེའ་ལས་ འགོ་བཙུགས་ཏེ་ ལེའ་ བཞི་པ་ བགཟེན་བསྟན་པའི་ ལེའ་ཚན།	༥༤	སློབ་འཇགས་ལས་སློན་དགོས། ལེའ་ལྷ་པ་ ཤེས་བཞིན་གྱི་ ལེའ་ལས་ འགོ་ བཙུགས་ཏེ་ ལེའ་བདུན་པ་ བརྗོན་འགྲུས་གྱི་ ལེའ་ཚན།	༥༤
༢	སློབ་འཇགས་མེ་ལོང་མ་ལས་སློན་དགོས། རང་བཞིན་བརྗོན་པ་ མཚངས་གསལ་ དཔེ་རྒྱུ།	༥༢	སློབ་འཇགས་མེ་ལོང་མ་ལས་སློན་དགོས། དཔེ་རྒྱུ་བསྐྱར་ཞིབ་དང་ གཟུགས་ཚན་གྱི་རྒྱུ།	༥༢
༣	མངོན་བརྗོན་ལས་སློན་དགོས། མཐོ་རིམ་སློབ་ཚན་ལས་ ས་འོག་གི་སློབ་ཚན་ཚན།	༡༥	མངོན་བརྗོན་ལས་སློན་དགོས། ས་གཞིའི་སློབ་ཚན་ལས་ མཇག་བྱང་ཚན།	༡༥

དན་གསོ།

ཚུམ་རིག་ཚོས་ཚན་གྱི་ ཐབས་ཚན་རེལ་ གླུ་མ་༥༠ རེའབད་ བལོ་བཤའ་རྒྱུ་ལོད། ཨིན་རང་ སློབ་གྲྲ་རང་སོའི་ བདེ་སྤྱབས་དང་འབྲིལ་ཏེ་ ཐབས་  
ཚན་དང་ཆ་ཚོད་ཚུ་ འགྲུར་བཙུགས་འབད་རང་བདུབ། བསྐྱེམས་གྱིས་ ལོ་གཅིག་ནང་ཆ་ཚོད་༡༣༠ འི་ ཚུམ་ དཔེ་ཆ་སློན་དགོ།

སློབ་རིམ་ ༡༡ དང་ ༡༢ པའི་ དབྱེ་ཞིབ་ལམ་ལགས།

སློབ་རིམ་ ༡༡ དང་ ༡༢ པའི་དབྱེ་ཞིབ་འདི་ དུས་རྒྱུན་དབྱེ་ཞིབ་དང་ ལོ་སྤྱོད་ཚོས་རྒྱུགས་དང་ ལོ་འཁོར་ཚོས་རྒྱུགས་བཙུགས་ ལག་གསུམ་ དབྱེ་  
ཞིན་ གླུ་གསུམ་གྱི་ཐོབ་ལམ་ཚུ་ འོག་གི་གླུ་གསུམ་ལམ་དང་ འབྲིལ་ནི་ཨིན།

སློབ་རིམ་ ༡༡ དང་ ༡༢ པའི་ དབྱེ་ཞིབ་འབད་ཐངས་འདི་ གཤམ་གསལ་ལྟར་ དབྱེ་བཤེསྟེ་ལོད།

སློབ་དུས་	དུས་རྒྱུན་དབྱེ་ཞིབ་གྱི་ གླུ་གསུམ་ཚན།	ཚོས་རྒྱུགས་གྱི་ གླུ་གསུམ་ཚན།	གླུ་གསུམ་བསྐྱེམས་
སློབ་དུས་དང་པ།	བརྒྱ་ཚ་ ༡༠	བརྒྱ་ཚ་ ༣༠ (ལོ་སྤྱོད་དང་བརྟུག་ཞིབ་)	བརྒྱ་ཚ་ ༤༠
སློབ་དུས་གཉིས་པ།	བརྒྱ་ཚ་ ༡༠	བརྒྱ་ཚ་ ༥༠ (ལོ་འཁོར་)	བརྒྱ་ཚ་ ༦༠
གླུ་གསུམ་བསྐྱེམས་	བརྒྱ་ཚ་ ༢༠	བརྒྱ་ཚ་ ༤༠	བརྒྱ་ཚ་ ༡༠༠

སློབ་རིམ་ ༡༡ ༡༢ ༡༣ ༡༤ ༡༥ ༡༦ ༡༧ ༡༨ ༡༩ ༢༠ ༢༡ ༢༢ ༢༣ ༢༤ ༢༥ ༢༦ ༢༧ ༢༨ ༢༩ ༣༠ ༣༡ ༣༢ ༣༣ ༣༤ ༣༥ ༣༦ ༣༧ ༣༨ ༣༩ ༤༠ ༤༡ ༤༢ ༤༣ ༤༤ ༤༥ ༤༦ ༤༧ ༤༨ ༤༩ ༥༠ ༥༡ ༥༢ ༥༣ ༥༤ ༥༥ ༥༦ ༥༧ ༥༨ ༥༩ ༦༠ ༦༡ ༦༢ ༦༣ ༦༤ ༦༥ ༦༦ ༦༧ ༦༨ ༦༩ ༧༠ ༧༡ ༧༢ ༧༣ ༧༤ ༧༥ ༧༦ ༧༧ ༧༨ ༧༩ ༨༠ ༨༡ ༨༢ ༨༣ ༨༤ ༨༥ ༨༦ ༨༧ ༨༨ ༨༩ ༩༠ ༩༡ ༩༢ ༩༣ ༩༤ ༩༥ ༩༦ ༩༧ ༩༨ ༩༩ ༡༠༠

དུས་རྒྱུན་དབྱེ་ཞིབ།                      སྐྱགས་ཚད་                      བརྒྱ་ཚ་ ༢༠

དུས་རྒྱུན་དབྱེ་ཞིབ་ཀྱི་ སྐྱགས་བརྒྱ་ཚ་ ༢༠ ཅན་ གཤམ་གསལ་གྱི་ལས་རིགས་ཚུ་ དབྱེ་ཞིབ་འབད་དེ་ སྐྱགས་ཐོ་ཚུ་བཞག་དགོ་པ་ཨིན།

༡ ལོ་འཁོར་དེ་ནང་ རང་སེའི་ཡར་རྒྱས་ཀྱི་རིམ་པ་ ག་དེ་སྟེ་ འགྲོ་དོ་ག་ རང་གི་ལ་ཤུལ་ བཟུ་ཚུ་གསལ་ནི་དོན་ལུ་ ཨ་ལོ་ཚུ་གིས་ རང་སེའི་ ལ་ཤུལ་ལེགས་ཤོམ་ཚུ་གི་ འདུ་དཔེ་རེ་ བསྐྱེ་ཞིན་ན་ ཡིག་སློབ་ནང་བཅུགས་ཏེ་ བཞག་བཅུག་དགོ། (དེ་གིས་ ཨ་ལོ་ཚུ་ཁོང་ར་གིས་ ཁོང་རེའི་ལ་ཤུལ་ ཚུ་རིམ་པ་བཞིན་ ག་དེ་སྟེ་ཡར་རྒྱས་འགྲོ་དེས་ག་ དབྱེ་ཞིབ་འབད་ཚུགས།)

༢ ཨ་ལོ་ཚུ་ལུ་ ལོ་འཁོར་གཅིག་ནང་ ཚེག་ཚད་ ༡༥༠ ལས་ ༢༠༠ ཅན་འཁོར་འབད་བའི་ ལས་འགལ་ ༢ ༡༣ ༢༤ གང་འཚམས་ཅིག་ ཁངས་ དག་ཏོ་ག་ཏོ་འབད་ འབྲི་བཅུག་ནི།

༣ ཨ་ལོ་ཚུ་ལུ་ ཁོང་ར་གིས་བྲིས་མི་ ལས་འགལ་ཚུ་ སྤྲོན་ཞུ་འབད་བཅུག་ནི།

༤ སློབ་ཁང་གི་ལ་དང་ ཁྱིམ་ལ་འབད་ནི་ཚུ་ནང་ བརྒྱུན་འགྲུལ་དང་ བཅའ་མར་གཏོགས་ཚུ་ལུ་བཟུ་དགོ།

སློབ་རིག་དབྱེ་ཞིབ་ཀྱི་ཚད་གཞི།

༡ ལེགས་པའི་ཚ།  
འབྲི་བཀོད་བསྐྱིག་ཐངས་ ཚེག་གི་བཅུད་མཚམས་ ཡིག་འདུགས་ལ་བ་ ཡིག་འབྲུ་སློམས་པ་སོགས་ བཟུ་ནི།

༢ མཛེས་པའི་ཚ།  
ཚེག་གི་ཉམས་འགྲུར་ལྡན་པ་ སྤྲོན་ཚེག་ལྡན་པ་ གོང་འོག་མ་ཞོར་བ་ གལ་འབབས་དང་ལྡན་པ་ དཔེ་དོན་མཐུན་པ་སོགས་ བཟུ་དགོས།

༣ བདེན་པའི་ཚ།  
ཁངས་དགལ་ རང་སློབས་ཡིན་པ་ དོན་མཐུན་པ་ བརྒྱུན་འགྲུལ་ལྡན་པ་སོགས་ བཟུ་ནི།

ཚོས་རྒྱགས།

ལོ་ཕྱེད་ཚོས་རྒྱགས་ལུ་ སྐྱགས་བརྒྱ་ཚ་ ༣༠ ལོ་འཁོར་ཚོས་རྒྱགས་ལུ་ སྐྱགས་བརྒྱ་ཚ་ ༤༠ བྱིན་དགོས་ཨིན་རུང་ ཚོས་རྒྱགས་ཀྱི་སྐབས་ལུ་ སྐྱགས་ ༡༠༠ འེངྱི་ བ་བཟོ་སྟེ་དབྱེ་ཞིབ་འབད་ཞིན་ན་ ཤུལ་ལས་ སློམས་རྩིས་བཏོན་ཞིན་ན་ སྐྱགས་བརྒྱ་ཚ་ ༣༠ དང་ ༤༠ ལུ་ཕབ་དགོས་ཨིན།

དཀག་པོ།

- ༡ དཔེ་སྟོན་དང་ཞིབ་འཇུག་གི་ལ་འདི་ སྐྱགས་ ༡༠༠ མོག་ལ་དབྱེ་ཞིབ་འབད་ཞིན་ན་ བརྒྱ་ཚ་ ༢༠ འཕྲོམ་མཱི་མོག་ལ་ཕབ།
- ༢ ལོ་སྟེན་དང་ ལོ་འཁོར་ཚེས་རྒྱུགས་ཀྱི་དྲི་བ་བཟོ་མཱི་ སྟེ་ཚེན་ ཀ་ ལ་ ཀ་ ཀ་ ལག་གསལ་གྱི་ སྐྱགས་ཚ་བཟོ་མཱི་ སྐྱགས་ ༡༠༠ གི་དྲི་བ་བཟོ་དགོ། དེ་ཡང་ སྟེ་ཚེན་ ཀ་ སྟོན་འཇག་ལ་ བརྒྱ་ཚ་ ༤༥ དང་ སྟེ་ཚེན་ ལ་ སྟན་དག་ལ་ བརྒྱ་ཚ་ ༤༠ སྟེ་ཚེན་ ཀ་ མངོན་བརྗོད་ལ་ བརྒྱ་ཚ་ ༡༥ གྱིན་དགོཔ་ཨིན།
- ༣ ལོ་འཁོར་གྲུབ་འབྲས་ཀྱི་སྐྱགས་ ཡོངས་བཟོ་མཱི་བཟོ་ན་པའི་སྐབས་ལ་ ལོ་སྟེན་ཚེས་རྒྱུགས་ཀྱི་སྐྱགས་བརྒྱ་ཚ་ ༣༠ དང་ ལོ་འཁོར་ཚེས་རྒྱུགས་ཀྱི་སྐྱགས་བརྒྱ་ཚ་ ༥༠ དེ་གར་ དུས་རྒྱུན་གྱི་དབྱེ་ཞིབ་ཀྱི་ སྐྱགས་བརྒྱ་ཚ་ ༢༠ པོ་འདི་བཀའ་ལྟེ་ སྐྱགས་ ༡༠༠ གི་རྩིས་བཟོ་དགོ།

ཚེས་རྒྱུགས།	དུས་ཡུལ།	ཚུ་ཚོད་ ༣	སྐྱགས་ ༡༠༠
སྟོབ་ཤིམ་ ༡༡	པའི་ཚེས་རྒྱུགས་ཀྱི་ དྲི་ཤོག་གཅིག་ནང་ལ་ དྲི་བ་སྟེ་ཚེན་ ཀ་ ལ་ ཀ་ ཀ་ གསལ་ཡོད།		
སྟེ་ཚེན་ ཀ་ ཅན་ལ་	སྟོན་འཇག།	སྐྱགས་ བརྒྱ་ཚ་ ༤༥	
སྟེ་ཚེན་ ལ་ ཅན་ལ་	སྟན་དག།	སྐྱགས་ བརྒྱ་ཚ་ ༤༠	
སྟེ་ཚེན་ ཀ་ ཅན་ལ་	མངོན་བརྗོད།	སྐྱགས་ བརྒྱ་ཚ་ ༡༥	
བཟོ་མཱི་		༡༠༠	

དྲི་བ་དང་སྐྱགས་ཀྱི་ཁ་གསལ།

ཤིག་གཞུང་གདམས་ཁའི་ཚེས་ཚན་འདི་ནང་ དྲི་བ་སྟེ་ཚེན་ཀ་ལ་གང་ བཞི་འབད་བཀོད་དེ་འོང། སྟེ་ཚེན་ ཀ་ པའི་དྲི་བ་ཚུ་གི་ལན་ ཨིན་གཅིག་མེན་གཅིག་རྒྱབ་དགོ། དེ་ལས་སྟེ་ཚེན་ལ་ ག་ རྒྱ་ལྷོ་གི་དྲི་བ་ཚུ་ གཤམ་གསལ་བཞིན་ གདམས་ཁ་རྒྱབ་སྟེ་ལན་འབྲི་མི་ཨིན།

སྟེ་ཚེན་ཀ་པའི་དྲི་བ། (ལན་ཨིན་གཅིག་མེན་གཅིག་འབྲི་དགོཔ་)

- ༡ སྟོན་འཇག་ལ་ དྲི་བ་ ༥ སྐྱགས་ ༡༥
- ༢ སྟན་དག་ལ་ དྲི་བ་ ༣ སྐྱགས་ ༡༠
- ༣ མངོན་བརྗོད་ལ་ དྲི་བ་ ༢ སྐྱགས་ ༥

སྟེ་ཚེན་ལ་པའི་དྲི་བ། (སྐྱགས་ ༡༠ འབད་མི་ དྲི་བ་གང་རུང་གཉིས་ གདམས་ཁ་རྒྱབ་སྟེ་ལན་འབྲི་མི་)

སྟེ་ཚེན་ལ་པའི་དྲི་བ་ནང་ལ་ཡང་ སྟོན་འཇག་ལས་ དྲི་བ་ ༥ རེ་འབད་མི་དྲི་བ་ཀ་ལ་གའབད་ ལག་ ༣ ལ་ སྐྱགས་ ༡༠ རེ་འབད་ཡོད། དེ་ནང་ལས་ གང་རུང་གཉིས་ གདམས་ཁ་རྒྱབ་སྟེ་འབྲི་དགོ།

ཀ་ སྟེ་ལ་དྲི་བ་ ༥ སྐྱགས་ ༡༠

ཁ རྩེལ་རྩི་བུ སྐྱགས་༡༠

ག རྩེལ་རྩི་བུ སྐྱགས་༡༠

སྡེ་ཚམ་གཤམ་འཁྲི་བ། (སྐྱགས་༡༠ འབད་མི་ རྩི་བ་གང་རང་གཉིས་ གང་མ་ཁ་རྩེ་བུ་ལཱ་འབྲི་ཞི་)

སྡེ་ཚམ་གཤམ་འཁྲི་བ་ནང་ལ་ཡང་ སྐྱོན་ངག་ལས་ རྩི་བུ རེ་འབད་མི་རྩི་བ་ཀ་ཁ་གཤམ་འབད་ ལག་༣ ལུ་ སྐྱགས་༡༠ འབད་ཡོད། དེ་ནང་ལས་ གང་རང་གཉིས་ གང་མ་ཁ་རྩེ་བུ་ལཱ་འབྲི་དགོ།

ཀ རྩེལ་རྩི་བུ སྐྱགས་༡༠

ཁ རྩེལ་རྩི་བུ སྐྱགས་༡༠

ག རྩེལ་རྩི་བུ སྐྱགས་༡༠

སྡེ་ཚམ་ང་ཤམ་འཁྲི་བ། (སྐྱགས་༡༠ འབད་མི་ རྩི་བ་གང་རང་གཉིས་ གང་མ་ཁ་རྩེ་བུ་ལཱ་འབྲི་ཞི་)

སྡེ་ཚམ་ང་ཤམ་འཁྲི་བ་ནང་ལ་ཡང་ མངོན་བརྗོད་ལས་ རྩི་བུ རེ་འབད་མི་རྩི་བ་ཀ་ཁ་གཤམ་འབད་ ལག་༣ ལུ་ སྐྱགས་༡༠ རེ་འབད་ཡོད། དེ་ནང་ལས་ གང་རང་ གཉིས་གང་མ་ཁ་རྩེ་བུ་ལཱ་འབྲི་དགོ།

ཀ རྩེལ་རྩི་བུ སྐྱགས་༡༠

ཁ རྩེལ་རྩི་བུ སྐྱགས་༡༠

ག རྩེལ་རྩི་བུ སྐྱགས་༡༠

རྩི་བའི་རྣམ་པ།

རྩི་ཤོག་དེ་ནང་ལ་ ལན་གང་མ་ཁ་ཅན་གྱི་རྩི་བ། ལན་ཐང་ཀུ་འབད་ འབྲི་ཞི་འཁྲི་བ། དེ་ལས་ ལན་རིང་མོ་འབད་ འབྲི་དགོ་པའི་ རྩི་བའི་རིགས་ཚུ་ འཛོན་འོང།

སྡེ་ཚམ་ ཀ པ། སྡོད་འཇགས། སྐྱགས་ བརྗོད་ ལུ

སྡོབ་དཔོན་གྱིས་ ཚོས་རྒྱལ་གྱི་རྩི་བ་བཟོ་མ་ད་ ཨ་ལོ་ཚུ་གི་རྒྱུད་ལུ་ གཤམ་གསལ་གྱི་ཡོན་ཏན་དང་ རིག་རྩལ་གྱི་ལྷོ་གསལ་གྱི་བཟུང་ ཡོད་མེད་གྱི་རྒྱུགས་ལེན་དགོ།

- ༡ དཔེ་ཚལ་རྩེ་བའི་ཞི་དང་ རྩེ་བའི་འགྲེལ་པ་རྩེ་བའི།
- ༢ དེས་ཚིག་འགྲེལ་ཞི་དང་ གཤམ་གི་ཤོད་ན་ འགྲེལ་བཤད་རྩེ་བའི།
- ༣ ཚོས་སྐད་གྱི་ མིང་ཚིག་གི་ཐ་སྐད་མ་འདྲམ་ཚུ་གི་ ཤོད་ན་བཤད་ཞི།
- ༤ ལངས་དོན་ཟང་ཞི། དེའི་སྐབས་ འབྲེལ་ཡོད་གཤམ་གཤམ་ལའི་ ལང་དང་རིག་པ་ཚུ་སྦྲར་ཏེ་འབྲི་ཞི།
- ༥ རྩེ་བའི་ལྷན་གྱི་ ས་བཅད་བཤགས་ཞི།
- ༦ སྡོད་འཇགས་རྩེ་བའི་པའི་ རྩེ་བའི་བརྗོད་འབྲི་ཞི།
- ༧ སྡོད་འཇགས་རྩེ་བའི་པའི་ དགོས་པ་ཚུ་འབྲི་ཞི།

- ༤ སྡོད་འཇགས་ ལྗོངས་ཚལ་གྱི་སྐོར་འབྲི་ཞི།
- ༧ འགྲུར་ཕུག་བཀོད་རྒྱུ་ཚལ།
- ༨ སྡོད་འཇགས་གི་གཞུང་ལྗོངས་ཚལ་འབྲི་ཞི།
- ༩ ཕྱི་པ་(ཨིང་ལི་ཞི)དང་ བང་པའི་བསྟན་བཅོས་ ལྗོངས་ཚལ་གྱི་ རྒྱུད་པར་རྒྱུ་བཤད་ཞི།

སྡེ་ཚན་ ༨ སྐབས་འགྲུབ་ རྒྱལ་ཁབ་ བརྒྱུ་ཚལ་ ༤༠

སྡོད་འཇགས་ཀྱི་ཚོས་རྒྱལ་ཁབ་ཀྱི་དྲི་བ་བཟོས་པ་དང་ ཨ་ལོ་ཚུ་གི་རྒྱུད་ལ་ གཤམ་གསལ་གྱི་ཡོན་ཏན་དང་ རིག་རྩལ་གྱི་ལྗོངས་ཀྱི་བརྒྱུ་བཟོ་ ཡོད་མེད་གྱི་རྒྱུ་ཁས་ལེན་དགོ།

- ༡ དཔེ་ཚའི་རྒྱུ་བའི་འབྲི་ཞི་དང་ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢ དེས་ཚིག་འབྲེལ་ཞི་དང་ གཞུང་གི་ལོ་འདུག་(སྐོར་འདུག་དང་ ཐད་ཀར་གྱི་འདུག)འབྲེལ་བཤད་རྒྱུ་ཚལ།
- ༣ ལངས་དོན་ཟུང་པའི་སྐབས་ འབྲེལ་ཡོད་གཞུང་གཞན་ལ་གི་ ལུང་དང་རིག་པ་སྐྱར་ཏེ་འབྲི་ཞི།
- ༤ སྐབས་ཚལ་གྱི་ དཔེ་བཟོ་རྒྱུ་ཚལ།
- ༥ སྐབས་ཚལ་ལྗོངས་པའི་ རྒྱལ་ཁབ་བཟོ་འབྲི་ཞི།
- ༦ སྐབས་ཚལ་བརྒྱལ་འདོད་པའི་ དགོས་པ་རྒྱུ་ཚལ།
- ༧ སྐབས་ཚལ་ ལྗོངས་ཚལ་གྱི་སྐོར་འབྲི་ཞི།
- ༨ འགྲུར་ཕུག་བཀོད་རྒྱུ་ཚལ།
- ༩ སྐབས་ཚལ་གཞུང་ལྗོངས་ཚལ་འབྲི་ཞི།
- ༡༠ སྐབས་ཚལ་ལྗོངས་ཚལ་དང་ ལྗོངས་ཚལ་གྱི་གཞུང་གི་ལྗོངས་ཚལ་དང་ སྐབས་ཚལ་གཞི་དང་སྐབས་ཚལ་རྒྱུ་ཚལ་དང་སྐབས་ཚལ་འཛིན་འབད་ཞི།
- ༡༡ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༡༢ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༡༣ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༡༤ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༡༥ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༡༦ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༡༧ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༡༨ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༡༩ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༠ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༡ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༢ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༣ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༤ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༥ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༦ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༧ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༨ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༢༩ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༠ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༡ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༢ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༣ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༤ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༥ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༦ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༧ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༨ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༣༩ ལྗོངས་ཚལ་འབྲི་ཞི།
- ༤༠ ལྗོངས་ཚལ་འབྲི་ཞི།

སྡེ་ཚན་ ༩ མཛོན་བཟོ་དང་ རྒྱལ་ཁབ་ བརྒྱུ་ཚལ་ ༡༥

སྡོད་འཇགས་ཀྱི་ཚོས་རྒྱལ་ཁབ་ཀྱི་དྲི་བ་བཟོས་པ་དང་ ཨ་ལོ་ཚུ་གི་རྒྱུད་ལ་ གཤམ་གསལ་གྱི་ཡོན་ཏན་དང་ རིག་རྩལ་གྱི་ ལྗོངས་ཀྱི་བརྒྱུ་བཟོ་ ཡོད་མེད་གྱི་རྒྱུ་ཁས་ལེན་དགོ།

- ༡ མིང་གི་རྒྱལ་ཁབ་ཚལ་ བཀོད་རྒྱུ་ཚལ།
- ༢ མིང་གི་དེས་ཚིག་ འབྲེལ་རྒྱུ་ཚལ།

- ༣ མིང་བཏགས་དགོ་པའི་ ལྷ་མཚན་དང་ དགོས་པ་བཤད་ཚུགས་ནི།
- ༤ མིང་གི་ཚུ་གི་ ལྷ་བ་ཁངས་དང་ སྤང་ཚུ་ བཤད་ཚུགས་ནི།
- ༥ སྤྱན་རློབ་རྣམས་ལ་ མིང་གི་རྣམ་གཟངས་ཚུ་ འོས་འབབ་ལྡན་ཏོག་ཏོ་འབད་ འབྲི་ཚུགས་ནི།

ལྷ་བའི་དཔེ་དེབ།

- ༡ སྤྱོད་འཇགས་ལྷ་བ། མཛད་པ་པོ། ལྷ་ལ་སྤྲས་ནི་བཤུ།
- ༢ སྤྱོད་འཇགས་ལྷ་འགྲེལ། མཛད་པ་པོ། མཁམ་པོ་ཀུན་བཟང་དཔལ་ལྷན་གྱི་འགྲེལ་པ།
- ༣ སྤྱན་དག་ལེའུ་བར་པའི་ལམ་སྟོན། སྤྱོད་ལྷ་སྤྲས་པ། སྤྱོད་པོན་དག་དབང་ཕྱག་རྩོར།
- ༤ མཛོན་བརྩོད་རྣམ་མཚའི་ཚུ་ཐིག། སྤྱོད་ལྷ་སྤྲས་པའབད་མི་ འོར་བ་དག་འདུལ་དང་ ཚེ་རིང་རྣམ་རྒྱལ།



# Literature in English



## **RATIONALE**

Literature is an integral part of human existence. Through its study we get a truer and a more profound understanding of the complex human existence and its relationships with nature.

The Literature in English course is a subject intended for arts students. In this course the students will pursue a deeper and more critical study of literature. This is to prepare them for a better degree of performance when they pursue the English Honours BA degree program.

The course also aims to expose the students to literature written in English from around the world. Through this exposure the students will learn to appreciate the efforts that writers have made to enrich the literary experience as well as the literature that is written in English.

## **AIMS**

1. Develop awareness of the growth and evolution of the different literary genres through the ages and their contribution to the refinement of literature.
2. Appreciate the literary work of writers writing in English.
3. Develop the ability to make interpretive, evaluative and critical judgment of a text.
4. Develop the ability to draw inferences ( from the symbols and images) interpret meaning and point out literary devices.
5. Sharpen ability to make sound judgments through the study of themes, plot, style, characterization, atmosphere/moods, found in novels, poems and drama.
6. Develop recognition of rhetorical devices, thematic, linguistic /contextual meanings and allusions.
7. To identify and point out characteristics of an individual author's writing styles, the speakers use of his/her use of satire, humour, irony, puns and so on.
8. To identify elements that contributes to poem sounds: rhythm, rhymes, alliteration, onomatopoeia and so on.
9. To foster a love for literature, awareness of social, cultural and artistic values.
10. Learn to respond appropriately to the poems' verbal playfulness, the musical dimensions.
11. Deepen emotional and personal involvement: by relating themselves to the characters, situations experiences, moods/atmosphere in the text.
12. Develop an understanding and appreciation of their own culture as well as the cultures of others through the study of prescribed texts.
13. Develop the range of their vocabulary and power of expression.
14. Develop an understanding of the place of human beings in the world as well as their limitations and possibilities.
15. Sharpen their human sensibilities through an understanding and appreciation of universal values, such as, beauty, goodness and truth.
16. The practice of discussions to come to new understanding of the human conditions-love, spirituality, loss of loved ones.
17. The importance of developing a deep sense of justice and fair play.
- 18.

## **LEARNING EXPERIENCE**

Through the study of the prescribed literary texts the students should:

1. Obtain a greater degree of content knowledge.
2. Study about some major writers and their works.
3. Understand the effect that a writer achieves by manipulating form, line, arrangement, view points or image patterns.
4. Use internet, library and other media forms to develop their researching skills.
5. Read and write independently in order to develop their study skills.
6. Compare and contrast language usage: language used in the texts they study and language used by mass media e.g. Newspapers, Brochures. Notices, Circulars and so on.
7. Read in and out of the class on a regular basis to foster an experience in different forms.

8. Write in and out of the class on a regular basis to foster an experience in different forms.
9. Participate in debates, quizzes, discussions, presentations, simulations, role plays and so on.
10. Carry out project works on Bhutanese literature.
11. Reflect on literary pieces studied in the class or elsewhere to develop creative as well as critical thinking.
12. Produce portfolios with their best poems, content for a novel, drama pieces, critical assessments of excerpts from their prescribe text/ picture analysis and so on.
13. Develop an appreciation of literature through a sensitive critical understanding of the text in study: derive fun and pleasure in reading, confidence in discussions and interpretations and negotiating the different meaning.
14. Explore the power of expression, metaphorical language (complexity, subtlety and ambiguity).
15. Compare, contrast and build relationships between the different literary genres.

## LEARNING OUTCOMES

The learning experiences in the classrooms should enable the students to:

1. Read with pleasure and enjoyment.
2. Distinguish different literary genres and their nature.
3. Acquire an enhanced knowledge and appreciation of literary works.
4. Use different reading strategies to read different texts.
5. Gain a deeper understanding of their own culture and people as well as the culture of other people around them.
6. Use different study skills to study independently.
7. Develop the range of their vocabulary, power of expression and confidence.
8. Heighten their sense of beauty and harmony which they can exhibit in their thoughts and actions.
9. Develop skills to analyze language usage.
10. Produce a portfolio of their own writings and also compile best writings from different genres.

## TOPICS FOR STUDY: CLASS XI

### NOVEL: PRIDE AND PREJUDICE BY JANE AUSTENA

The argument for our choice is that it provides:

1. Language approachability.
2. Themes are approachable and relevant.
3. Possibilities to interact with the text.
4. More manageable than the prescribed text of the ISC board.

## POETRY

**The questions for the poetry section will be based on the following poems and not from other poems.**

(I) Emily Dickinson

1. This was a poet
2. Of Bronze and Blaze
3. I cannot dance upon my toes

(II) William Wordsworth

1. Nutting
2. Upon Westminster Bridge
3. Resolution and Independence

(III) Tennyson

1. Mariana
2. The Lady of Shallot
3. With Trembling Fingers Did We Weave (from In Memoriam)

- (IV) Hopkins
1. Hurraing in Harvest
  2. Binsey Poplars
  3. Felix Randal

- (V) Wilfred Owen
1. Exposure
  2. Mental Cases
  3. Strange Meeting

**Examination Weighting 100%**

Pride and Prejudice 34% (Novel)

Poetry 33%

The Importance of Being Earnest 33% (Play)

**PLAY: THE IMPORTANCE OF BEING EARNEST BY OSCAR WILDE**

This play has been chosen because:

1. It has humour in it which will appeal to the students.
2. It is lighter than the one prescribed as a text.
3. The satirical element can be understood.
4. It has wit which is an appealing element.

**TOPICS FOR STUDY: CLASS XII**

**NOVEL: TESS OF THE D'URBEVILLES BY THOMAS HARDY**

This play was chosen because:

1. The themes are emotionally approachable and relevant even though tragic in nature.
2. Of the possibilities to interact with the text.
3. It is easier for students to relate to the natural background which is heavily portrayed in the novel.
4. The plot flows smoothly.

**POETRY**

**The questions for the poetry section will be based on the following poems and not from other poems.**

- (I) Ted Hughes
1. Crow Tyrannosaurus
  2. Ravens
  3. The Stag
- (II) Seamus Heaney
1. Punishment
  2. Casualty
  3. Follower
- (III) W.B. Yeats
1. A Prayer For My Daughter
  2. The Second Coming
  3. Broken Dreams
- (IV) Sylvia Plath
1. Tulips
  2. Snake Charmer
  3. Mushrooms

(V) W.H. Auden

1. The Unknown Citizen
2. The Shield of Achilles
3. As I Walked Out One Evening

Examination Weighting 100%

Tess of the D'urbervilles 34% (Novel)

Poetry 33%

The Crucible 33% (Play)

### **PLAY: THE CRUCIBLE BY ARTHUR MILLER**

This play has been chosen because:

1. It is action packed and therefore can be very engaging for students.
2. The socio-cultural elements portrayed can be associated to the Bhutanese beliefs.
3. The themes of justice and fair play can be enhanced.

### **Strategies for the implementation of the texts for both classes XI-XII**

To foster appropriate learning in the classroom we have determined a few strategies that the teacher can employ in the class.

1. Provided demonstration by showing students how they make meaning from the text.
2. Provide meaningful group work for specific tasks which should be related to the aims. This will help students to listen to each other as resources and also interact with each other meaningfully.
3. Lead whole class discussions.
4. Alternate activities from active participation to passive listening and vice-versa to hold on to attention span of the students.
5. Supplement teaching with audio and visual materials.
6. Recapitulate the previous lesson.
7. Outline and review the lesson for the day.
8. Conduct quizzes and debates on the play/stories/poems.
9. Arrange guest lectures by the author, critic, or an educationist.
10. Encourage writing on characters, plot, setting, likes, dislikes and so on.
11. Encourage illustration of the text for students who have an artistic inclination.
12. Encourage writing across the genres for e.g. changing prose to poetry, drama to poetry, poetry to prose/drama.
13. Facilitate discussions on areas that puzzles them or on areas where they find intertextual connections to help them broaden their understanding of how authors use ideas and language.
14. Initiate role plays on small parts of the texts.
15. Encourage hot seating whereby students impersonating the characters/writer/critic.
16. Encourage students to maintain portfolios of materials that inspire them.

### **TIME ALLOCATION FOR TEACHING OF LITERATURE IN ENGLISH FOR CLASS XI-XII**

The time allocated for teaching of Literature in English is **5 hours** of teaching time, a week.

## MODES OF ASSESSMENT

### School Level Assessment

The assessment part must have components to check student's performance in the class as well as for grading. The areas of assessment are explained below.

Terms	Types of Assessment		
	CA	Examination	Total
First Term	10%	30%	40%
Second Term	10%	50%	60%
<b>Total</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>

#### 1. Continuous Assessment (20%)

The following are suggested modes of assessment for awarding the 20% for continuous assessment:

1. Students should be advised to keep portfolios in which they have samples of works that has been done in the literature class. Students can have self assessment forms in their portfolios.
2. Students could be provided with 2-3 assignments ranging from 150 -200 words for which students can do an in depth study.
3. Students could be provided with a Project work. The grading and the presentations of the project work can be done for the autumn term
4. Students can also be awarded marks for class participation.

#### Criteria

Teachers are required to develop their own rubrics to assess students' writings based on the following components:

The **process grade** is based on attitude, effort, and participation from the students in the class and on a particular writing (story or poem). The next one is **content grade** which is based on the quality of the writing: content meaning; authority on the subject; presence of individual voice; idea development; design or format; and clarity. The third component is **mechanics**, which takes into consideration; legibility, punctuation, spelling, usage, and paragraphing. The fourth basis is of course the **knowledge of the writing process** – drafting, composing, revising, editing. This is to check whether the students have experienced the entire writing process.

Grading system has to take into account all the abilities of the writer when he/she writes. Writing involves a combination of many skills; planning, choosing, questioning, anticipating, organising, reading, listening, reviewing, responding, editing, and so on.

#### 2. Examinations (80%)

There will be examinations at the end of the first and the second terms. The examination indicated for the second term will be the annual examination. The Examination will be conducted out of 100 marks which will then be converted to 30% and 50% for the first and second term respectively.

## NATURE OF ASSESSMENT

### Section A: Play

The students will be tested for his/her ability to:

1. Provide literary development of the genre.
2. Give character sketches, plot analysis, thematic study, and critical appraisal of the text.
3. Write responses/notes on the plot, setting, imagery, point of view of the play.
4. Analyze the business of the play and explain it.
5. Make a comparative study between different characters, plays, in the play.
6. Discusses the social and the cultural milieu of the play and the playwright.

7. Make a world to text connection to the play in terms of:
  - a. Personal choice of characters with justifications
  - b. Resolving conflict in the play and in oneself.
  - c. The character's ulterior/intentional motive and the result/outcome of the intended outcome. (character foil, minor and major, roles in the conflict)
  - d. The juxtaposition of characters and plot vs sub-plots.
8. Analyze the structure of the play-expository, the rise (conflict) and the fall-in action (build in climax and the anti-climax)
9. Point out the recurrent themes/preoccupations/issues and the significance of the events/episodes in the play (patriotism, friendship, betrayal, sacrifice and so on.
10. Answer open-ended questions.

### **Section B: Poetry**

The student will be tested for his/her ability to:

1. Provide literary development of the genre.
2. Comprehend the language of the poem.
3. Interpret his/her understanding.
4. Critique the rhetorical devices used.
5. Understand the salient features of the different forms of poetry such as an ode, a sonnet, a dramatic monologue, and ballads.
6. Understand the background to the poem and the poet.
7. Comprehend the theme of the poem.
8. Comment on the style of the poem.
9. Explain and identify common metaphorical expressions.

### **Section C: Novel**

The student will be tested for his/her ability to:

1. Trace the origin and the development of the novel as a literary genre.
2. Understand the salient features of the novel.
3. Comprehend the different themes presented in the novel.
4. Respond to the ideas presented in the piece.
5. Identify the rhetorical devices used in the piece.
6. Critically appreciate the novel.

## **EXAMINATION SPECIFICATION FOR LITERATURE IN ENGLISH CLASS XI-XII**

The end of year examination will be conducted by the Bhutan Board of Examinations. This 100% external examination will constitute the assessment of class 12 students.

The examinations will comprise of one paper.

Time: Three hours for writing and fifteen minutes for reading the questions.

Weighting: 100marks

Question Format:

Section I is compulsory. It comprise of ten multiple choice items and three short answer questions worth five marks each on all three texts. It is worth 25 marks.

Section II comprises of extended response items worth 25 marks. There will be a choice of three questions on each text. The student will have to attempt one question from each text. This section will require students to attempt questions worth 75 marks.

## **TEXTBOOKS & REFERENCES**

### **Texts for Class XI**

1. *Pride and Prejudice* by Jane Austen.
2. *The Importance of Being Earnest* by Oscar Wilde, OUP.
3. *19<sup>th</sup>-20<sup>th</sup> Century Verse* edited by Chris Woodhead, OUP.

### **Texts for Class XII**

1. *Tess of the D'Urbervilles* by Thomas Hardy.
2. *The Crucible* by Arthur Miller.
3. *19<sup>th</sup>-20<sup>th</sup> Century Verse* edited by Chris Woodhead, OUP.

### **References for Class XI-XII**

1. *The Short Oxford History of English Literature*, Andrew Sanders OUP.
2. *Oxford Concise Dictionary of Literary Terms*, Chris Baldick, OUP.
3. *Cambridge International Dictionary of Phrasal Verbs*, CUP.

**NOTE:** You are advised to use these materials regularly to teach literature effectively in the classroom.

# Mathematics



## **RATIONALE**

Mathematics is a tool-subject for the enhanced study of many other subjects. At the same time, it is also a profound discipline in itself. Students studying at these levels will be able to appreciate both these aspects of the subject. It is a fact that there is an unprecedented need to understand and use mathematics, in the work of professions and in every day lives. Students graduating out of class 12 will realize that mathematical achievement in the examinations has become a critical filter that determines their options for careers and further studies.

Acquisition of the content knowledge alone or just a good mark in the examinations may not be adequate anymore. For a successful sail during these levels and beyond class 12, students would be required to learn mathematics with in-depth understanding. Towards this, our mathematics curriculum and instructions in the classrooms should play proactive roles.

This course of the mathematics will serve as a launch pad for the students to pursue any specific further academic or vocational studies.

## **AIMS**

Teachers should guide the students to develop their:

- In-depth understanding of the mathematical topics that they learn
- Appreciation of the importance and relevance of the subject
- Confidence in the use of the subject
- Ability to communicate mathematical ideas effectively, both orally and in writing
- Ability to reason out, including making conjecture and proving or disproving those conjectures based on the available evidences
- Problem solving skills in various situations
- Ability to read and interpret mathematical information correctly

## **LEARNING EXPERIENCES**

Students should have the opportunities to:

- Discuss and debate the relevance and importance of mathematics in their lives and society
- Make, refine and explore conjectures on the basis of evidences and use a variety of reasoning and proof techniques to confirm or disprove those conjectures
- Get meaningfully engaged in mathematical tasks both in groups and alone
- Present and communicate their mathematical ideas and results, orally and in writing
- Connect a mathematical idea other ideas, and with real world situations
- Mathematics Syllabus for Classes 11 & 12
- Use technologies (like calculators and computers) in the study of mathematics
- Learn mathematical contents and procedures with understanding
- Estimate answers and solutions
- Develop confidence and positive attitude towards the subject

## **LEARNING OUTCOMES**

These experiences will help the students to:

- Apply the mathematical knowledge and skills in appropriate real world situations
- Read, interpret, and draw inferences correctly from mathematical information
- Communicate mathematical ideas and results effectively, both orally and in writing
- Use appropriate technology effectively
- Develop their reasoning power and problem solving skills
- Gain a strong foundation to pursue mathematics or mathematics related career after class 12
- Value mathematics and engage actively in learning it

## MATHEMATICS SYLLABUS FOR CLASS XI (2010 - )

The syllabus for the Pure Mathematics course and the Business Mathematics course are as given below. It will be noticed that while the students taking the Business Mathematics will study comparatively less content under certain units like Trigonometry, Calculus and Coordinate Geometry, they will study an additional unit called Commercial Mathematics. The commonalities and the differences of the contents between the Pure Mathematics and Business Mathematics are clearly indicated below. A good estimate of the expected times that should be spent in the formal teaching of each topic is given in hours with the topics.

UNIT 1 - ALGEBRA		Pure Mathematics	Business Mathematics
1	<b>Sequence and Series (10 hrs)</b> <ul style="list-style-type: none"> <li>▪ AP, GP: Their meanings and finding the <math>n</math>th term (<math>T_n</math>) and the sum of the series (<math>S_n</math>); Insertion of arithmetic and geometric means between two numbers; sum to infinity of GP (<math> r  &lt; 1</math>);</li> <li>▪ Special sums, i.e. <math>\sum n</math>, <math>\sum n^2</math>, <math>\sum n^3</math>, <math>n \in \mathbb{N}</math>; Explain the meaning and use of <math>\sum</math> (summation notation)</li> <li>▪ Problems involving the above sequences</li> </ul>	All	All
2	<b>Binomial Theorem (7 hrs)</b> <ul style="list-style-type: none"> <li>▪ Binomial expansion for positive integral indices; use of Pascal's triangle; and the binomial theorem, i.e.  <math>(x + y)^n = {}^nC_0x^n + {}^nC_1x^{n-1}y + \dots + {}^nC_ny^n</math></li> <li>▪ Meaning of <math>{}^nC_r</math></li> <li>▪ Binomial theorem for the expansion of binomial expressions having negative or fractional indices</li> <li>▪ Finding the general term of the expansions</li> <li>▪ Application of the theorem for approximation, e.g. <math>(0.99)^8 = (1 - 0.01)^8</math></li> </ul>	All	All
3	<b>Logarithms (5 hrs)</b> <ul style="list-style-type: none"> <li>▪ Revise the laws of Exponents taught in class IX</li> <li>▪ Relationship between Logarithmic and Exponential expressions</li> <li>▪ Laws of Logarithm and their properties including the change of base</li> </ul>	All	All
4	<b>Remainder and Factor Theorem (5 hrs)</b> <ul style="list-style-type: none"> <li>▪ Meaning of Rational Integral Function</li> <li>▪ Remainder Theorem</li> <li>▪ Factor Theorem</li> <li>▪ Factorization of cubic and quadratic polynomials</li> </ul>	All	All
5	<b>Quadratic Equations and functions (15 hrs)</b> <ul style="list-style-type: none"> <li>▪ Solution of Quadratic equations by factorization and use of their graphs/sketches</li> <li>▪ Solution of Quadratic equations by the Formula method</li> <li>▪ Nature of roots - Real roots, Complex roots, Equal roots</li> <li>▪ Introduction to the concept of imaginary and complex numbers through the square root of -1</li> <li>▪ Sum and Product of roots</li> <li>▪ Forming quadratic equations with given roots and related data</li> <li>▪ Graph of quadratic function <math>ax^2 + bx + c</math>; Sign of quadratics function; Maximum and minimum value of quadratic functions</li> <li>▪ Quadratic inequalities: Solution of quadratic inequalities; Use of graphs and number lines should be employed</li> </ul>	All	All

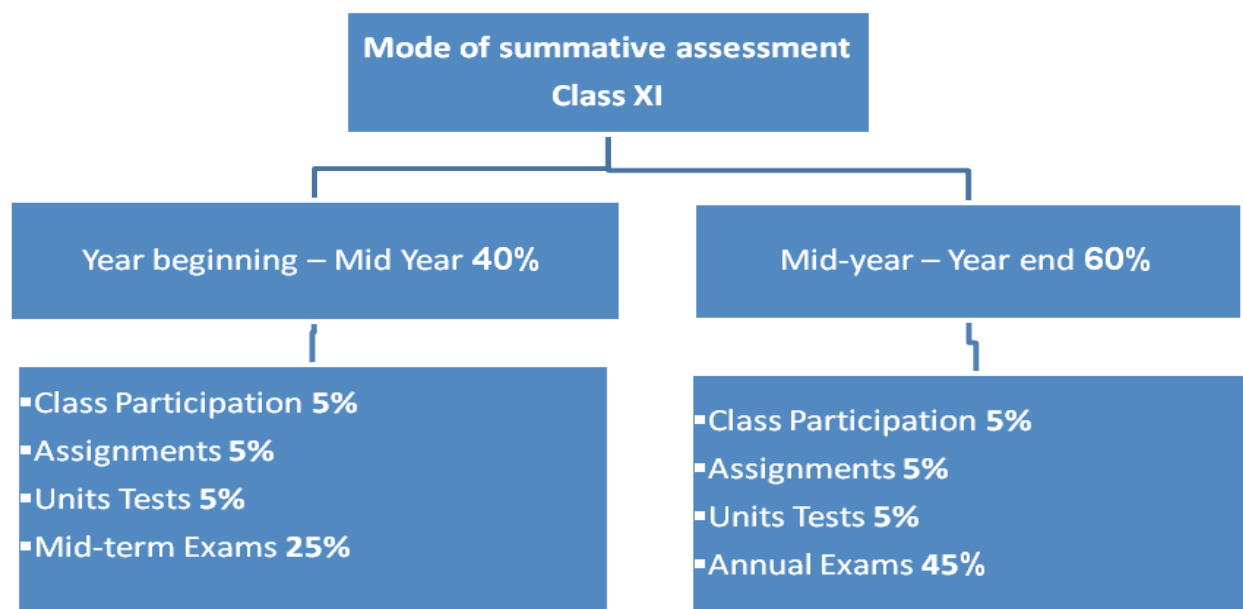
6	<p><b>Partial Fractions (10 hrs)</b></p> <ul style="list-style-type: none"> <li>Rational functions of the form <math>f(x) / g(x)</math>, where <math>f(x)</math> and <math>g(x)</math> are polynomial functions in <math>x</math></li> </ul> <p>CASE I - degree of numerator &lt; degree of denominator</p> <ul style="list-style-type: none"> <li>Type 1 - Non repeated linear factors</li> <li>Type 2 - Repeated linear factor</li> <li>Type 3 - Quadratic factors (may not be factorizable)</li> </ul> <p>CASE II - degree of numerator <math>\geq</math> degree of denominator</p> <ul style="list-style-type: none"> <li>Type 1 - Non repeated linear factor</li> <li>Type 2 - Repeated linear factor</li> </ul>	All	All
<b>UNIT 2 – TRIGONOMETRY</b>		<b>Pure Mathematics</b>	<b>Business Mathematics</b>
1	<p><b>Angles and Arc lengths (3 hr)</b></p> <ul style="list-style-type: none"> <li>Angles: Convention of signs of angles; Magnitude of an angle; Measures of angles; Circular measures</li> <li>The relation <math>S = r\theta</math>, where <math>\theta</math> is in radians; Relation between radians and degrees</li> <li>Arc length and area of a sector of a circle</li> </ul>	All	All
2	<p><b>Trigonometric functions (7 hrs)</b></p> <ul style="list-style-type: none"> <li>Trigonometric ratios; Relationship between trigonometric ratios</li> <li>Proving simple trigonometric identities</li> <li>Signs of trigonometric ratios</li> <li>Limits of trigonometric ratios</li> <li>Trigonometric ratios of standard angles</li> <li>Trigonometric ratios of allied angles</li> <li>Periods of trigonometric functions</li> <li>Graphs of simple trigonometric functions (only sketches); Students should be exposed to Computer Generated Graphs through the use of computers</li> </ul>	All	All
3	<p><b>Compound and Multiple Angles (7 hrs)</b></p> <ul style="list-style-type: none"> <li>Addition and Subtraction formulas: <math>\sin(A \pm B)</math>; <math>\cos(A \pm B)</math>; <math>\tan(A \pm B)</math>; <math>\tan(A + B + C)</math>; etc., Double angle, triple angle, half angle and one third angle formula as special cases</li> <li>Sums and differences as products: e.g. <math>\sin C + \sin D = 2\sin\left\{\frac{C + D}{2}\right\}\cos\left\{\frac{C - D}{2}\right\}</math></li> <li>Product to sums or differences: e.g. <math>2\sin A \cos B = \sin(A + B) + \sin(A - B)</math> etc</li> <li>Conditional identities (involving angles of triangles)</li> </ul>	All	All
4	<p><b>Trigonometric Equations (4 hrs)</b></p> <ul style="list-style-type: none"> <li>Solutions of trigonometric equations (General solution and solution in specified range)</li> <li>Type 1: Equations in which only one function of a single angle is involved e.g. <math>\sin 5\theta = 0</math></li> <li>Type 2: Equations expressible in terms of one trigonometric ratio of the unknown angle</li> <li>Type 3: Equations involving multiple and sub-multiple angles</li> <li>Equations involving compound angles</li> <li>Linear equations of the form <math>a\cos\theta + b\sin\theta = c</math>, where <math> c  \leq (a^2 + b^2)^{1/2}</math> and <math>a, b \neq 0</math></li> </ul>	All	This chapter is NOT for Business Mathematics

5	<b>Properties of Triangles (4 hrs)</b> <ul style="list-style-type: none"> <li>▪ Sine Rule (including ambiguous case for triangles)</li> <li>▪ Cosine Rule</li> <li>▪ Projection formula</li> <li>▪ Napier's Formula for the area of a triangle (Proof and use)</li> </ul>	All	This chapter is NOT for Business Mathematics
6	<b>Heights and Distances (3 hrs)</b> <ul style="list-style-type: none"> <li>▪ Practical problems based on angle of elevation and depression (in 2 - D)</li> </ul>	All	This chapter is NOT for Business Mathematics
<b>UNIT 3 - CALCULUS</b>		<b>Pure Mathematics</b>	<b>Business Mathematics</b>
1	<b>Functions (5 hrs)</b> Concept of real valued functions; Domain and Range; Inverse functions; Classification of functions; Sketch of graphs of exponential functions, logarithmic functions, step functions, and simple trigonometric functions like Sinx, Cosx, and Tanx	All	All
2	<b>Limits (5 hrs)</b> Notion and meaning of limits; Fundamental theorems on limits; Limits of algebraic and trigonometric functions	All	All
3	<b>Continuity (5 hrs)</b> Continuity of a function at a point $x = a$ ; Continuity of a function in a range	All	All
4	<b>Differentiation (15 hrs)</b> <ul style="list-style-type: none"> <li>▪ Meaning and geometrical interpretation of derivatives; Differentiation from first principle; Derivative of simple algebraic and trigonometric functions and their formulae; Derivative of sums, differences, products and quotients of functions;</li> <li>▪ Application of derivatives: Equation of tangent and normal; Approximation; Rate measure;</li> </ul>	All	All EXCEPT the portion of the Application of derivatives concerning <i>Approximation and Rate Measure</i>
5	<b>Integration (5 hrs)</b> <ul style="list-style-type: none"> <li>▪ Indefinite integral: integration as the inverse of differentiation; Anti-derivatives of polynomials and functions like <math>(ax + b)^n</math>, <math>\sin(x)</math>, <math>\cos(x)</math>, <math>\sec^2(x)</math>, <math>\operatorname{cosec}^2(x)</math></li> <li>▪ Integration by simple substitution for simple polynomial functions and simple trigonometric functions</li> </ul>	All	All
<b>UNIT 4 – COORDINATE GEOMETRY</b>		<b>Pure Mathematics</b>	<b>Business Mathematics</b>
1	<b>Points and their coordinates in 2-Dimensions (7 hrs)</b> <ul style="list-style-type: none"> <li>▪ Cartesian system of coordinates</li> <li>▪ Distance formula</li> <li>▪ Section formula</li> <li>▪ Centroid of a triangle</li> <li>▪ Incentre of a triangle</li> <li>▪ Area of a triangle using its three vertices</li> <li>▪ Area of a quadrilateral</li> <li>▪ Slope or gradient of a line</li> <li>▪ Angle between two lines</li> <li>▪ Conditions of perpendicularity and parallelism of two lines</li> </ul>	All	All

2	<b>The Straight line (7 hrs)</b> <ul style="list-style-type: none"> <li>Various forms of equation of lines: point slope form; two points form; intercept form; perpendicular/normal form; general equation of a line; slope/gradient; distance of a point from a line; distance between parallel lines; Angles between two lines; equations of lines bisecting the angle between the lines; Identical Lines</li> <li>Family of lines: Lines parallel to <math>ax + by + c = 0</math> are of the form <math>ay + bx + k = 0</math>; Lines perpendicular to <math>ax + by + c = 0</math> are of the form <math>ay - bx + k = 0</math>; any line through the intersection of two lines <math>L_1</math> and <math>L_2</math> is of the form <math>L_1 + KL_2 = 0</math>, where <math>K \in \mathbb{R}</math></li> </ul>	All	All EXCEPT the portion on the Family of Lines  <i>In other words, the portion on the Family of lines is EXCLUDED for B/Maths</i>
3	<b>Locus and its equation (4 hrs)</b> <ul style="list-style-type: none"> <li>Definition of a locus and methods to find the equation of a locus; problems should be limited to fairly simple ones</li> </ul>	All	This chapter is NOT for B/Maths
4	<b>Equations of Circles (6 hrs)</b> <ul style="list-style-type: none"> <li>Equation of a circle in: Standard form; diameter form; general form; parametric form</li> <li>Given the equation of a circle, to find the centre and the radius</li> <li>Finding the equation of a circle, given 3 non-collinear points; and given other sufficient data</li> </ul>	All	All
5	<b>Theorems on Circles (8 hrs)</b> <ul style="list-style-type: none"> <li>Theorems on chords of a circle</li> <li>Theorems on arcs and angles</li> <li>Theorems on angles in alternate segment</li> <li>Theorems on congruent arc and chords</li> <li>Theorems on tangent lines and circles</li> </ul>	All	All
<b>UNIT 5 - STATISTICS</b>		<b>Pure Mathematics</b>	<b>Business Mathematics</b>
1	<b>Measures of Central Tendency (4 hrs)</b> <ul style="list-style-type: none"> <li>Mean, Median, Mode; finding by direct methods, formulas, and graphs</li> </ul>	All	All
2	<b>Dispersion (4 hrs)</b> <ul style="list-style-type: none"> <li>Range: Quartiles, inter quartiles</li> <li>Standard deviation - by direct method, short cut method and step deviation method; the meaning of Standard deviation should be emphasized</li> </ul>	All	All
<b>UNIT 6 – COMMERCIAL MATHEMATICS</b>		<b>Pure Mathematics</b>	<b>Business Mathematics</b>
1	<b>Simple Interest and Compound Interest (5 hrs)</b> <ul style="list-style-type: none"> <li>Meanings and methods of the interest calculations</li> <li>Problems involving the two types of interests</li> </ul>	This is NOT for P/Maths	All
2	<b>Discount (5 hrs)</b> Trade discount; problems based on it, Present value, True discount, Bill of Exchange; banker's gain; days of grace; problems based on these.	This is NOT for P/Maths	All

## MODE OF ASSESSMENT

There are two types of assessment, depending on what you do with them: Formative Assessment and Summative Assessment. Formative Assessment is observation to guide further instruction; and the observation is normally not measured, or its measurement is not recorded to grade the students. Summative Assessment is used to determine a mark or a grade. There are various ways provided to accomplish formative and summative assessment (*Please see the “Mathematics Curriculum Guide for Teachers, Class XI” produced by CAPSD.* The mode of assessment given here is for summative assessment of students in class XI. However, observations and analysis made on students’ performance in these summative assessments could very well be used for further instructions. The Summative assessment in class XI will be done as per the following break-downs:



A brief rationale on each of the components of the assessment above follows:

### YEAR BEGINNING TO MID-YEAR

**Class Participation:** Student’s active involvement in the class is important for his/her learning. Class participation would consist of student’s positive attitude and behaviors towards earning: his/her ability to follow instructions, cooperation displayed in doing group works, confidence in asking questions and answering the questions asked, etc to mention a few. Teacher should develop criteria to assess students for the class participation. A better alternative would be to work out the criteria with the students in the beginning of the year. It is important that the students know the criteria and are reminded of them from time to time. This would force the students to be active, cooperative, critical thinkers and confident communicators in the class. This would also force the teachers to drive students towards these qualities. These are desirable and healthy disposition we would want in our children. Whatever reasonable assessment tools and marking scheme the teacher has chosen to use for the class participation up to the mid term should be worked out to be worth 5% of the whole year assessment, for entering into the student progress report form.

**Assignment:** Reasonable amounts of assignment, which we normally call home works, should be assigned quite regularly. More importantly, they should be checked, and prompt feedback provided to the students on their works. The teacher will check at least two times each student’s home works during the first half term of the year; they can devise their own marking scheme. The average mark from the total should be worked out to be worth 5% for entering onto the students’ Progress Report Card.

**Unit Tests:** A unit test should be conducted at the end of teaching a unit. It should be carried out during one of the class periods. The teacher should keep proper record of the students’ achievement in the series of unit tests. A minimum of two unit tests should be conducted before the mid term exams. The total mark obtained in the unit tests should be worked out to be worth 5% for entering onto the student’s Progress Report Card.

**Mid-term examination:** The mid-term examination format may be based on the specifications provided for the annual examinations below. The mark obtained in it should be brought down to 25% for entering into the progress report card.

**MID-YEAR TO YEAR-END:**

**Class Participation:** To be done similarly as during the first term of the year.

**Assignments:** To be done similarly as during the first term of the year.

**Unit Tests:** To be done similarly as during the first half term of the year, but with the units covered after the mid term examination.

**Year-End Examination:** The annual examination paper will be set for 100 marks, with writing time of **Three hours**. The paper will consist of two sections:

- **Section A** will be composed of 15 multiple choice questions, covering the entire syllabus. Each MCQ should carry one Key/Correct Answer and three distracters. Each MCQ is worth 2 marks, making the section worth 30 marks in total.
- **Section B** will be made up of about 13 open answer type questions set from the entire syllabus, out of which students will attempt 10 questions. Each question will be set to carry 7 marks, making the section worth 70 marks in total.

**NOTE:**

1. For Pure Mathematics, the weighting accorded for each of the units for the annual examination is as given below:

	<b>UNITS</b>	<b>MARK</b>
1	Algebra	30
2	Trigonometry	20
3	Calculus	25
4	Coordinate Geometry	15
5	Statistic	10
	<b>Total</b>	<b>100</b>

2. For the Business Mathematics the weighting accorded for each of the units for the annual examination is as given below:

	<b>UNITS</b>	<b>MARK</b>
1	Algebra	25
2	Trigonometry	15
3	Calculus	25
4	Coordinate Geometry	15
5	Statistic	10
6	Commercial Mathematics	10
	<b>Total</b>	<b>100</b>

3. Care should also be taken in the preparation of questions having a balance of them requiring conceptual understanding, problem solving, communication, reasoning, and applications of procedural knowledge and skills. Some questions should cross strands or units. Along with these, test blue print based on Blooms Taxonomy would also be needed to be used in the preparation of the paper.

4. The marks obtained out of 100 in this examination should be worked out to be worth 45% for entering in to the student’ progress report card.



## MATHEMATICS SYLLABUS FOR CLASS XII (2011 - )

The syllabus for both the Pure Mathematics course and the Business Mathematics course are as given below. It will be noticed that while the students taking the Business Mathematics will study comparatively less content under certain units like Calculus and Coordinate Geometry, they will study an additional unit called Commercial Mathematics. The Pure Mathematics students will study two additional units called Trigonometry and Complex Numbers. The commonalties and the differences of the contents between the Pure Mathematics and the Business Mathematics are clearly indicated below. A good estimate of the expected times that should be spent in the formal teaching of each topic is given in hours with the topics.

UNIT 1 - ALGEBRA		Pure Mathematics	Business Mathematics
1	<b>Permutations and Combinations (12 hrs)</b> <ul style="list-style-type: none"> <li>▪ Factorial Notation</li> <li>▪ Concept of Permutation (<math>{}^n P_r</math>): Permutation of alike things; restricted permutation; circular permutations</li> <li>▪ Concept of Combination (<math>{}^n C_r</math>): Restricted combinations; Distribution of different things into groups; Open selection of items from different things and from alike things</li> <li>▪ Mixed problems on permutations and combinations (note: problems should be of fairly simple ones)</li> </ul>	All	All
2	<b>Determinants and Matrices Determinants: (6 hrs)</b> <ul style="list-style-type: none"> <li>▪ Of order 2 and 3</li> <li>▪ Minors and Co-factors of a determinant</li> <li>▪ Expansion of a determinant</li> <li>▪ Properties of a determinant and their use in the evaluation of a determinant</li> <li>▪ Product of determinants (without proof);</li> <li>▪ Solution of simultaneous equations in 2 or 3 variables using <u>Cramer's rule</u></li> <li>▪ Conditions for consistency of 3 equations in two variables</li> </ul> <b>Matrices: (6 hrs)</b> <ul style="list-style-type: none"> <li>▪ Of order <math>m \times n</math>, where <math>m, n \leq 3</math>, including case <math>m = n</math>; Types of matrices</li> <li>▪ Operations: Addition/Subtraction (Compatibility); Multiplication by a scalar; Multiplication of two matrices (Compatibility)</li> <li>▪ Adjoint and inverse of a matrix</li> <li>▪ Application of Matrix multiplication</li> <li>▪ Use of matrices to solve simultaneous linear equations in 2 or 3 unknowns</li> </ul>	All	All
UNIT 2 – TRIGONOMETRY		Pure Mathematics	Business Mathematics
1	<b>Inverse Trigonometric functions 10 hrs)</b> <ul style="list-style-type: none"> <li>▪ Meaning of inverse trigonometric functions (<math>\sin^{-1}x</math>, <math>\cos^{-1}x</math>, <math>\tan^{-1}x</math>, <math>\cot^{-1}x</math>, <math>\operatorname{cosec}^{-1}x</math>, <math>\sec^{-1}x</math>)</li> <li>▪ Principal values (use of graphs in explanation)</li> <li>▪ Properties of inverse trigonometric functions (without proof)</li> </ul>	All	This Unit is NOT for B/Maths



UNIT 3 - CALCULUS		Pure Mathematics	Business Mathematics
1	<b>Differential Calculus (15 hrs)</b> <ul style="list-style-type: none"> <li>▪ Revision of the topics done in class XI</li> <li>▪ Derivatives of trigonometric, logarithmic, and exponential functions</li> <li>▪ Derivatives of composite, absolute value, implicit and parametric functions</li> <li>▪ Interchange of independent and dependent variables</li> <li>▪ Differentiating function with respect to another function</li> <li>▪ Logarithmic differentiation</li> <li>▪ Successive differentiation up to 2nd order</li> <li>▪ Maxima and Minima</li> <li>▪ Application of maxima and minima to practical problems</li> <li>▪ <i>Derivatives of inverse trigonometric functions reducible to simple form by substitution</i></li> </ul>	All	All EXCEPT (i) Derivative of <i>Inverse trigonometric function</i> (ii) Application of maxima and minima are NOT included for B/Maths
2	<b>Integral Calculus (15 hrs)</b> <ul style="list-style-type: none"> <li>▪ Revision of formula of integration from class XI</li> <li>▪ Standard method of integration of <math>1/x</math>, <math>e^x</math>, <math>\tan x</math>, <math>\cot x</math>, <math>\sec x</math>, <math>\operatorname{cosec} x</math>, <math>(ax + b)^n</math>, where <math>n \in \mathbb{Q}</math></li> <li>▪ Integration using substitution</li> <li>▪ Integration by using partial fractions</li> <li>▪ Integration by parts</li> <li>▪ Integrals of the type <math>\sin^2 x \, dx</math>, <math>\sin^3 x \, dx</math>, <math>\cos^2 x \, dx</math>, <math>\cos^3 x \, dx</math>, <math>f'(x)/[f(x)]^n \, dx</math></li> <li>▪ Definite integral as a limit of sum</li> <li>▪ Properties of Definite Integrals</li> <li>▪ Application of definite integrals - area of a curve included between x or y axis, volume of revolution about the x-axis or y-axis or about a line</li> </ul>	All	All EXCEPT, the portion on <i>Definite Integrals, Properties of definite integrals and Applications of definite integrals</i> are NOT included for B/Maths
3	<b>Differential Equations (10 hrs)</b> <ul style="list-style-type: none"> <li>▪ Meaning of differential equation; order and degree of a differential equation</li> <li>▪ Solution of differential equation of 1st order and 1st degree</li> <li>▪ Variable separable</li> <li>▪ Homogenous equations and equations reducible to homogenous form; <math>(dy/dx) + Py = Q</math>, where P and Q are functions of x only</li> <li>▪ Solution of differential equations of second order; <math>(d^2y / d^2x) = f(x)</math></li> </ul>	All	This chapter is NOT for B/Maths
UNIT 4 – COORDINATE GEOMETRY		Pure Mathematics	Business Mathematics
1	<b>Pairs of Straight Lines (10 hrs)</b> <ul style="list-style-type: none"> <li>▪ General equation of a family of lines passing through the intersection of two lines <math>L_1</math> and <math>L_2</math>: <math>L_1 + kL_2 = 0</math>, <math>k \in \mathbb{R}</math>; finding k using additional condition</li> <li>▪ General equation of second degree in x and y representing a pair of lines</li> <li>▪ Conditions for general second degree equation to represent a pair of straight lines</li> <li>▪ Conditions for two lines to be perpendicular or parallel</li> </ul>	All	This chapter is NOT for B/Maths

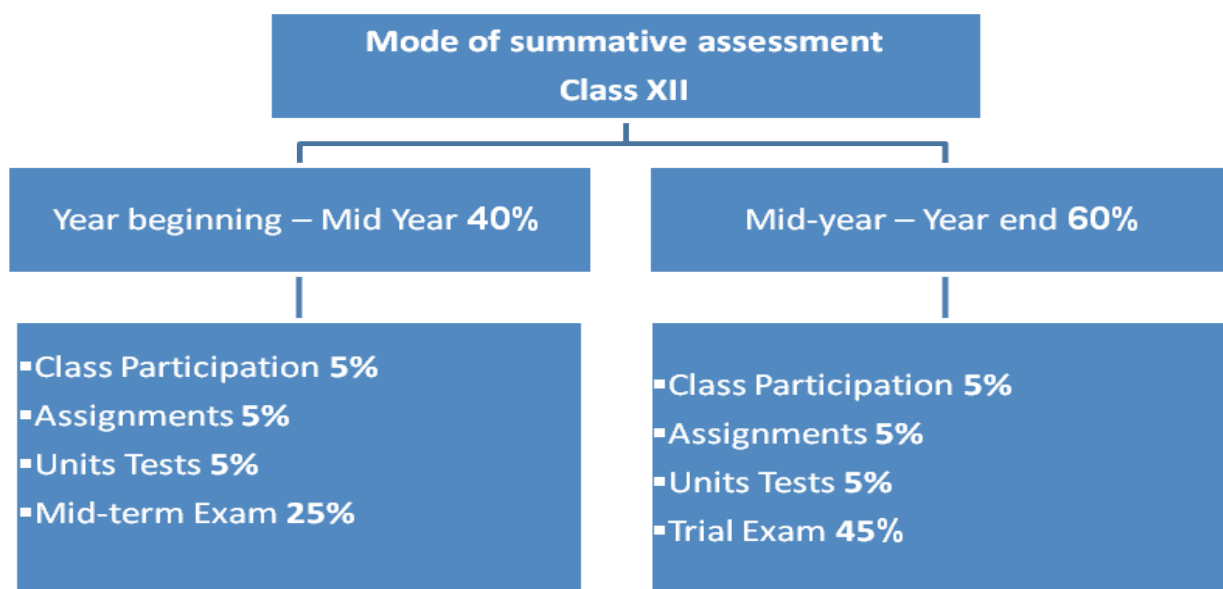
	<ul style="list-style-type: none"> <li>▪ Point of intersection and angle between two lines represented by a second degree equation in x and y</li> <li>▪ Equation of the bisector of the angle between a pair of given straight lines</li> </ul>		
2	<b>Conics (15 hrs)</b> <ul style="list-style-type: none"> <li>▪ As a section of a cone</li> <li>▪ Definition and understanding of Foci, Directrix, Latus Rectum</li> <li>▪ Recognition of Equation of a Parabola, Ellipse and Hyperbola in standard form</li> <li>▪ Finding the equation for a conic when focus, directrix, and eccentricity or related data are given</li> <li>▪ Finding basic information like foci, directrix, etc from a given equation.</li> </ul>	All	All
3	<b>Points and their co-ordinates in 3-Dimensions (10 hrs)</b> <ul style="list-style-type: none"> <li>▪ Distance between two points;</li> <li>▪ Section and mid-point formulas;</li> <li>▪ Direction cosines and direction ratios of a line;</li> <li>▪ Angle between two lines;</li> <li>▪ Conditions of line to be parallel or perpendicular</li> </ul>	All	All
4	<b>Plane (10 hrs)</b> <ul style="list-style-type: none"> <li>▪ General equation of a plane, as <math>ax + by + cz = d</math>, where a, b, c are direction ratios of the normal to the plane</li> <li>▪ Equation of a plane: One point form; Normal form; Intercept form</li> <li>▪ Distance of a point from a plane</li> <li>▪ Angle between two planes, and angle between a line and a plane</li> <li>▪ Equation of a plane through the intersection of two planes</li> <li>▪ Finding the equation of a plane given a point and direction cosine/ratios of the normal and other sufficient data</li> </ul>	All	This chapter is NOT for B/Maths
<b>UNIT 5 – DATA AND PROBABILITY</b>		<b>Pure Mathematics</b>	<b>Business Mathematics</b>
1	<b>Measures of dispersion (4 hrs)</b> <ul style="list-style-type: none"> <li>▪ Meaning of dispersion; quartile deviation; standard deviation, coefficient of variation; Mean deviation from the mean or median</li> <li>▪ Combined mean and standard deviation of two groups only</li> </ul>	All	All
2	<b>Correlations (5 hrs)</b> <ul style="list-style-type: none"> <li>▪ Definition and meaning of correlations coefficient</li> <li>▪ Use of scatter diagram and Line of best fit</li> <li>▪ Calculation of coefficient of correlation by Karl Pearson's method for ungroup data</li> <li>▪ Calculation of rank correlation coefficient by Spearman's method, for both repeating and non-repeating data</li> <li>▪ Calculation of regression coefficient and the two lines of regression by the method of least squares; use of lines of regression for prediction</li> </ul>	All	All

3	<b>Probability (8 hrs)</b> <ul style="list-style-type: none"> <li>▪ Random experiment and their outcomes</li> <li>▪ Events: sure events, impossible events, mutually exclusive events, independent and dependent events</li> <li>▪ Definition of probability of an event</li> <li>▪ Laws of probability: addition and multiplication laws; conditional probability</li> </ul>	All	All
<b>UNIT 6 – COMMERCIAL MATHEMATICS</b>		<b>Pure Mathematics</b>	<b>Business Mathematics</b>
1	<b>Annuities (10 hrs)</b> <ul style="list-style-type: none"> <li>▪ Meaning, Present value, Annuity Certain, Contingent Annuity, Perpetual Annuity, Immediate Annuity, Annuity Due, PV of immediate and perpetual annuity</li> </ul>	This unit is NOT for P/Maths	All
2	<b>Application of Derivatives in Commerce and Economics (10 hrs)</b> <ul style="list-style-type: none"> <li>▪ Cost Function</li> <li>▪ Average cost</li> <li>▪ Marginal cost</li> <li>▪ Revenue function and break-even point</li> </ul>	This unit is NOT for P/Maths	All
<b>UNIT 7 – COMPLEX NUMBERS</b>		<b>Pure Mathematics</b>	<b>Business Mathematics</b>
	<ul style="list-style-type: none"> <li>▪ Meaning and as an ordered pair of real number in the form <math>a + ib</math></li> <li>▪ Geometrical representation in complex plane - Argand diagram for <math>z</math> (a complex number), <math>1/z</math>, <math>\bar{z}</math> and <math>z</math>; equality of two complex numbers; absolute value (modulus)</li> <li>▪ Argument and Conjugate of complex numbers</li> <li>▪ Operations: Sum/Difference, product and quotient of two complex numbers; additive and multiplicative inverse of a complex number</li> <li>▪ Simple locus equation on complex numbers; proving using <math display="block">z \cdot \bar{z} =  z ^2 \text{ and } z_1 + z_2 = z_1 \pm z_2</math> </li> <li>▪ Square root of a complex number</li> <li>▪ De Moivre's theorem and its application</li> <li>▪ Cube root of unity: <math>1, \omega, \omega^2</math>; application problems</li> </ul>	All	This unit is NOT for B/Maths

### MODE OF ASSESSMENT

The final assessment for class 12, which will determine the students' result, will be 100% external examinations conducted by the Bhutan Board of Examination (BBE) at the end of the academic session. The BBE examination format will be as per the specification provided herein for the trial examination.

However, for the purposes of assessing the students' learning process and progress, and for school's internal records, the schools must conduct their assessments on class 12 students based on the following structure, till the trial examinations, which is similar to that of class XI.



A brief rationale on each of the components of the assessment above follows:

### YEAR BEGINNING TO MID-YEAR

**Class Participation:** Student's active involvement in the class is important for his/her learning. Class participation would consist of student's positive attitude and behaviors towards earning: his/her ability to follow instructions, cooperation displayed in doing group works, confidence in asking questions and answering the questions asked, etc to mention a few. Teacher should develop criteria to assess students for the class participation. A better alternative would be to work out the criteria with the students in the beginning of the year. It is important that the students know the criteria and are reminded of them from time to time. This would force the students to be active, cooperative, critical thinkers and confident communicators in the class. This would also force the teachers to drive students towards these qualities. These are desirable and healthy disposition we would want in our children. Whatever reasonable assessment tools and marking scheme the teacher has chosen to use for the class participation up to the mid term should be worked out to be worth 5% of the whole year assessment, for entering into the student Progress Report form.

**Assignment:** Reasonable amounts of assignment, which we normally called home works, should be assigned quite regularly. More importantly, they should be checked, and prompt feedback provided to the students on their works. The teacher will check at least two times each student's home works during the first half term of the year; they can devise their own marking scheme. The average mark from the total should be worked out to be worth 5% for entering onto the students' Progress Report card.

**Unit Tests:** A unit test should be conducted at the end of teaching a unit. It should be carried out during one of the class periods. The teacher should keep proper record of the students' achievement in the series of unit tests. A minimum of two unit tests should be conducted before the mid term exams. The total mark obtained in the unit tests should be worked out to be worth 5% for entering onto the student's Progress Report Card.

**Mid-term examination:** The mid-term examination may be based on the specifications provided for the Trial examination/Board Examination as below. The mark obtained in it should be brought down to 25% for entering into the progress report card.

## MID-YEAR TO YEAR-END:

**Class Participation:** To be done similarly as during the first term of the year.

**Assignments:** To be done similarly as during the first term of the year.

**Unit Tests:** To be done similarly as during the first half term of the year, but with the units covered after the mid term examination.

**Trial Examination/Board Examination:** The annual examination paper will be set for 100 marks, with writing time of **Three hours**. The paper will consist of two sections:

- **Section A** will be composed of 15 multiple choice questions, covering the entire syllabus. Each MCQ will carry 2 marks, making the section worth 30 marks in total. Each MCQ should have one Key/Correct Answer and three distracters.
- **Section B** will be made up of about 13 open answer type questions set from the entire syllabus, out of which the student will have to attempt 10 questions. Each question will carry 7 marks, making the section worth 70 marks in total.

### NOTE:

1. For Pure Mathematics, the weighting accorded for each of the units for the annual examination is as given below:

	UNITS	% MARK
1	Algebra	15
2	Trigonometry	7
3	Calculus	30
4	Coordinate Geometry	25
5	Data and Probability	15
6	Complex Numbers	8
	<b>Total</b>	<b>100</b>

2. For the Business Mathematics the weighting accorded for each of the units for the annual examination is as given below:

	UNITS	MARK
1	Algebra	20
2	Calculus	25
3	Coordinate Geometry	15
4	Data and Probability	20
6	Commercial Mathematics	20
	<b>Total</b>	<b>100</b>

3. Care should also be taken in the preparation of questions having a balance of them requiring conceptual understanding, problem solving, communication, reasoning, and applications of procedural knowledge and skills. Some questions should cross strands or units. Along with these, test blue print based on Blooms Taxonomy would also be needed to be used in the preparation of the paper.

4. The marks obtained out of 100 in this examination should be worked out to be worth 45% for entering into the student' progress report card.

# Science

## A. RATIONALE

With the rapid advancement of science and technology the knowledge in this area has become extremely important. People need to be made scientifically literate to understand and benefit from the fast changes that are taking place in the world of science and technology. Science in classes XI and XII therefore, should cater to equip the students with the knowledge that will help them pursue higher studies in the field of science. For those who do not want to pursue higher studies, this course should enable them to understand the basic scientific principles useful in their lives and in particular, technology. At the same time, people should possess adequate knowledge and skills to maintain the informed balance between the development and the natural environment, vital for the wellbeing of the nation.

## B. GOALS

The goals of science education are:

1. To enable the learners to acquire knowledge and understanding of the natural sciences at a level appropriate to their developmental stage
2. To develop and apply the skills of inquiry, investigation, problem-solving, logical reasoning and communication
3. As a result of goals 1 and 2, learners will be ‘scientifically literate’ and be able to participate in critical and informed debates on the key questions and issues that may affect their own lives, community, country, and the world at large
4. To prepare learners for higher studies in science and technology, and also to allow them to make a smooth transition into jobs that require an understanding of science
5. To equip the learners with the knowledge of local as well as global environmental and ecological problems, their consequences and solutions
6. To instil in the learners love and care for the natural environment and to develop the necessary understanding to be able to live harmoniously with nature and realise the goal of sustainable development
7. To develop a sense of health and well-being and how to live a healthy life
8. To enable the learners to appreciate that while science can answer most questions, there are also questions which it cannot answer
9. To inculcate in learners a love of learning science and learning in general, which they will carry on throughout their lives

## C. LEARNING EXPERIENCES

The development of the Science Curriculum Framework is informed and guided by the following ten principles that transpired from the series of consultations with science educators, science professionals and other stakeholders, but not compromising with global views.

**Developmental Appropriateness:** The Science Curriculum Framework emphasises the importance of a developmentally appropriate curriculum based on the knowledge and skills about how children develop and learn. Although, no one theory of development is sufficient, the Science Curriculum was informed by:

- (i) Stage theory of development proposed by Jean Piaget.
- (ii) Bloom’s taxonomy of cognitive domain to inform the writing of the key learning outcomes.
- (iii) The outcomes of the consultation meetings. At all stages of development, key stakeholders’ views were sought to ensure that the Science Curriculum is developmentally appropriate and progressive for Bhutan’s learners and that it fulfils the needs of the Bhutanese society.

**Learners and Learning:** Children learn from birth, and learning continues throughout their lives. This view is supported by the science education literature which demonstrates that learners already bring an understanding of the natural world to the science classroom. As soon as learners start to interact with the environment, they start developing personal beliefs, concepts and skills about the world around them. Using their past experiences, beliefs and myths, children develop ideas and theories to explain the natural phenomena which may not always be consistent with the conventional scientific ideas. Therefore, children and scientists both have views about how and why things behave as they do and have meanings for words in science. However, the child's view may appear far more sensible and logical to him or her than the scientists' viewpoint. In order to develop children's ideas consistent with conventional science, the science education literature advocates that learning must take place through the active participation of learners.

**Teaching for Constructing Knowledge:** a number of constructivist approaches to science teaching are being proposed, which are summarised as:

- identification of the students' past experiences, ideas and views before the teaching;
- provision of opportunities for the students to explore their ideas and test their strength in explaining phenomena, accounting for events and making predictions;
- provision of stimuli for the students to develop, modify and, where necessary, change their ideas and views; and
- support the learner's attempts to rethink and reconstruct his or her ideas and views.

**Effective Pedagogy:** Learning is a result of active interaction a learner with teachers and the surrounding world to which they belong. The curriculum developers and teachers need to adopt to achieve effective learning in science. Through role playing, games, simulations, talking, reading, writing, and experimentation the students continue to explore their own understanding and begin to gain an appreciation of the views and understanding of others. A conducive learning environment is pivotal to the successful implementation of the Science Curriculum. The teachers must show respect to the individual learner's views and needs; create a safe and secure environment; and provide the learners with the opportunity to actively participate in teaching-learning process. It is crucial that the science teachers exhibit tolerance and respect for the diverse ideas, skills, and experiences of all learners.

ICT in science classes promotes cognitive acceleration in learners; enables a wider range of experience so that learners can relate science to their own and other real-world experiences; increases the learner's self-learning management and facilitates data collection and presentation. It is also important that the teachers ensure equal participation of boys and girls in all aspects of the science learning process, consistently use non-sexist language and avoid competitive approaches in curriculum design and teaching. Activities, materials and resources must be developed by the curriculum designers that will appeal to both girls and boys, and be relevant to their lives.

**Language Learning:** Scientific terminology and the grammatical structure of scientific English is vital for learners to effectively comprehend and communicate their ideas and study findings to the class and the wider world.

Therefore, it is suggested that new technical terms be introduced in a systematic way and at an appropriate pace so that not too many terms are introduced in a lesson. The language of Scientific English must be direct, using commonly understood words. Appropriate use of writing frames, and DARTS activities also facilitate the learning of scientific English.

**Knowledge and Understanding:** The aspiration of the Science Curriculum is to develop in the learners the notion of a 'scientific temper' which is the spirit of enquiry, the courage to question objectivity, and to be divergent in independent thinking guided by the knowledge of scientific methods of enquiry and its use in solving problems.



Therefore, the Science Curriculum has been developed not only to give the learners a strong foundation in science so that they are factually well informed but also to develop scientifically literate citizens, which is consistent with the idea of developing a scientific temper imperative to pave the path to go beyond the prescribed course of studies. A scientific literate citizen is seen as one who is aware that science, mathematics, and technology are interdependent human enterprises with strengths and limitations; understands key concepts and principles of science; is familiar with the natural world and recognises both its diversity and unity; and uses scientific knowledge and scientific ways of thinking for individual and social purposes.

**Culture and Values:** The Science Curriculum will contribute significantly to an individual's self-discipline. The fundamental law of nature is that all forms of life regardless of religion, law, creed or education survive by mutual cooperation based on their interconnectedness and the precept of *tha dhamtsi lay jumdrej* its profound influence on the learners' spiritual, cultural and traditional way of living. Science Curriculum ensures that the learners undertake investigative work in order to contribute to developing strong purposeful, caring and constructive relationships in the classroom.

**Community Involvement:** The Science Curriculum, to the maximum extent, is designed to offer the teachers opportunities to involve the members of local community in the teaching and learning of science on the local knowledge and practices. Science Curriculum encourages field work by taking the learners out to project sites, nature reserves in the local community to explore scientific ideas and to become aware of the applications of science in the real life situations

**Local Knowledge:** Communities are storehouses of knowledge and practices about different aspects of Bhutan's environment, and traditional and cultural values passed down over generations. The constructivist paradigm also states that the child's community and local environment forms the context for more effective learning and constructing knowledge. Therefore, the Science Curriculum has been designed so that, at different key stages, the learners' own thoughts and immediate contexts are drawn upon to construct knowledge.

**Science and GNH:** The Science Curriculum has been designed underpinning the principles of Gross National Happiness as an approach to science teaching so that, learners imbibe the essence of harmonious living in the society and with the environment, and to engender the students with full values of humanity and capability. Science is one of the learning areas that enhances the understanding of the natural world; hence, it is a vital medium for disseminating the values and principles of GNH through its myriad conceptual and pedagogical tools.

#### **D. LEARNING OUTCOMES**

The learning experiences should help the students to:

1. understand scientific concepts and acquire skills appropriate to their level of learning and for their lives as citizens or as future science professionals.
2. develop their skills of inquiry in order to carry out investigations and experiments.
3. be able to transfer the skills of inquiry to be active and critical citizens.
4. develop the ability to use information critically from a wide range of sources to answer scientific questions, address misconceptions and issues in society and in life.
5. be able to apply their knowledge and understanding of science to solve key problems and for the conservation of the environment including adopting the principles of refuse, reduce, recycle and reuse.
6. develop their abilities for meeting the scientific and technological needs and aspirations of the country and day-to-day life.

7. develop a sense of ethics and responsibility by understanding that the knowledge of science has not only contributed positively to the human development, but also has harmful effects both on the environment and the human life.
8. be able to share with others the skills learnt in science in order to develop effective scientific communication skills in the learners and in the society.
9. acquire qualities of commitment, self-confidence, curiosity, creativity, integrity and adaptability.
10. develop a sense of honesty and the importance of their contribution to their family, community and country, and understand the value of working together as a team.

## E. COURSE CONTENT

### PART 1: PHYSICS (CLASS XI)

#### 1. MOTION IN A STRAIGHT LINE

Rest and motion, point objects, position, displacement and path length, average velocity and average speed, instantaneous velocity and speed, acceleration, Kinematic equations for uniformly accelerated motion: graphical method and calculus method and free fall acceleration.

*(Scope: Determine position, displacement and path-length(distance), define displacement, speed, velocity and acceleration, represent distance travelled, displacement, speed, velocity and acceleration using graphical methods, find the distance travelled by calculating the area under a speed-time graph, find acceleration using the slope of a velocity-time graph, derive the equations of motion, from the definitions of velocity and acceleration, Interpret displacement-time graph and speed-time graph for uniform and non-uniform acceleration, derivation of three kinematic equations which represent uniformly accelerated motion in a straight line  $v = u + at$ ,  $s = ut + \frac{1}{2}at^2$ ,  $v^2 = u^2 + 2as$ , and apply the kinematic equations for acceleration in a straight line, including the motion of bodies falling in the Earth's uniform gravitational field without air resistance).*

#### 2. MOTION IN A PLANE

Scalars and vectors, Multiplication of vectors by real numbers, addition and subtraction of vectors: Graphical method, resolution of vectors, vector addition: analytical method, laws of vector addition, phasor: projection of rotating vector, motion in a plane, motion in a plane with constant acceleration, projectile motion and real life applications.

*(Scope: Distinguish between scalar and vector quantities and give examples, determine the resultant of two coplanar vectors using a vector triangle, calculate the resultant for two perpendicular vectors, resolve a vector into two perpendicular components at right angles to each other by drawing and by calculation, explain the independent nature of perpendicular components of a vector and define a phasor as the projection of a rotating vector along an axis, Apply the kinematic equations for constant acceleration to explain the motion of an object due to uniform velocity in one direction and a uniform acceleration in a perpendicular direction e.g. parabolic path of a projectile in free fall, Determine the velocity of aircraft and shipping, the speed of cars by police, the distance of planets from the Earth and the size and velocity of meteorological phenomenon e.g. rain clouds, using radar).*

#### 3. LAWS OF MOTION

Force, law of inertia, Newton's first law of motion, Newton's second law of motion, Newton's third law of motion, conservation of momentum, collision and impulse, systems with varying mass: a rocket, common forces in mechanics, circular motion and solving problems in mechanics.

*(Scope: define force and calculations of net force acting on a given body, state the law of inertia and its applications in daily life, State and apply each of Newton's three laws of motion, define linear momentum as the product of mass and velocity ( $p=mv$ ) and appreciate the vector nature of momentum, define the net force acting on a body as equal to the rate of change of its momentum, apply the equation  $\mathbf{F} = \frac{\Delta\mathbf{P}}{\Delta t}$  to solve numerical problems, explain that  $F=ma$  is a special case of Newton's second law when*

mass  $m$  remains constant, define impulse of force, explain that the area under a force against time graph is equal to impulse, explain and use the equation Impulse = change in momentum, State the principle of conservation of momentum, define the terms a perfectly elastic collision and an inelastic collision, apply the principle of the conservation of momentum to solve problems in one dimension including elastic and inelastic interactions in one dimension, explain that while the momentum of system is always conserved in the interaction between bodies, some change in kinetic energy usually occurs, convert angles from degrees into radians and vice versa, explain that a force perpendicular to the velocity of an object will make the object describe a circular path, explain centripetal acceleration and centripetal force, Apply the equations for angular velocity  $\omega = \frac{2\pi}{T}$  and centripetal acceleration  $a = \frac{\omega^2}{r}$ , and apply the equation  $F=ma$  to uniform motion in a circle to derive  $F = \frac{Mv^2}{r}$ ).

#### 4. MECHANICAL PROPERTIES OF SOLIDS

Elastic behaviour of solids, Stress and strain, Hooke's law, Stress- strain curve, work done by a spring force, elastic module, applications of elastic behaviour of materials.

**(Scope:** Describe the deformation of a substance caused by a force in one dimension and explain that force can be tensile or compressive, describe the behaviour of springs and wires in terms of force, extension, elastic limit, Hooke's law and the force constant, Apply the equation  $F=kx$ , where  $k$  is the force constant of a spring or wire and Explain the terms stress, strain and Young's modulus).

#### 5. WORK, ENERGY AND POWER

Work, Kinetic energy, concept of potential energy conservation of mechanical energy and power.

**(Scope:** Work and calculation of work done using scalar product of vectors, derive and apply the equation  $\Delta PE=mg\Delta h$  for calculations of potential energy near the Earth's surface, derive and apply  $KE=\frac{1}{2}mv^2$ , apply the equations for potential and kinetic energy to prove the law of conservation of energy and power and its calculation from work done).

#### 6. THERMAL PHYSICS

Heat, internal energy and work, internal energy and first law of thermodynamics, internal energy at absolute zero, change of state and phase changes.

**(Scope:** Explain that at absolute zero a substance has minimum internal energy, define the term internal energy as the sum of the kinetic energy and bond potential energies of the molecules in a system as measured when the system as a whole is not moving, explain that a rise in temperature of a substance leads to an increase in its internal energy, explain that when a substance changes its state e.g. from solid to liquid, its internal energy increases but not its temperature and explain the terms melting, boiling and evaporation using the kinetic theory of matter).

#### 7. GRAVITATION

Universal law of gravitation, acceleration due to gravity of earth, acceleration due to gravity below and above the surface of earth, gravitational potential energy, escape velocity and earth satellites.

**(Scope:** Understand universal law of gravitation, describe a gravitational field as a field of force and gravitational field strength as force per unit mass  $g=\frac{F}{m}$ , represent a gravitational field using field lines, explain and apply Newton's law of gravitation for point masses in the form  $F=\frac{GM_1M_2}{r^2}$ , state and apply  $g=\frac{GM}{r^2}$  for the gravitational field strength of a point mass in a radial field, describe that on the Earth's surface the magnitude of 'g' is approximately constant and equal to the acceleration of free fall, derive and apply the equation for gravitational potential  $V=-\frac{GM}{r}$ , derive the escape velocity equation,  $v = \sqrt{\frac{2GM}{r}}$  and apply it in solving problems, describe earth's satellites and its orbital velocity and time periods of satellites).

## 8. MAGNETIC FIELDS

Magnetic force and field, magnetic flux, Lorentz force, motion of charged particles in a uniform magnetic field and solenoid.

**(Scope:** Describe the magnetic patterns of a long straight current-carrying conductor and a long solenoid, State Fleming's left hand rule and determine the force on current conductor placed at right angles to a magnetic field, Apply equations  $F=BIL$  and  $F=BIL\sin\theta$ , Define magnetic field, magnetic field, magnetic flux, magnetic flux density ( $\Phi$  - field) and the tesla, Apply  $F=BQv$  for the force on a charged particle travelling at right angles to a uniform magnetic field and explain that a charged particle follows a circular path in a uniform magnetic field,  $r = \frac{mv}{BQ}$ ).

## 9. ELECTRIC CIRCUITS

Potential difference, electric current, electric current in conductors, Ohm's law, resistance and resistivity, resistivity of various materials, temperature dependence of resistivity, electrical energy and power, series and parallel circuits and cells, emf and internal resistance.

**(Scope:** Describe the electric current as the net flow of charged particles, explain and apply the equation  $I = \frac{\Delta Q}{\Delta t}$ , define potential difference and the volt in terms of work done per unit charge, explain and apply  $V = \frac{W}{Q}$  and  $V = \frac{P}{I}$ , Sketch and explain ( $I/V$ ) characteristics of a metallic conductor at constant temperature, a semiconductor diode and a filament lamp, define resistance and the ohm, state and apply  $R = \frac{V}{I}$ , define resistivity and conductivity, State and apply  $\rho = \frac{AR}{L}$  and  $\sigma = \frac{LG}{A}$ , calculate the total resistance of resistors in series using the formula  $R = R_1 + R_2 + R_3 + R_4 + \dots$  and the total conductance  $G_r = \frac{1}{G_1} + \frac{1}{G_2} + \frac{1}{G_3} + \frac{1}{G_4} + \dots$ , calculate the total resistance of resistors in parallel using the formula  $R_r = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \dots}$ , and the total conductance of resistors in parallel using the formula  $G_r = G_1 + G_2 + G_3 + G_4 + \dots$ , State and apply equations to calculate electric power in a series circuit  $P = VI = RI^2 = \frac{V^2}{R}$ , explain the concepts of electromotive force (emf) and internal resistance and the difference between emf and potential difference (p.d.) and State and apply the equations  $\mathcal{E} = \frac{E}{Q}$  and  $\mathcal{E} = I(R+r)$ ).

## 10. REFLECTION AND REFRACTION

Refraction, total internal reflection, rainbows, optical fibres, modes of propagation of light in optical fibres.

**(Scope:** State the laws of the refraction of light, define the term refractive index  $\mu = \frac{C_i}{C_r}$  and use the expression  $\mu = \frac{\sin i}{\sin r}$ , explain critical angle and total internal reflection, relate refractive index to critical angle by the equation  $\mu = \frac{1}{\sin c}$ , describe the formation of primary and secondary rainbows, describe the application of total internal reflection in the transmission of light along an optic fibre and state modern applications of fibre optics e.g. endoscopy and communications).

## 11. WAVES

Characteristics of transverse and longitudinal waves, displacement relation in a progressive wave, the speed of travelling wave, principle of superposition of waves, standing waves and normal modes and standing waves and resonance.

**(Scope:** Define the terms displacement, amplitude, frequency, phase, period, speed and wavelength, describe progressive, longitudinal and transverse waves, Interpret graphical representations of transverse and longitudinal waves, deduce the equation  $v = f\lambda$  from definitions of speed, frequency and wavelength, explain formation of stationary waves using graphical methods to identify nodes and antinodes, describe the similarities and differences between progressive wave and standing wave, apply the equation: separation

*between adjacent nodes (or antinodes) =  $\lambda/2$ , calculation of displacement equation for progressive wave, calculation of wave number, frequency, wavelength, period, and angular frequency of progressive wave, calculation of speed of travelling wave, superposition principle of waves, formation of standing waves and resonance and draw simple graphical wave patterns of stationary waves for stretched strings, pipes and microwaves).*

## **12. ELECTROMAGNETIC WAVES**

Electromagnetic waves, electromagnetic spectrum, electromagnetic waves in communication, basic terminology used in electronic communication systems, bandwidth of signals, propagation of electromagnetic waves, analogue signal and digital signal, polarisation of electromagnetic waves.

*(Scope: Define electromagnetic waves and ration of electric and magnetic fields in electromagnetic waves, explain the values of the wavelengths of the different regions of the electromagnetic spectrum from radio waves to  $\gamma$ -rays, explain that all electromagnetic waves travel at the same speed in a vacuum, describe the similarities and differences among different electromagnetic radiations of the electromagnetic spectrum, describe the practical uses and dangers of electromagnetic waves, describe the differences between analogue signal and digital signal, and production of digital signal by sampling an analogue signal, calculate the rates of data transmission for different communication systems, describe the advantages of digital signals in modern communications, explain plane polarised waves and describe the polarisation of electromagnetic waves with particular reference to microwaves and light waves).*

## **13. ATOMS**

Alpha particle scattering and Rutherford's nuclear model of atom, atomic masses and composition of nucleus, nuclear force, atomic spectra, Bohr model of the hydrogen atom, Atomic spectra and energy levels.

*(Scope: Define nucleon number and the proton number, explain and apply the symbol  $X$  to represent nuclides, describe the basic atomic structure and the sizes of the atom in relation to the nucleus, describe the change in models of the atom the plum-pudding model to the Rutherford and Bohr models, using the Rutherford alpha particle experiment and the need to account for the hydrogen emission spectrum, explain the strong attractive nuclear force between nucleons operating over a very short range, estimate the density of nuclear matter and define isotope and give examples from a range of elements).*

## **14. NUCLEI**

Atomic masses and mass defect, mass-energy (equivalence) relation, nuclear binding energy, radioactivity, nuclear decay equations, applications of radio decay isotopes, relative risk of radiation exposure.

*(Scope: Define atomic masses, mass defect and binding energy, explain Einstein's mass-energy equivalence relation, apply nuclear decay equations to represent simple nuclear reactions, identify the quantities conserved in nuclear decay, describe the spontaneous and random nature of radioactive decay of unstable nuclei, describe the three different types of radiation:  $\alpha$ -particles,  $\beta$ -particles and  $\gamma$ -rays and describe their power of penetration and range determine the changes in atomic number and mass number caused by  $\alpha$  and  $\beta$  decay and represent them by simple decay equations, define activity and decay constant, state and apply the equation  $A=\lambda N$ , state and apply the equations  $A=A_0 e^{-\lambda t}$  and  $N=N_0 e^{-\lambda t}$  ( $A$  = activity,  $N$ = number of undecayed nuclei) in calculations, define the term half-life and determine it from graphical decay data, apply  $t_{\frac{1}{2}} = \frac{\ln 2}{\lambda}$  in simple calculations, describe a number of applications of radioactive isotopes e.g. radiocarbon dating, radioactive tracers in medicine, radioactive isotopes in smoke detectors including ethical and environmental issues and discuss the relative risks of certain occupations and activities e.g. flying, medical).*

## **15. SUN, EARTH AND CLIMATE**

Newtonian gravitation, Kepler's law, internal structure of Sun, internal structure of Earth, magnetic field of the Sun and the Earth, quassi-biennial oscillation and gravity waves, global warming, and the role of climate forcing in climate change.



**(Scope:** Describe orbital motions, conic sections and gravitational orbits using Kepler's laws and Newtonian gravitation, describe internal structure of Sun and Earth, compare magnetic field of the Sun and the Earth, explain gravity waves and quasi-biennial oscillation, global warming and the role of climatic forcing in climate change).

## PHYSICS (CLASS XII)

### 1. FORCES AND MOTION IN FLUIDS

Fluid resistance, mass and weight, motion of bodies falling in a uniform gravitational field with fluid resistance, surface tension, molecular theory of surface tension, surface energy, surface tension and its applications, surface tension in liquids, angle of contact and shape of meniscus, rise of liquid in a capillary (ascent formula), flow of liquids through porous media, viscosity of fluids, streamline flow, friction-like effects, equation of continuity, Bernoulli's Principle, dynamic lifts, viscosity, Stoke's Law, measurement of viscosity, Poisson's ratio and its application.

**(Scope:** Describe the motion of bodies falling in a uniform gravitational field with fluid resistance. explain the concept of weight as the effect of a gravitational field on a mass, state and apply the relationship  $\text{weight} = \text{mass} \times \text{acceleration due to gravity}$ , explain the movement of liquids in capillary tubes using ideas of surface tension, describe the cause and effect of surface tension in liquids e.g. beading of raindrops on a polished car, oil floating on water, describe the flow of liquids through porous media using capillary action e.g. the flow of water through soil, describe a fluid's internal resistance to flow of liquid using of pH meters e.g. water has a lower viscosity than honey, state that in a non-viscous fluid, an increase in the speed of the flow decreases the pressure, Bernoulli's principle, and its application e.g. airspeed indicators on aircraft, state and apply Stoke's Law  $F_d = 6\pi\mu RV$  to calculate the viscosity of fluids, state and apply the principle of continuity in any steady state process, that the rate at which mass enters a system is equal to the rate at which mass leaves the system, describe Poisson's ratio for the expansion of materials under stress and its applications e.g. in pressurised pipes.)

### 2. OSCILLATIONS

Periodic and oscillatory motions, periodic motion, oscillatory motion, simple harmonic motion, period and frequency, periodic functions, motion of simple oscillating system, displacement, SHM Equation, simple harmonic motion and uniform circular motion, velocity and acceleration in simple harmonic motion, velocity of SHM, Acceleration of SHM, energy in simple harmonic motion, system executing simple motion, the simple pendulum, damped simple harmonic motion and forced oscillations and resonance.

**(Scope:** Describe free oscillations, define the terms displacement, amplitude, period, frequency, frequency and phase difference, express period ( $T$ ) in terms of frequency ( $f$ ) using  $T = 1/f$ . explain simple harmonic motion (SHM) with examples, state and apply the equation  $a = -(2\pi f)^2 x$  as the defining equation of simple harmonic motion, use  $x = A \cos(2\pi ft)$  or  $x = A \sin(2\pi ft)$  as solutions to the equation  $a = -(2\pi f)^2 x$ , use the equation  $V_{\max} = (2\pi f) A$  to calculate the maximum speed of a simple harmonic oscillator, explain that the period with simple harmonic motion of an object is independent of its amplitude, explain the changes in displacement, velocity and acceleration, time and energy due to simple harmonic motion graphically, state and apply the equation for the total energy of a system in SHM  $E_1 = \frac{1}{2} m(2\pi f)^2 A^2$ , explain that this remains constant, being equal to the sum of the kinetic and potential energies, state and apply the equation for the kinetic energy of a system in SHM  $E_k = \frac{1}{2} m\omega^2 A^2 \sin^2(2\pi f t)$  and the solution  $x = A \cos(2\pi ft)$ , state and apply the equation for the potential energy of a system in SHM  $E_p = \frac{1}{2} m(2\pi f)^2 A^2$ , state that SHM is one-dimensional projection of uniform circular motion, describe the effects of damping on an oscillatory system and give practical examples of damped oscillations, describe the change in amplitude of a forced oscillation with frequency near to the natural frequency of the system graphically, describe examples where resonance is useful and where it is not useful.)

### 3. KINETIC THEORY OF GASES

Molecular nature of matter, behavior of gases, Gas laws, applications of Gas laws, the ideal Gas Law, kinetic theory of an ideal gas, consequences of kinetic theory of gases, pressure of an ideal gas, kinetic interpretation of temperature, average, rms, and most probable speeds, ideal gas equation in terms of Boltzmann's factors and use of Boltzmann factor to predict probability of an event..

**(Scope:** State Boyle's Law and Charles' Law and apply them in calculations, apply the ideal gas equation  $pV=NkT$  and  $pV=nRT$  in calculations where the amount of gas is given in moles, derive and use the equation  $pV=\frac{1}{3}Nmv^2$  from the kinetic theory model of matter, explain that the mean translational kinetic energy of an atom of an ideal gas is directly proportional to the temperature of the gas in Kelvin, apply the equation  $E \frac{3}{2} = kT$  to calculate the mean translational kinetic energy of atoms, state and use the Boltzmann factor equation  $f = \exp(-\frac{\epsilon}{KT})$ , give uses of Boltzmann factor to predict the probability of an event occurring.)

### 4. ELECTRIC CHARGES AND FIELDS

Electric charge, conductors and Insulators, basic properties of electric charges, Coulomb's Law, force between two charges in terms of their position vectors, forces due to multiple charges, electric field, physical significance of electric field, electric field lines, properties of electric field lines, similarities and differences between electric field and gravitational field, electric flux and Gaussian surface, electric field strength, due to a point charge, due to system of charges, electric field strength of a uniform electric field, electric charges and fields, and charged particle moving in uniform electric field.

**(Scope:** Explain electric charge and its properties, derive and apply  $F = \frac{kq_1q_2}{r^2}$ , explain that an electric field is a field of force and the electric field strength as force per unit charge  $E = \frac{F}{Q}$ , draw field lines to represent an electric field, state and apply Coulomb's law for point charges in a vacuum  $F = \frac{kq_1q_2}{r^2}$ , where  $k = \frac{1}{4\pi\epsilon_0}$ , state and use  $E = \frac{KQ}{r^2}$  for the electric field strength of a point charge in a radial field, state and use  $E = \frac{V}{d}$  for the electric field strength between two charged parallel plates, explain that a charged particle follows a parabolic path in a uniform electric field, outline the similarities and differences between electric field and gravitational field, explain electric flux and Gaussian surface.)

### 5. CAPACITORS

Capacitors and capacitance, effect of dielectric on capacitance, combination of capacitors, capacitors in parallel, capacitors in series, energy stored in a capacitor, RC circuits, discharging of a capacitor, time constant and charging of a capacitor.

**(Scope:** Define capacitors and the farad, state and use  $C = \frac{Q}{V}$ , apply the equation of capacitance of capacitors in series,  $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \frac{1}{C_4} + \dots$ , and in parallel,  $C = C_1 + C_2 + C_3 + \dots$ , state and use the equation  $E = \frac{1}{2} QV$  for the energy stored by a capacitor, derive the expression of stored potential difference against charge stored from the area under a graph, and apply related expressions e.g.  $E = \frac{1}{2} = CV^2$ , describe the discharging of a capacitor through a resistor and sketch graphs showing the variation of the potential difference, charge stored and current during the discharge with time, state the practical importance of time constant for discharge of a capacitor through a resistor, explain  $\tau = RC$  for the time constant of a capacitor-resistor circuit, calculate the discharge of a capacitor using the equation  $Q = Q_0 e^{-t/RC}$ .)

### 1. ELECTROMAGNETIC INDUCTION

Magnetic flux. magnetic circuits, permeability, magnetic field strength, Magnetomotive force (mmf), reluctance and permeance, flux in magnetic circuits, the experiments of Faraday and Henry (First, second and third experiments), Faraday's Laws of EM induction, Lenz's law, Lenz's law and energy conservation, inductance, inductance of a solenoid, mutual Induction, mutual Inductance of two closely wound solenoids, self-induction, transformers, transformation ratio, ideal transformer, losses in transformers, AC generators, Principle, construction and working, induction motor, three phase system large scale power generation and distribution.

**(Scope:** Define magnetic flux ( $\phi$ ) and weber, state and use the equation for magnetic flux  $\phi = BA$ , where B is perpendicular to A, define magnetic flux linkage ( $\phi = N\phi$ ), recognise and use the expression  $\epsilon = \frac{\Delta(N\phi)}{\Delta t}$ , where N is coefficient of self-induction or mutual induction, and explain it using Faraday's Law and Lenz's Law, describe the function of a simple transformer, use the transformer equation  $\frac{V_s}{V_p} = \frac{N_s}{N_p}$  and describe the function of step-up and step-down transformers, calculate the flux in a magnetic circuit using  $\phi = \frac{NI}{\Lambda}$ , where  $\Lambda$  is the permeance, describe working of an ac generator (alternator) and draw graphs for current, flux and induced emf, describe working of an induction motor and the use of a three-phase system for large scale power generation and distribution.)

## 2. ELECTRIC CIRCUITS

Classifications of conductors, insulators and semiconductors on the basis of conductivity, classification on the basis of energy bands, temperature dependence of resistivity, thermistors, superconductors, semiconductors, intrinsic semiconductors, extrinsic semiconductors, temperature dependence of conductivity and resistivity of semiconductors, DC circuits, Kirchhoff's rules, potential divider, linearity, sensitivity and resolution of a sensor in a circuit, systematic and random errors, response time, AC circuits, Root mean square (RMS) value of AC, AC voltage applied to a resistor, AC voltage applied to an inductor, AC voltage applied to a capacitor, AC voltage applied to a series LCR circuit, phasor diagram solution, analytical solution and resonance.

**(Scope:** Classify material into conductors, insulators and semiconductors on the basis of conductivity, classification on the basis of energy bands, describe the qualitative effects of temperature on the resistivity of metal conductors and thermistors and state its applications e.g. temperature sensors, describe the differences between n-type and p-type semiconductors and describe the temperature dependence of their conductivity and resistivity, explain that a superconductor is a material that loses all resistance below a certain temperature and identify the potential applications of room-temperature superconductors, explain Kirchhoff's first law and Kirchhoff's second law and recognise that this is a consequence of the conservation of charge and energy in a dc circuit, explain the use of a potential divider as a source of variable p.d. describe some applications of potential dividers e.g. in audio volume controls, in light dependent resistors and thermistors to control lighting and heating systems, evaluate the sensitivity and resolution of a sensor in a circuit, describe the importance of response time, random error (noise), systematic error and linearity of a sensor in a circuit, calculate the sinusoidal variation of voltage in an a.c. circuit and the r.m.s. voltage in an ac circuit using  $V_{rms} = \frac{V_{peak}}{\sqrt{2}}$  for a sinusoidal voltage, calculate current and voltage in a.c. series circuits using phasors where I and V are in phase for a resistor, but out of phase for a capacitor and inductor.)

## 3. RAY OPTICS

Laws of reflection, reflection of light by spherical mirrors, sign convention, the mirror equation, locating Images by drawing rays, refraction at spherical surfaces, refraction by lenses, diverging lens, converging lens, the lens equation and power of a lens.

**(Scope:** Explain the laws of reflection and the reflection by spherical mirrors, state and apply the lens equation  $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$  using the Cartesian sign convention, state and use the equation for linear magnification  $m = \frac{v}{u}$  and power of lens, draw optical diagrams showing reflection from plane surface and concave surface, refraction, total internal reflection and light passing through a lens and combined lenses to form an image.)

## 4. WAVES OPTICS

Wave front, Huygens' principle, refraction and reflection of a plane waves using Huygens' Principle, reflection of plane wave by a plane surface, superposition of waves, coherent and incoherent addition of waves, interference and Young's experiment, conditions for constructive and destructive interference, locating the fringes, intensity in double slit interference, Interference by sound waves, interference by Microwaves, single source interference, single source interference by sound waves, diffraction, diffraction of sound waves, diffraction of water waves, diffraction by single slit: locating minima, diffraction between interference and diffraction based on intensity pattern and use of diffraction in the spectral analysis of the light from stars.



**(Scope:** Explain reflection and refraction using Huygen's Principle, explain diffraction and apply Huygen's Principle of secondary wavelets to model the phenomenon, describe diffraction of water waves, microwaves and light waves at a single slit of different sizes, determine the wavelength of light by diffraction, differentiate interference and diffraction based on intensity pattern, derive and use the equation  $d \sin \theta = n \lambda$ . describe the use of diffraction from a single slit in the spectral analysis of light from stars, apply the principle of the superposition of waves, explain the terms interference, coherence, path difference and phase difference, describe experiments that demonstrate single-source interference and dual-source interference using sound, light and microwaves, describe constructive interference and destructive interference in terms of path difference and phase difference, explain the differences between constructive interference and destructive interference, describe the appearance of two slit interference patterns for water waves, microwaves and light, state and use the Young's slits equation  $\lambda = \frac{ax}{D}$  for double slit interference using light.)

## 5. QUANTUM PHYSICS

Particle nature of light, the quantum of light, photons have momentum, photon model of EM radiation, electron emission, photoelectric effect, Hertz's observation, Hallwach's and Lenard's observations, experimental study of the photoelectric effect, photoelectric effect and wave theory of light, Einstein's photoelectric equation: Energy quantum of radiation, various forms of Einstein's equation of photoelectric effect, analysis of Einstein's equation of photoelectric effect, conservation of energy, wave nature of matter, EM radiation as a photon, de Broglie equation, de Broglie wavelength of an electron, Davisson and Germer Experiment, experimental arrangement used by Davisson and Germer, Electron diffraction to determine structure of crystalline substances, the quantum atom, continuous. Emission and absorption spectra, hydrogen spectra

**(Scope:** Describe the photon model of electromagnetic radiation, explain that a photon is a quantum of energy of electromagnetic radiation, calculate the energy in electron volts (eV) of a photon using the equations  $E = hf$  and  $E = \frac{hc}{\lambda}$ , explain the photoelectric effect, explain that the photoelectric effect provides evidence that electromagnetic radiation has a particulate nature while interference and diffraction provide evidence that electromagnetic radiation has a wave-like nature, explain the significance of the terms work function and threshold frequency, state that energy is conserved when a photon interacts with an electron, explain the use of Einstein's photoelectric equation  $hf = \phi + \frac{1}{2} m v_{max}^2$ , explain that electron diffraction provides evidence for the wave nature of particles such as electrons, explain and apply the de Broglie equation  $\lambda = \frac{h}{mv}$ , explain the use of electron diffraction to determine the structures of crystalline substances e.g. polycrystalline graphite and the size of nuclei, explain absorption and emission line spectra for elements e.g. hydrogen that provide evidence for the existence of discrete energy levels and transitions between these energy levels, use the equation  $hf = E_1 - E_2$  in numerical problems.)

## 6. PARTICLE PHYSICS

The standard model, particles and antiparticles, annihilation, classification of particles, Quarks, Leptons, Nanotechnology, Carbon Nanotubes, Nano electronics, Nano sensors, Nano textiles, Nanotechnology and life science and Future implication of nanotechnology.

**(Scope:** Explain that for every particle there is a corresponding antiparticle, explain that the positron, antiproton, antineutron and antineutrino are antiparticles of the electron, proton, neutron and neutrino respectively, describe the annihilation processes that occur when any matter and antimatter come together, explain the existence of quarks, describe a simple quark model of hadrons in terms of up, down and strange quarks and their respective antiquarks, taking into account their charge, baryon number and strangeness, explain the quark model in relation to properties of charm, topness and bottomness, describe the properties of protons and neutrons in terms of a simple quark model, describe the two types of  $\alpha$ -decay ( $\alpha^-$  and  $\alpha^+$ ) using a simple quark model, explain that a  $\beta^-$  particle is an electron and a  $\beta^+$  particle is a positron, state that  $\beta^-$  decay produces an antineutrino and  $\beta^+$  decay produces a neutrino, state that electrons and neutrinos are members of a group of particles called leptons, explain that nanotechnology is considered a key technology for the future, outline the applications of nanotechnology in the fields of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, microfabrication, etc., discuss the future implications of nanotechnology.)

## 7. NUCLEAR ENERGY

Nuclear energy, Nuclear stability, Nuclear fission: The basic process, thermal neutron, a close look at fission, chain reaction, thermal neutrons Vs. thermal protons or  $\alpha$ -particles, nuclear reactor, enriched uranium, peaceful and destructive applications of nuclear fission, nuclear fusion: The basic process, thermonuclear fusion in the sun and other stars, controlled thermonuclear fusion and advantages of nuclear fusion over nuclear fission.

*(Scope: State and use Einstein's mass-energy equation  $\Delta E = \Delta mc^2$ , define the terms binding energy and binding energy per nucleon, calculate the binding energy of nuclei using the equation  $\Delta E = \Delta mc^2$  and the masses of nuclei, explain using binding energies, coulomb repulsion and the concepts of neutron excess that some nuclei are stable and some are unstable and liable to decay, explain the term thermal neutrons, describe occurrence of induced nuclear fission, explain occurrence of a nuclear chain reaction, explain working of a nuclear fission reactor and its use as an energy source, describe the peaceful and destructive applications of nuclear fission including its role in scientific research and the environmental effects of nuclear waste, describe the process of nuclear fusion, describe the process of nuclear fusion in the core of the Earth's Sun and other stars, explain the advantages of nuclear fusion as a potential energy source over nuclear fission, calculate the energy released in simple nuclear reactions.)*

## 8. THE SUN, THE EARTH AND THE CLIMATE

Astrophysical plasma, sunspot cycle, solar dynamo, solar Activity, solar irradiance and insolation, influence of solar flares and coronal mass ejections on the Earth and effect of solar eruption.

*(Scope: Describe the sunspot cycle and the solar dynamo, the concepts of solar irradiance and insolation, evaluate the influence of solar flares and Coronal Mass Ejections on the Earth, explain the concept of astrophysical plasmas, explain the effects of solar eruptions on the Earth's space environment and technologies.)*

## F. PRACTICAL WORKS:

Educational paradigm for most of the twentieth century was governed by the philosophy of indoctrinating the young into the logic of the present. This worldview had to evolve when mass exodus of technology, a product of science, infused every strata of society. Science technology and society and scientific literacy therefore gained prominence becoming a popular slogan for science education reform movement. School science, therefore, was carefully realigned to reflect the intellectual and cultural traditions that characterise the practice of contemporary science. It is of utmost importance that students develop an understanding of what science is, what science is not, what science can and cannot do, and how science contributes to culture (NRC, 1996). The goals of school science that underlie the Science Curriculum Framework (DCRD, 2013) and the National Education Framework (REC, 2012) are to educate students who are able to:

1. understand scientific concepts and acquire skills appropriate to their level of learning and for their lives as citizens, or as future science professionals.
2. develop their skills of inquiry in order to carry out investigations and experiments.
3. transfer the skills of inquiry to be active and critical citizens.
4. develop the ability to use information critically from a wide range of sources to answer scientific questions, address misconceptions and issues in society and in life.
5. apply knowledge and understanding of science to solve key problems of science and for the conservation of environment, including adopting the principles of refuse, reduce, recycle and reuse.
6. develop their abilities for meeting the scientific and technological needs and aspirations of the country and day-to-day life.
7. develop a sense of ethics and responsibility by understanding that the knowledge of science has not only contributed positively to the human development, but also has harmful effect both on environment and human life.
8. share the skills learnt in science in order to develop effective scientific communication skills in learners and in the society.

9. acquire qualities of commitment, self-confidence, curiosity, creativity, integrity and adaptability.
10. develop a sense of honesty and the importance of their contribution to their family, community and country, and understand the value of working together as a team.

In essence, Science Education encompasses “Scientific Content” and “Scientific Process”. The content ascribes the quantum of scientific knowledge critical in understanding about living and non-living things around, while the scientific process elicits the variety of skills that facilitate learners to understand “the nature of the scientific knowledge” and “how science works”. The later part is critical in facilitating learners develop the ability of constructing their understanding about the world around them culminating to making individuals lifelong learners and endowed with scientific temper and competencies. On this premise, practical work in all discipline of science classes is pivotal in science teaching and learning processes in Bhutan.

The practical work is considered as the means and ends and embeds numerous types of scientific activities, which can be categorised into two main groups as described by Woodley (2009), as follows:

1. **Core activities:** These include ‘hands-on’ activities such as different investigations, laboratory techniques and procedures, as well as fieldwork. These types of activities can help enhance the development of students’ practical laboratory skills, as well as helping them to understand the key scientific concepts and phenomena.
2. **Directly related activities:** These are closely connected to the above core activities, and include content based practical demonstrations performed by the teacher, planning and designing scientific investigations, and analysis of data by students.

The following are the practical works carried out in classes XI and XII.

## CLASS XI

1. Measurement of length of an object with vernier callipers.
2. Measurement of diameter of object with screw gauge.
3. Measurement of current, potential difference with ammeter, voltmeter respectively.
4. Conversion of galvanometer to ammeter and voltmeter.
5. Finding the average speed of an individual as one walks/runs to and fro between two points.
6. Verification of the parallelogram law of vector addition using Gravesand’s method and calculate the unknown weight.
7. Determination of refractive index of prism using spectrometer.
8. Determination of focal length of spherical mirrors.
9. Determination of  $g$ (gravitation pull) using simple pendulum.
10. Verification of Ohm’s law using meter bridge.
11. Verify law of combination (series and parallel) of resistance using ammeter-voltmeter method and coils of known resistances.
12. Experiment analogy to radioactive decay. (Find the time required to empty a burette, filled with water, to  $\frac{1}{2}$  of its volume to  $\frac{1}{4}$  of its volume, to  $\frac{1}{8}$  of its volume and so on. Plot a graph between volume of water in the burette and time. And thus study at each stage that the fractional rate of flow  $\Delta v/\Delta t$  is the same).
13. Determination of the Speed of a Pulse Propagated through a Stretched String (transverse wave).
14. Verify the Third Law of Motion Using Two Spring Balances.
15. ICT base practical (simulation: PhET/genius maker/molecular workbench).

## CLASS XII

1. Determination of effective length of second's pendulum (SHM) and time period.
2. Determination of frequency of a tuning fork using sonometer.
3. Determination of focal length of convex lens.
  - a. Using displacement method
  - b. u-v method
  - c. co-axially
    - i) two convex lenses
    - ii) convex and concave lenses.
4. Determination of power and magnification of a lens.
5. Determination of refractive index of a liquid using concave mirror.
6. Determination of refractive index of a liquid and glass with travelling microscope.
7. Determination of resistance per unit length of a given wire.
8. Determination of internal resistance of a cell.
9. Determination of resistance of wire using meter bridge
10. Determination of e.m.f. of a cell using potentiometer
11. Determination of resistance of the galvanometer.
12. Verification of Boyle's law.
13. Comparison of magnetic moments of two bar magnets by deflection magnetometer.
14. Null method.
15. Deflection method. (only for tan A position setting)

### G. ASSESSMENT

Educational assessment is the process of documenting, usually in measurable terms, outcomes of knowledge, skills, attitudes and beliefs of the learners. This includes the processes of gathering and interpreting information about the progress of their learning.

The learners should be well informed about what will be assessed and how it will be assessed. This makes the teacher's expectations clear to the learners to set appropriate learning outcomes.

The teachers can play an important role in the learners' achievement by effectively monitoring their learning and giving them constructive feedback on how they can improve, and provide the necessary scaffolding for the needy learners as identified through the reliable assessment techniques and tools. Assessment is generally used to:

- **inform and guide teaching and learning**

A good classroom assessment plan gathers evidence of student learning that informs teachers' instructional decisions. It provides teachers with information about what students know and can do. To plan effective instruction, teachers also need to know what the student misunderstands and where the misconceptions lie. In addition to helping teachers formulate the next teaching steps, a good classroom assessment plan provides a road map for students. Students should, at all times, have access to the assessment so they can use it to inform and guide their learning.

- **help students set learning goals**

Students need frequent opportunities to reflect on where their learning is at and what needs to be done to achieve their learning goals. When students are actively involved in assessing their own next learning steps and creating goals to accomplish them, they make major advances in directing their learning, and what they understand about themselves as learners.

- **assign report card grades**

Grades provide parents, employers, other schools, governments, post-secondary institutions and others with summary information about student learning.

- **motivate students**

Research (Davies 2004; Stiggins et al. 2004) has shown that students will be motivated and confident learners when they experience progress and achievement, rather than the failure and defeat associated with being compared to peers that are more successful.

The achievements and performances of the learners in science are assessed on the following three domains:

- Work scientifically
- Scientific knowledge
- Scientific values and attitudes

## 1. THE ASSESSMENT PROCESS

Effective classroom assessment in Science:

- addresses specific outcomes in the program of studies
- shares intended outcomes and assessment criteria with students prior to the assessment activity
- assesses before, during and after instruction
- employs a variety of assessment strategies to provide evidence of student learning
- provides frequent and descriptive feedback to students
- ensures students can describe their progress and achievement and articulate what comes next in their learning
- informs teachers and provides insight that can be used to modify instruction.

## 2. SCHEME OF ASSESSMENT

These are assessed through the following schemes of assessment:

### *i) Continuous Formative Assessment (CFA)*

Formative assessment is used to provide feedback to teachers and learners, so that teaching and learning can be improved through the provision of regular feedback and remedial learning opportunities for the learners when needed. It also enables the teachers to understand what teaching methods and materials work best.

CFA facilitates the teachers to diagnose the learning needs of the learners and recognize the individual differences in learning. Through the constructive feedback provided, the learners are able to understand their strengths and weaknesses. It also empowers them to be self-reflective learners who monitor and evaluate their own progress. CFA should happen daily throughout the teaching-learning processes of the academic year. It is NOT graded, as it is to give continuous feedbacks to the learners.

The suggested techniques for CFA for the three domains are:

- **Work scientifically:** Class work, observations, immediate interaction with the students, etc.
- **Scientific knowledge:** Question and answer, homework, class work, etc.
- **Scientific values and attitudes:** Observations of students' conduct guided by scientific and social values.

The tools identified for CFA are checklists and anecdotal records.

### ii) Continuous Summative Assessment (CSA)

Continuous Summative Assessment is another form of continuous assessment. It helps in determining the learner's performance and the effectiveness of instructions. The feedback from this assessment help to improve the learners learning and mandates the teachers to incorporate varied teaching strategies and resources to ensure quality teaching and learning in the science classes. It empowers learners to be self-reflective learners who monitor and evaluate their own progress.

In CSA, the learner's performances and achievement are graded. This ensures active participations of learners in the teaching-learning processes.

The suggested techniques for CSA for the three domains are:

- **Work scientifically:** Project work, science journal and scrapbook, and practical works.
- **Scientific knowledge:** Home work, and class tests.
- **Scientific values and attitudes:** Observation of the learners' conduct in the classroom guided by scientific and social values.

The main tools for CSA are rubrics and paper pencil tests.

### iii) Summative (SA)

Summative assessment (SA) is conducted at the end of the first term and at the end of the year to determine the level of learning outcomes achieved by the learners. The information gathered is used by the teachers to grade learners for promotion and to report to parents and other stakeholders.

The identified techniques for SA are term examinations - first term and annual examinations. The questions for the term examinations should cover all the three domains of science learning objectives using the principles of Bloom's taxonomy.

## 3. ASSESSMENT MATRIX FOR CLASSES XI AND XII

Assessment Matrix								
Types of assessment	CFA			CSA			SA	
Definition	It is a continuous process of assessing student's problems and learning needs and to identify the remedial measures to improve student's learning. It also enables teachers to understand what teaching methods and materials work best.			It is a continuous process of grading student's performances and achievements. Teachers provide feedbacks for improvement. It also enables teachers to understand what teaching methods and materials work best.			Assesses student's cumulative performances and achievements at the end of each term.	
Domains	Scientific knowledge (SK)	Working scientifically (WS)	Scientific values and attitudes (SV)	Scientific knowledge (SK)	Working scientifically (WS)	Scientific values and attitudes (SV)	SK, WS & SV	SK, WS & SV
Techniques	Quiz & debate, class presentation, homework, class work, immediate interaction with students.	Immediate interaction with students, class work, home work, experiments, exhibition, case studies	Observation of student's conduct, in group work, field trip, excursion, etc.	Class Test	Practical work	Project Work.	Term exam	Term exam



Assessment Tools	Q&A, checklist and anecdotal records.	Checklist and anecdotal records	Checklist and anecdotal records	Paper pencil test	Rubrics (Practical work)	Rubrics (Project work)	Paper pencil test	Paper pencil test
Frequency interval (when & how)	Checklists and anecdotal records must be maintained for each topic throughout the academic year.			Monthly	Twice in each term	Project Work – One PW for CI 11 & 12 but the work is assessed in parts in each year.	Once in a term	Once in a year.
Format in Progress Report				SK	WS	SV	Mid- Term	Annual Exam
				T1= 2.5 T2= 2.5	T1=15 T2= 15	T1= 2.5 T2= 2.5	T1=20	T2=40
NB:	Same mode of assessment will be followed in Mid Term and Trial examinations for Class 12. The mark for the Project Work of Class 12 is the sum total of CI 11 and 12, which is out of 10 (5+5). The CI 12 Practical Examination (20) is assessed externally.							

### CHAPTER-WISE WEIGHTING AND TIME ALLOCATION (CLASS IX)

Chapter	Chapter title	Maximum time required (mins)	Weighting (%)
Chapter 1	Motion in a Straight Line	500	8%
Chapter 2	Motion in a Plane	625	10%
Chapter 3	Laws of Motion	750	12%
Chapter 4	Mechanical Properties of Solids	500	8%
Chapter 5	Work, Energy and Power	375	6%
Chapter 6	Thermal Physics	375	6%
Chapter 7	Gravitation	375	6%
Chapter 8	Moving Charges and Magnetism	375	6%
Chapter 9	Electric Circuits	375	6%
Chapter 10	Reflection and Refraction	375	6%
Chapter 11	Waves	500	8%
Chapter 12	Electromagnetic Waves	375	6%
Chapter 13	Atoms	250	4%
Chapter 14	Nuclei	250	4%
Chapter 15	Sun, Earth and Climate	250	4%
	Total	6250	100%

*The total time required to complete the topics is 6250 minutes or 125 periods of 50 minutes in a period.*

## CHAPTER-WISE WEIGHTING AND TIME ALLOCATION (CLASS XII)

Chapter	Chapter title	Maximum time required (mins)	Weighting (%)
Chapter 1	Force and motion in fluids	438	7%
Chapter 2	Oscillations	938	15%
Chapter 3	Kinetic theory of gases.	313	5%
Chapter 4	Electrostatic Field	313	5%
Chapter 5	Capacitors	375	6%
Chapter 6	Electromagnetic Induction	500	8%
Chapter 7	Electric Circuits	875	14%
Chapter 8	Ray Optics	625	10%
Chapter 9	Wave Optics	438	7%
Chapter 10	Quantum Physics	375	6%
Chapter 11	Particle physics	438	7%
Chapter 12	Nuclear Energy	375	6%
Chapter 13	The Sun, the Earth and the climate	250	4%
	Total	6250	100%

*The total time required to complete the topics is 6250 minutes or 125 periods of 50 minutes in a period.*

### Textbooks & References

1. Fundamentals of Physics Class 11, Halliday, Resnick, Walker, Wiley India Pvt. Ltd, New Delhi, India
2. Fundamentals of Physics Class 12, Halliday, Resnick, Walker, Wiley India Pvt. Ltd, New Delhi, India





# Chemistry

## **RATIONALE**

People need to be made scientifically aware and benefit from the fast changes taking place in the world of science. Increasingly knowledge of chemistry plays a great role in the field of pharmaceutical industries and polymers to improve the quality of life. Knowledge of Chemistry provided in class 11 & 12 should update the students on the scientific advancement and provide sound foundation for those who opt for higher studies and equip with basic scientific literacy for those who drop studies. Through the analysis of implication of development in the field of chemistry on the living and their environment, students become aware of advantages and hazards posed by chemical effluents and toxic wastes. Students at this level through the learning of chemistry should develop skills required both for higher studies and to solve the day-to-day life related problems through investigation and application.

## **AIMS**

Teachers should guide the students to develop their:

1. knowledge and understanding of terms, concepts, facts and principles relating to the subject.
2. ability to apply the knowledge of content in day-to-day life.
3. interest in students in activities involving usage of the knowledge of Chemistry.
4. ability to handle scientific equipments, chemicals and reagents safely.
5. understanding about the scientific advancements and their impacts on the human life.
6. ability to correlate the subject with other branches of science.
7. ability to analyse the implication of advancement in the field of Chemistry to human lives and environment.

## **LEARNING EXPERIENCES**

Students should have the opportunity to:

- i. learn through enquiry.
- ii. learn through investigatory approach.
- iii. work in cooperation with others and even independently.
- iv. gain experience through practical works, taking care of safety measures.
- v. learning the subject through problem solving, involving in literary activities and science exhibition.
- vi. examine critically and think positively.
- vii. inculcate the habit to do independent research through print, electronic media and experiments.
- viii. learn through assigned projects.

## **LEARNING OUTCOMES**

These experiences will enable students to:

- i. understand the chemical concepts, facts and principles.
- ii. apply the knowledge of contents in day to day life.
- iii. have analytical approach.
- iv. acquire social and scientific values such as commitment, honesty, tolerance, self-confidence, punctuality, curiosity and adaptability.
- v. take care of environment through safe disposal of chemical wastes.
- vi. take safety precautions in handling the apparatus/chemicals.
- vii. cope up with the demand of the Nation relating to the subject.
- viii. process data, evaluate findings and interpret information and generalise.
- ix. communicate scientific ideas with scientific and mathematical conventions such as symbols, analogies, models etc.

# CLASS XI CHEMISTRY

## PAPER I (THEORY)

### SECTION A

#### 1. ATOMS AND MOLECULES

- i. **The concept of atoms having fixed properties in explaining the laws of chemical combination.**

[Scope: The study about atoms, Dalton's atomic theory: main postulates of the theory, its limitations; modern atomic theory. Laws of chemical combination, which includes the law of conservation of mass (Experimental verification of the law by Landolt's experiment), its present position according to Einstein's theory of relativity ( $E=mc^2$ ). Law of definite proportions or constant composition. Law of Multiple proportions. Law of reciprocal proportions. Gay Lussac's Law of gaseous volumes. Simple numerical problems on different laws of chemical combinations.]

- ii. **Atomic and isotopic masses and their determinations by mass spectrometry.**

[Scope: The atomic mass unit is one of the experimentally determined S. I unit. It is equal to 1/12 of the mass of the carbon-12 isotope. Determination of atomic mass and isotopic masses by Mass Spectrometry. Principle of the method and determination of atomic mass of the isotopes may be discussed. Aston's Mass spectrograph. Structure, principle of the method of separation of isotopes. Simple numerical problems based on the above methods.]

- iii. **Chemical equivalents with reference to Faraday's second law of electrolysis and volumetric calculation in terms of molarity, molality and normality. Questions will not be set on experimental determination of equivalent and atomic weights by a classical method. C = 12.00 should be taken as a standard for expressing atomic masses.**

[Scope: Equivalent weight expresses the combining capacity of the elements with the standard elements such as H, Cl, O and Ag. Variable equivalent weights. Gram equivalent weights. Relationship between molecular weight, equivalent weight and valency. Faraday's laws of electrolysis i.e. First law of electrolysis, equivalent weight by using the law. Determination of eq. wt. of acid, alkali, salts, oxidising agents and the reducing agents. Terms used in volumetric calculations such as normality, molarity, molality, etc. should be discussed. Simple calculations.]

- iv. **Relative molecular mass and mole, relationship between the mole and Avogadro number.**

[Scope: Determination of molecular masses by molar volume method. Numerical problems based on the above method by Victor Meyer's method. Numerical problems. (Determination of relative molecular mass of volatile substances may also be included in this chapter). Mole concept, Avogadro's number, relationship between mole and Avogadro number. Simple numerical problems on mole concept. Gram molecular volume.]

#### 2. ATOMIC STRUCTURE

- i. **Electrons, Protons and Neutrons as fundamental particles, their charges and masses.**

[Scope: The concept of indivisibility of atom as proposed by Dalton does not exist. The atom consists of subatomic fundamental particles. Production of cathode rays and its properties. Production of anode rays and its properties; Chadwick's experiment for the discovery of neutron, properties of neutron.]

- ii. **Rutherford's nuclear model based on the scattering experiment.**

[Scope: Rutherford's nuclear model of atom. Rutherford's scattering experiment (discovery of nucleus), Defects of Rutherford model.]

- iii. **Bohr's atomic model. No mathematical details are required.**  
 [Scope: Bohr's atomic model: Postulates of Bohr's atomic model (model based on Planck's quantum theory), defects of Bohr's model, calculation of angular momentum of the moving electron, radius of orbit of hydrogen atom and energy of electrons of any orbit. Explanation of hydrogen spectrum by Bohr's model.]
- iv. **Atomic structure: wave mechanical model – a simple non-mathematical treatment; quantum numbers; shape, size and orientation of s and p orbitals only; Hund's rule; Pauli's exclusion principle and Aufbau principle; electronic configuration of elements in terms of s, p, d, and f subshells.**  
 [Scope: Wave mechanical model. Experimental verification of wave nature of electron. de Broglie's equation. Heisenberg's uncertainty principle, simple numerical problems. Quantum numbers, types of quantum numbers and information given by them. Pauli's exclusion principle, shape, size and the orientation of s and p subshell. Hund's rule of maximum multiplicity. Aufbau principle, (n+ l) rule. Electronic configuration of elements in terms of s, p, d and f subshell ( $nl^x$ ) notation.]

### 3. THE PERIODIC TABLE

Please refer to the Periodic Table given at the end of the Chemistry syllabus.

- i. **Atomic number (Proton number) as the basis for classification of the elements in the Periodic table. Questions will not be set on the historical development of the Periodic table.**  
 [Scope: Mendeleef's Periodic law. Defects of Mendeleef's Periodic Table. Modern Periodic law (atomic number taken as the basis of classification of the elements). Extended or Long form of periodic table. General characteristics of groups and the periods. Division of the Periodic Table into s, p, d and f blocks elements.]
- ii. **Extra nuclear structure as the basis of periodicity. Some idea of the following: ionisation potential, electron affinity, atomic radius, atomic volume, electronegativity etc. must be given; the periodicity of electronic structure leading to the periodicity of elements, e.g. the relative ease of ionisation of the elements.**  
 [Scope: Periodic properties such as valence electrons, atomic volume, atomic and ionic radii and their variations in groups and periods. The idea of the ionisation potential, electron affinity and electronegativity must be given, the factors which affect these periodic properties and the variation in groups and periods.]
- iii. **Periodicity of elements with reference to s, p, d and f block elements.**  
 [Scope: Classification of elements on the basis of s, p, d and f blocks elements, and also on the basis of their complete and incomplete electron shells.]

### 4. CHEMICAL BONDING

*Electrovalent Bond*

- i. **Electrovalent or ionic bond, e.g. formation of NaCl, Li<sub>2</sub>O, MgO, CaO, MgF<sub>2</sub> and Na<sub>2</sub>S.**  
 [Scope: Cause of chemical combinations, types of chemical bonding, electrovalent or ionic bond. Properties of ionic compounds, electron dot structure of the following ionic compounds NaCl, Li<sub>2</sub>O, MgO, CaO, MgF<sub>2</sub> and Na<sub>2</sub>S.]
- ii. **Factors influencing the formation of ionic bond, e.g. electron affinity, lattice energy and electro negativity.**  
 [Scope: The conditions necessary for the formation of ionic bonds such as low ionisation energy, high electron affinity, high lattice energy and electro negativity value should be discussed.]
- iii. **The relation between the ionic bonding and Periodic Table**  
 [Scope: the relationship between the formation of cations and anions of an atom and their position in the periodic table should be discussed. The elements of IA and IIA groups form cations whereas VIA and VIIA group forms anions easily.]

iv. **Variable electrovalency and its causes.**

[Scope: Variable electrovalency, the reasons for variable electrovalency such as (a) unstable core or kernel and (b) due to inert electron pair effect by using suitable examples.]

*Covalent Bond*

i. **Covalent bond (polar and non polar covalent bond), e.g. formation of NH<sub>3</sub>, N<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, CO<sub>2</sub>.**

[Scope: Definition of covalent bonding, condition for formation of covalent bonds, the type of covalent bonds i.e. single, double and triple covalent bonds. Classification of covalent bond based on electronegativity of atoms i.e. Polar and non-polar covalent bond. Formation of NH<sub>3</sub>, N<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, CO<sub>2</sub> and their electron dot structure. Characteristics of covalent compounds. Comparison of electrovalency and covalency.]

ii. **Variable covalency, e.g. chlorine exhibits the valency of 1, 3, 5 and 7 respectively.**

[Scope: Variable covalency, cause of variable covalency e.g. chlorine exhibits the valency 1, 3, 5 & 7 respectively; variable covalency of P and S may also be discussed.]

iii. **Deviations from the Octet rule and Fajans' rule.**

[Scope: Octet rule, failure of octet rule, either incomplete octet or expansion of octet with suitable examples. Explanation of the failure of the octet rule should be discussed, (one example for incomplete and one for expansion). Fajan's rule - statements, conditions for electrovalency and covalency, correlation of polar and non-polar bonds with Fajans' rule.]

## 5. GASEOUS STATE

i. **Gas law, Ideal gas equation PV=nRT, non-ideal behaviour of gases and Vander Waal's equation**

[Scope: Characteristics of gases: comparison of solid, liquid and gas. Properties of gases on the basis of kinetic theory of gases. Laws of gases: Charles' law, Boyle's law, Temperature- Pressure law, Avogadro's law. Ideal gas equation  $PV = nRT$  or  $PV = (W/M) RT$  and its application in calculation of molecular weight of gases and in calculation of value of R (gas constant). Simple numerical problems based on the above laws. Non-ideal behaviour of gases i.e. deviation from gas laws at low and at high temperature and pressure should be discussed. Van der Waals' equation  $(P+a/V^2)(V-b) = RT$  for one mole of a gas.]

ii. **Graham's law of diffusion and Dalton's law of partial pressure, simple Numerical problems based on the above laws.**

[Scope: Dalton's law of partial pressure and its application. Graham's law of diffusion and its application. Simple numerical problems based on the above laws.]

## 6. CHEMICAL KINETICS: QUALITATIVE TREATMENT OF THE DEPENDENCE OF REACTION RATES ON: CONCENTRATION OF REACTANTS; SIZE OF THE PARTICLES; TEMPERATURE; PRESENCE OF A CATALYST.

[Scope: Scope and importance of kinetics of the reaction. Variation in reaction rates (rate of reaction, factors affecting the rate of the reaction such as concentration, temperature, nature of reactants, presence of catalyst, surface area and radiation). Refer to practical for some experiments.]

## 7. CHEMICAL EQUILIBRIA

i. **Reversible reactions and dynamic equilibrium. The concept of equilibrium constant in terms of concentration or partial pressure to indicate the composition of the equilibrium mixture. The following are the examples: the dissociation of dinitrogen tetra oxide; hydrolysis of simple esters; the contact process for manufacture of sulphuric acid; the synthesis of ammonia.**

[Scope: Irreversible and reversible reactions, chemical equilibrium, characteristics of chemical equilibrium, its dynamic nature. The law of mass action equilibrium constant in terms of concentration ( $K_c$ ) for gaseous reaction, equilibrium constant in terms of partial pressure ( $K_p$ ), relationship between  $K_p$  and  $K_c$ , characteristics of equilibrium constant, units of equilibrium constant. Simple calculations of equilibrium constant and concentration. The following examples to show the maximum yield of the product, the dissociation of dinitrogen tetraoxide, manufacture of sulphuric acid and ammonia.]

ii. **Le Chatelier's principle and its application to chemical equilibria.**

[Scope: Le Chatelier's principle (1884)- statement and explanation, factors affecting chemical and physical equilibria such as change of concentration, change of temperature, change of pressure, effect of catalyst and addition of inert gas should be discussed in the light of Le Chatelier's principle.]

## SECTION B

### 8. GENERAL SURVEY OF GROUPS OF ELEMENTS

General survey of the following groups of elements in the periodic table. It should include the following: (a) Occurrence in nature; (b) Physical state; (c) Type of bonding; (d) Nature of oxides; hydroxides, chlorides, hydrides, carbonates, nitrates and sulphates wherever applicable.

i. **p-block elements : 3<sup>rd</sup> group – Al; 4<sup>th</sup> group – C, Si, Sn, Pb; 5<sup>th</sup> group – N, P; 6<sup>th</sup> group – O, S; 7<sup>th</sup> group – F, Cl, Br, I.**

[Scope: Group IIIA. The elements B, Al, Ga, In, and Tl: their general characteristics, both physical and chemical properties should be discussed.

Group IVA. The elements C, Si, Ge, In and Pb: their electronic configuration, general trend in the physical and chemical properties. Catenation. Allotropes of carbon (Diamond and graphite)

Group VA. The elements N, P, As, Sb and Bi: General trends in the physical and chemical properties.

Group VIA. The elements O, S, Se, Te, Po: Occurrence, general trends in physical and chemical properties, allotropes of sulphur.

Group VIIA. The elements F, Cl, Br, I and At; occurrence. General trend in physical and chemical properties, anomalous behaviour of fluorine.]

ii. **d-block elements-transition elements, e.g. Cu, Ag, Zn, Fe.**

[Scope: d- block elements, electronic configuration of all the d- block elements. General characteristics of transition elements (3d, 4d, 5d & 6d series), catalytic properties, alloy formation of complex compounds etc. should be discussed.]

iii. **f block elements – introduction to lanthanides and actinides, general electronic configuration .**

[Scope: Self-explanatory]

### 9. ISOLATION, MANUFACTURE, PROPERTIES AND USES OF MAGNESIUM AS METAL AND SULPHUR AND CHLORINE AS NON-METALS

[Scope: Occurrence of magnesium and its ores. Extraction of magnesium by electrolytic reduction of anhydrous magnesium chloride, electrolysis of magnesium oxide, properties of magnesium such as reaction with acids, with non-metals, alkyl halides should be discussed. Uses of magnesium. Sulphur, occurrence of sulphur, extraction of sulphur by Frasch Process or Louisiana process, properties of sulphur, allotropes of sulphur, effect of heat on sulphur, action with non-metals, metals, reducing action, action with alkalis should be discussed.

Chlorine, occurrence of chlorine, preparation by the oxidation of HCl. Laboratory method from bleaching powder should be taken in account; manufacture of chlorine by electrolytic process (electrolysis of brine solution) and Deacon's process should be discussed. Properties of chlorine and their uses.]



## 10. PREPARATION, MANUFACTURE, PROPERTIES AND USES OF THE FOLLOWING COMPOUNDS ONLY:

- i. NaOH, Na<sub>2</sub>CO<sub>3</sub>, FeSO<sub>4</sub> · 7H<sub>2</sub>O, MgCl<sub>2</sub> · 6H<sub>2</sub>O
- ii. Mohr's salt, FeCl<sub>2</sub>, FeCl<sub>3</sub>, ZnSO<sub>4</sub> · 7H<sub>2</sub>O

[Scope: Only brief qualitative treatment is required, main emphasis must be given to the preparation, chemical properties and the uses of the above compounds.]

## SECTION C

### 11. INTRODUCTION TO ORGANIC CHEMISTRY

- i. The unique nature of carbon atom and catenatio

[Scope: Introduction to organic chemistry, vital force theory, reason for separate study of organic chemistry and its importance, characteristics of carbon atom (tetravalency). Reasons for large number of organic compounds. (a) Catenation (b) Isomerism (c) Multiple bonding]

- ii. Classification of organic compounds, nomenclature and homologous series

[Scope: classification of organic compounds into the following: Open chain, closed chain, homocyclic, heterocyclic, aromatic and alicyclic compounds. Functional groups, homologous series and its characteristics. Nomenclature of organic compounds using IUPAC Rules should be discussed in detail.]

- iii. Detection of carbon, hydrogen, nitrogen, halogens (Cl, Br, I) and sulphur

[Scope: Analysis of organic compounds. Detection of elements (qualitative analysis) such as carbon and hydrogen, nitrogen, halogens and sulphur should be considered by using Lassaigne's test. Estimation of elements (quantitative analysis) such as carbon, hydrogen, nitrogen, sulphur and halogens should be considered.]

### 12. HYDROCARBONS

- i. Alkanes: general methods of preparation and properties of alkanes with reference to methane. Petroleum as an industrial source of hydrocarbons.

[Scope: Alkanes are saturated hydrocarbons, general formula of alkanes, homologous series, naming of alkanes, isomerism of alkanes, occurrence, general method of preparation from sodium salt, alcohols, halides and aldehydes; physical and chemical properties of alkanes with reference to methane and ethane should be discussed. (Physical properties should include state of existence, freezing points, melting point and density). Chemical properties should include combustibility, reaction with chlorine, reaction with oxygen in presence of catalyst- formation of alcohol, aldehyde and acid, and slow oxidation), uses of alkanes. Petroleum, its origin, theories regarding origin of petroleum, composition, petroleum mining, refining of petroleum, cracking and reforming, octane number, cetane number, antiknocking compounds should be discussed.]

- ii. Alkenes: general methods of preparation and properties of alkenes with reference to ethene.

[Scope: Alkenes are unsaturated hydrocarbon containing double bonds, general formula of alkene, nomenclature of alkene, general methods of preparation, physical and chemical properties with reference to ethene (C<sub>2</sub>H<sub>4</sub>), Markownikoff's rule, by using suitable example, anti Markownikoff's rule, uses of alkenes should be discussed].

- iii. Alkynes: methods of preparation (including manufacture), properties and uses of ethyne. The application of Markownikoff's rule is expected.

[Scope: Alkynes, unsaturated hydrocarbons containing triple bond, general formula of alkyne, general method of preparation of alkynes, manufacture of acetylene by calcium carbide and from natural gas, physical and chemical properties of alkynes with reference to acetylene or ethyne (C<sub>2</sub>H<sub>2</sub>), its uses.]



### 13. HALIDES

- i. **The nomenclature of aliphatic compounds containing halogen atom.**  
[Scope: Naming of halogen derivatives of alkanes by using common system and IUPAC system for monohalo derivatives and dihalo derivatives up to butane should be discussed.]
- ii. **Preparation, properties and uses of haloalkanes.**  
[Scope: Preparation from alkane and halogen, alkene and hydrohalide, alcohol and phosphorus pentachloride. General properties-combustibility, substitution reactions, reaction with sodium nitrite, silver nitrite, disodium hydroxide, alcoholic sodium hydroxide and polymerisation reactions should be dealt. Uses of halogen derivatives of alkanes in day-to-day life and in industry may be considered.]
- iii. **Correlation of physical properties.**  
[Scope: Comparative study of physical properties of halogen derivatives (chloro derivatives and bromo derivatives, monochloro and dichloro derivatives) of alkanes should be considered.]
- iv. **Preparation properties and uses of the following:  
Ethylbromide, chloroform and iodoform.**  
[Scope: Preparation, properties and uses of ethyl bromide, chloroform and, iodoform. Haloform reaction for the preparation of chloroform and iodoform from alcohol may be discussed.]

### 14. ALCOHOLS

- i. **Classification, general formulae structure and nomenclature of alcohols.**  
[Scope: Classification, general formulae, structure and nomenclature of alcohols. Difference between primary, secondary and tertiary alcohols in terms of structure, physical properties and chemical properties.]
- ii. **General methods of preparation, manufacture, properties and uses of methanol and ethanol (outline – no details).**  
[Scope: General methods of preparation of methanol and ethanol must be discussed; manufacture of methanol from water gas and wood (pyrolygenous acid) and manufacture of ethanol by the fermentation of carbohydrates should be taken into account (only outline of the method, no details required).]
- iii. **Manufacture, properties and uses of ethane – 1,2 diol, propane- 1,2,3 triol (outline- no details).**  
[Scope: Manufacture of ethane – 1, 2 diol from ethylene; manufacture of Propane 1, 2, 3 triol from – oils and fats and propene; Physical and chemical properties of both, and their uses. Test for glycerol may also be taken.]

### 15. PREPARATION OF GRIGNARD'S REAGENT. ITS USE IN THE PREPARATION OF ALKANES, ALCOHOLS, ALDEHYDES, KETONES, AMINES AND FATTY ACIDS.

[Scope: Grignard's reagent, its preparation, its use in the preparation of organic compounds such as alkanes, alcohols, aldehydes, ketones, amines and fatty acids should be considered.]

### 16. ANALYSIS, FORMULAE AND STRUCTURE OF ORGANIC COMPOUNDS

**Calculations of empirical formula from analytical data. Molecular formula and structure deduced from physical properties and reactions of functional group.**

[Scope: Molecular formula, its relationship with empirical formula. Problems of structural formula as determined by chemical behaviour and reactions of the functional group may be discussed]

## PAPER II

### PRACTICAL WORK

1. Measurement of the rate of reaction based on the size of the particle, concentration of reactions, temperature and presence of catalyst, e.g. the study of the rate of dissolving of magnesium or zinc in dilute sulphuric or hydrochloric acid.
2. Qualitative analysis- Identification of the following:
  - a) Cations :  $\text{NH}_4^+$ ,  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$
  - b) Anions :  $\text{CO}_3^{2-}$ ,  $\text{HCO}_3^-$ ,  $\text{NO}_2^-$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$

*Formal analytical procedure is required.*
3. Titration: Acid-base titration involving molarity and normality:  
Hydrochloric acid / Sodium carbonate solution; Hydrochloric acid / Sodium hydroxide solution; Oxalic acid / Sodium hydroxide solution.

### PROJECT WORK

Candidate is to creatively execute one project / assignment on any aspect of Chemistry. Teachers may assign or students may choose any project of their choice. Teacher should guide students in execution of their project. The minimum length of project should be about 1000 – 1500 words. The projects must be carried out by the candidates and the original work should be compiled and the outcome must be submitted in neatly hand written or typed form on time.

Suggested topics for the Project Work:

- Atomic model
- Electrolysis and its application
- Qualitative analysis of water of the local catchments
- Periodic Table (Past and Present)
- Construction of electrochemical cells
- Catalysis and its importance
- Chemical bonds and its application
- Soil analysis
- Cement Industry with reference to Bhutan
- Carbide Industry with reference to Bhutan
- Ferro-silicon Industry with reference to Bhutan
- Beverages Industry in Bhutan.
- Chromatography and its applications
- Halogen derivatives and their uses in day to-day life as well as in industry.
- Any other relevant topics within the scope of the syllabus.

## TIME ALLOCATION AND WEIGHTING

Topics	Weighting	Time in hours
<b>Section A</b>		
1. Atoms and Molecules	10 %	6 hr 40 min
2. Atomic structure	10 %	11 hr 40 min
3. The Periodic table	10 %	10 hr
4. Chemical bonding	10 %	10 hr
5. Gaseous State	5 %	5 hr 50 min
6. Chemical kinetics	8 %	6 hr 40 min
7. Chemical equilibria	5 %	10 hr
<b>Section B</b>		
8. General survey of groups of elements	10 %	8 hr 20 min
9. Isolation, manufacture, properties and uses of magnesium as metal and chlorine and sulphur as non-metal	4 %	5 hr 50 min
10. Preparation, manufacture, properties and uses of compounds	6 %	8 hr 20 min
<b>Section C</b>		
11. Introduction to organic chemistry	6 %	10 hr 50 min
12. Hydrocarbons	5 %	5 hr 50 min
13. Halides	3 %	2 hr 30 min
14. Alcohols	3 %	2 hr 30 min
15. Preparation of Grignard Reagent and its uses	2 %	2 hr 30 min
16. Analysis, Formulae and structure of organic compounds	3 %	5 hr
	<b>100%</b>	<b>112 hr 30 min</b>
<b>Practical</b>		<b>17 hr 30 min</b>
<b>TOTAL</b>		<b>130 Hours</b>

## MODE OF ASSESSMENT

The candidate will be assessed internally by the school as per the following procedures.

Terms	Types of Assessment & Weighting			
	CA	Examinations		Total
		Paper I: Theory	Paper II: Practical	
<b>First</b>	10%	30%	-	40%
<b>Second</b>	10%	40%	10%	60%
<b>Total</b>	20%	70%	10%	<b>100%</b>

### 1. Continuous Assessment (CA)

The candidate will be assessed across the two terms through Continuous Assessment (CA) by the following modes.

- 1.1 **Assignment:** For CA during the FIRST term, each candidate will choose any topic from the class XI syllabus and write a short assignment of about 750 – 1000 words. This is to extend the learning through literature research. The award of marks may be based on the following marking scheme:

<i>Presentation</i>	Table of content, bibliography, introduction, main body and conclusion (1.5%)
<i>Content</i>	Relevant information, analysis and depth (2.5%)
<i>Language</i>	Clarity of ideas, use of terms and grammar (1%)

**1.2 Presentation:** The candidate will also present the assignment to the class in the FIRST term. The presentation may be of 10 minutes duration followed by three to four questions from the class and teacher. The award of marks may be based on the following marking scheme:

<i>Content</i>	Coverage of main ideas and depth (2.5%)
<i>Language</i>	Not memorised but in student's own words (1%)
<i>Discussion</i>	Ability to respond tactfully and correctly (1.5%)

**1.3 Project work:** During the SECOND term, the Project Work which the candidate has been doing through out the two terms will be assessed for CA. The award of marks may be based on the following marking scheme:

<i>Presentation</i>	Table of content, bibliography, introduction, main body and conclusion (2%)
<i>Content</i>	Relevant information, analysis and depth (3%)
<i>Language</i>	Clarity of ideas, use of terms and grammar (2%)
<i>Process</i>	Draft copy, notes taken during literature research or information gathering, consultation of subject teacher, experimentation (3%)

## 2. Examination

There will be written examinations at the end of the both terms. A practical examination is mandatory at the end of the year. Assessment is based on the weighting given above.

<b>Paper I: Theory:</b>	3 hours	=	100 marks (with a weighting of 40%)
<b>Paper II: Practical:</b>	3 hours	=	20 marks (with a weighting of 10%)

### Paper I (Theory)

There will be one paper of 3 hours duration divided into 2 parts.

**Part I (40 marks)** will consist of compulsory 20 short answer questions, testing knowledge, application and skills relating to elementary/fundamental aspects of the entire syllabus.

**Part II (60 marks)** will be divided into three sections A, B and C. There shall be **six** questions in Section A (each carrying 7 marks) and candidates are required to answer **four** questions from this Section. There shall be **four** questions in Section B (each carrying 6 marks) and candidates are required to answer **three** questions from this Section. There shall be **three** questions in Section C (each carrying 7 marks) and candidates are required to answer **two** questions from this Section. Therefore, candidates are expected to answer nine questions in Part II.

## CLASS XII CHEMISTRY

### PAPER I (THEORY)

#### SECTION A

##### 1. SOLUTIONS

Types of solutions, vapour pressure of solution and Raoult's law. Ideal solution, Non-ideal solution, Colligative properties. Determination of molecular mass based on colligative properties – vapour pressure, elevation in boiling point, depression in freezing point and osmotic pressure. Abnormal molecular masses and Van't Hoff factor.

**[Scope:** *The following methods may be considered for the determination of relative molecular masses:*

*Molality, Molarity, mole fraction as the measure of concentration, Raoult's law and colligative properties.*

*Relative molecular masses of non-volatile substances:*

- i) By relative lowering of vapour pressure method*
- ii) Depression of freezing point (cryoscopic) method-Beckman's method.*
- iii) Elevation of boiling (Ebullioscopic) method- Cottrell's method*
- iv) Osmotic pressure and its application in the determination of relative molecular mass, Van't Hoff factor, Van't Hoff equation and its interpretation (simple numerical problems on different methods mentioned above for the determination of molecular masses and abnormal molecular masses are included).*

*Definition of the above terms with examples. Simple problems relating mass, molar mass and mole.*

*Colligative Properties: Determination of relative molecular mass by measurement of lowering of vapour pressure, boiling point elevation, freezing point depression and osmotic pressure.*

*Ostwald-Walker method. Cottrell's method. Beckmann's method, Berkeley-Hartley method) and problems. Abnormal molecular mass, Van't Hoff factor– Van't Hoff equation. Simple numerical involving molecular association and dissociation. Calculation of theoretical molecular masses of non-volatile solutes based on Van't Hoff factor.]*

##### 2. NUCLEAR CHEMISTRY

Radioactivity and the nature of radiation, Modes of Decay, Group Displacement law. Rate of radioactive disintegration, half-life period, average life, numerical based on them. Nuclear Stability, Artificial transmutation (using  $H^1_1$ ,  $n^1_0$ ,  $He^4_2$ ), Nuclear fusion, Nuclear fission, Nuclear reactor, Application of Radioisotopes.

- i. Uses of  $C^{14}$ ,  $P^{35}$ ,  $I^{127}$ ,  $Co^{60}$ ,**
- ii. Determination of age of rocks & minerals**
- iii. Radiocarbon dating**

**[Scope:** *Radioactive disintegration – Definition and reason.  $\alpha$ ,  $\beta$  and  $\gamma$  radiations- their characteristics.*

*Modes of decay of radioactive elements and group displacement law. Nuclear equations. Mathematical form of decay law.*

*Half-life Period: Definition – Graphical representation and derivation – Average life. Problems involving  $t_{1/2}$  decay constant and average life.*

*Relationship between N/P and nuclear stability of light and heavy nuclei, Graphical representation of nuclear stability (stability belt), Artificial radioactivity. Transmutation produced by  $^1_0n$ ,  $^1_1H$ ,  $^4_2He$ ,*

*Fission and fusion Reaction: Definitions, examples, differences.*

*Radio isotopes and their application  $^{14}C_6$ ,  $^{32}P_{15}$ ,  $^{127}I_{53}$ ,  $^{60}Co_{27}$  (Production not included)]*

##### 3. CHEMICAL BONDING

- i. Coordinate bond or dative covalent bond, e.g. Formation of oxyacids of chlorine.**

**[Scope:** *Co-Ordinate (dative-covalent) bonding: definition – formation of  $H-O-Cl-O$ ,  $H-O-Cl-O_2$ ,  $H-O-Cl-O_3$  – structural formation of above molecules based on co-ordinate bonding.]*

- ii. **Hydrogen bonding – its essential requirement, examples of HF, water (ice), alcohol.**  
[Scope: H- bonding : Definition , types , conditions for H- bond formation, examples of inter-molecular hydrogen bonding in detail taking HF, H<sub>2</sub>O (liquid/ ice) and ethanol.]
- iii. **Metallic bonding, Van der Waals' forces, dipole effect and dipole moment**  
[Scope: Metallic Bonding: Definition, examples. Van der Waal's forces. Dipole Moment: Definition examples, dipole effect, polar and non- polar molecules taking H<sub>2</sub>O, NH<sub>3</sub>, CO<sub>2</sub> and CCl<sub>4</sub> as examples.]
- iv. **Hybridization and shapes of molecules (hybridization involving s and p orbitals only), sigma and pi bonds, shapes of simple molecules, eg. Methane, ammonia, water based on the concepts of repulsion between electron pairs, pyramidal and planar molecules, examples of trigonal bipyramidal. Molecular orbital theory: explain simple molecules like hydrogen, oxygen and nitrogen, bond order, predict if certain molecules can exist, para-magnetism of oxygen.**  
[Scope: Hybridization and molecular shapes- definition of hybridisation of orbitals involving s- and p orbitals, sigma and pi bonds: M.O Theory - bonding and anti bonding MoT. Bonding in H<sub>2</sub>, He, O<sub>2</sub>, and N<sub>2</sub> - Bond order and the molecular stability considering the above mentioned molecules. Concept of electron pair repulsion and the shapes of molecules taking CH<sub>4</sub>, NH<sub>3</sub> and H<sub>2</sub>O as examples.]

**4. THE SOLID STATE: LATTICE STRUCTURE AND SPACING (QUALITATIVE IDEA OF THE GEOMETRY IS EXPECTED), CRYSTALLINE AND AMORPHOUS SUBSTANCES, CHARACTERISTICS OF CRYSTALLINE SOLIDS ESPECIALLY IN REGARD TO ELECTRICAL PROPERTIES, MAGNETIC PROPERTIES AND DIELECTRIC PROPERTIES, UNIT CELL AND LATTICE POINTS. STRUCTURE OF NaCl AS IONIC CRYSTAL, COPPER AS METALLIC CRYSTAL, DIAMOND AND GRAPHITE AS ATOMIC CRYSTAL. ELECTRONIC AND ATOMIC IMPERFECTIONS IN SOLID INCLUDING POINT DEFECTS.**

[Scope: Structure and properties (as per the syllabus)]

**5. SURFACE CHEMISTRY: ADSORPTION, COLLOIDAL SOLUTION, EMULSIONS. CATALYSIS INCLUDING THEORIES OF MECHANISM OF CATALYSIS.**

[Scope: Adsorption- definition, mechanism, factors influencing adsorption, types of adsorption. Colloidal solution- Preparation of both hydrophilic (starch and gelatin) and hydrophobic (S and As<sub>2</sub>S<sub>3</sub>), Precipitation as evidence that colloidal particles are charged, Purification of colloids (dialysis, ultra filtration), Properties of colloidal solution such as Brownian movement, Tyndall effect, coagulation, protection. Idea of gold number and Hardy-Schulze rule, Application of colloids in life. Emulsion: Preparation and its application. Catalysis - Differences between homogenous and heterogeneous catalysis with relevant examples. Elementary treatment of intermediate compound formation and adsorption theory of catalysis.]

**6. CHEMICAL KINETICS**

- i. **Collision Theory**
- ii. **The Law of mass action**
- iii. **Effect of concentration of reactants on –**
  - (a) rate of the reaction
  - (b) the rate constant
- iv. **Molecularity and order of reaction**
  - a) Meaning of the order of reaction
  - b) Meaning of molecularity
- v. **Mechanism of Reactions**  
SN and SN<sup>2</sup>, E<sub>1</sub> and E<sub>2</sub> mechanisms are to be taught at this point.



vi. **Variation of rate constant with temperature; Arrhenius equation**

**$K = Ae^{-E_A/RT}$  and related graphs.**

[Scope: Condition for a chemical change – close contact – particles should collide. Collision to be fruitful – optimum energy and right orientation while colliding. Energy barrier build up when collision is about to take place. Activated complex formation. Difference in the energy of reactants and product- Exergonic and endergonic reaction with proper graphs and labelling. Statements – meaning of the active mass, explanation with examples- general reactions. Statement of the rate law. General rate equation.

Rate =  $k(\text{concentration of reactant})^n$ . Relationship between the rate of the reaction with respect to the various reactant i.e.

$$aA + bB + cC + dD \rightarrow \dots$$
$$-1/a \{ d[A] / dt \} = -1/b \{ d[B] / dt \} = 1/c \{ d[C] / dt \}$$
$$= 1/d \{ d[D] / dt \} .$$

Factors affecting the rate of a reaction. The law of mass action. Definition of rate constant- mathematical derivation of the rate equation for the first order reaction Characteristics of first order reaction. Differences between the order and molecularity of a reaction, half life period of a first order reaction (their relations). Simple numerical used on the above mentioned concepts. Effect of Temperature and concentration of the rate constant of a reaction. Arrhenius equation ( $K = Ae^{-E_A/RT}$ ); meaning of the terms – Related graph. Evaluation of  $A$  and  $E_A$  from the graph (experimental details not included)]

7. **PHASE EQUILIBRIA: PHASE RULE & PHASE DIAGRAM; SOLUBILITY OF GASSES IN LIQUIDS; QUALITATIVE EXPLANATION OF HENRY'S LAW IN TERMS OF LE-CHATILIER'S PRINCIPLE AND THE KINETIC THEORY. DISTRIBUTION OF A SOLUTE BETWEEN TWO SOLVENTS, DISTRIBUTION LAW, ETHER EXTRACTION AND ITS USE IN ORGANIC CHEMISTRY (EXPLANATION THROUGH NUMERICAL EXAMPLES). SOLUTION OF LIQUID IN LIQUID (MISCIBLE & IMMISCIBLE LIQUIDS), METHODS OF SEPARATION: USE OF FRACTIONAL DISTILLATION, USE OF FRACTIONAL CRYSTALLIZATION, STEAM DISTILLATION. CHROMATOGRAPHY (PRINCIPLE), USE OF COLUMN CHROMATOGRAPHY, THIN LAYER CHROMATOGRAPHY, PAPER CHROMATOGRAPHY, GAS CHROMATOGRAPHY AS AN ANALYTICAL TOOL**

[Scope: Solubility of gases in liquids as a physical dispersion- Henry's law of gas solubility – statement, mathematical representation, explanation in terms of Le Chatelier's principle and kinetic theory of gases (effect of pressure and temperature on gas solubility).

Distribution (Partition) Law: Statement, examples (limited to solutes remaining in the same molecular state in both solvents).

Ether extraction of aniline. Simple problems involving single and two steps extraction using the same quantity of solvent. Liquid – Liquid System: Miscible and immiscible systems with examples. Fractional distillation (graphs not included).

Liquid- Solid System: Examples, solubility of solids in liquids, definition on solubility. Solubility curves showing the effect of temperature on solubility (examples for increase and decrease of solubility with temperature). Experimental determination of solubility of NaCl in water. Crystallisation principle and a brief mention of their applications.

Chromatography – A brief account of the principles of column, Thin Layer, Paper and gas chromatography with emphasis on their applications.]

8. **IONIC EQUILIBRIA:**

- i. **Ostwald's dilution law and its derivation; strengths of acids and bases based on their dissociation constants; Bronsted and Lewis concepts of acids and bases.**
- ii. **Ionic product of water, pH of solutions and pH indicators, problems.**
- iii. **Common ion effect.**
- iv. **Salt hydrolysis.**
- v. **Buffer solutions.**
- vi. **Solubility product and its application, simple numerical problems based on ionic equilibria.**

[**Scope:** *Ostwald's Dilution law: Statement and derivation. Strengths of acids and bases based on their dissociation constants.*

*Bronsted- Lowry concepts of acids and bases with examples. Lewis concept of acids and bases with examples.*

*Ionic Product of water: Definition of pH, pOH and  $pK_w$  of solutions- Problems on the above concepts.*

*pH indicators and their choice in titrimetry.*

*Common Ion Effect: Definition. Examples (sodium acetate and ammonium chloride), applications*

*Salt hydrolysis: salts of strong acids and weak bases, weak acids and strong bases and the pH of the solutions of these salts in water with suitable examples (in detail).*

*Buffer solutions: definition, examples, buffer action and its interpretation based on Le- Chatelier's principle.*

*Solubility Product: Definition, application in qualitative salt analysis (group II, III and IV cations).*

*Simple problems based on ionic equilibria.]*

**9. ELECTROCHEMISTRY: ELECTROLYTIC CONDUCTANCE, EQUIVALENT & MOLAR CONDUCTIVITIES FARADAY'S LAWS OF ELECTROLYSIS, (DEFINITIONS, UNITS, NUMERICAL, GRAPHS), RELATIONSHIP BETWEEN FARADAY, AVOGADRO'S CONSTANT AND CHARGE ON ELECTRON. GALVANIC CELL, ELECTRODE POTENTIAL AND EMF OF A GALVANIC CELL, FACTORS AFFECTING ELECTRODE POTENTIAL, NERNST EQUATION, ELECTROCHEMICAL SERIES AND ITS EXPLANATION BASED ON STANDARD ELECTRODE POTENTIAL**

[**Scope:** *Faraday's Law of Electrolysis. Relationship between Faraday, Avogadro's constant and electron charge ( $F=N_A e$  should be given).*

*Galvanic cells and electrode potential: Cell notation, Mechanism of production of electric current in a galvanic cell. Factors affecting electrode potential with examples.*

*Nernst equation with suitable examples.*

*Emf of a cell: definition, example.*

*Standard hydrogen electrode: Definition, preparation, application and limitations Measurement of standard electrode potential of  $Zn^{2+}/Zn$  half cell (using standard  $H_2$  electrode).*

*Prediction of spontaneity of a reaction based on the cell emf. Electrochemical series, its explanation on the basis of standard cells.*

*Electrolytic Conductance: Definitions and units of specific, equivalent and molar conductivities- graphs and simple numerical.]*

## SECTION B

### 10. CHEMICAL THERMODYNAMICS

i. **Introduction**

ii. **First law of thermodynamics and its mathematical statement.**

iii. **Second law of thermodynamics- Entropy, Free energy, spontaneity of chemical change.**

**$\Delta G = -2.303 RT \log K$ ; reversible & irreversible changes, isobaric, isochoric.**

[**Scope:** *Scope and characteristics of thermodynamics, types of system – ideal, real, isolated, closed and open.*

*Meaning of surrounding and system, properties of system – macroscopic, intensive and extensive. State of system. Main processes of system – reversible, irreversible and adiabatic, isothermal, isobaric, isochoric and cyclic. Meaning of thermodynamic equilibrium and thermodynamic process. Idea of conservation of energy – total energy of the system and the surrounding. Internal energy of the system and change in internal energy of the system, meaning of work done by the system and by the surrounding at constant temperature, heat absorbed by the system and by the surrounding at constant temperature. Sign convention for change in internal energy, heat given out or gained, work done by the system or by the surrounding. State function and path function – meaning with examples. Internal energy change, work done and heat absorbed in a cyclic process. Internal energy changes in an isolated and non- isolated system. Total energy change of a system and surrounding. First law of Thermodynamics: Statement and mathematical expression, significance of first law of thermodynamics. Chemical change and internal energy. Need for enthalpy – constant pressure or open vessel processes. Enthalpy a thermodynamic property – state function. Mathematical form of enthalpy at constant pressure and Simple*



problems based on the above concept. Idea about heat, work and energy. Mathematical form of reversible and irreversible work. Difference between and irreversible work done- graphically. Adiabatic reversible expansion. Relationship between  $C_v$  and internal energy change. Application of first law of thermodynamics: Joule-Thompson Effect- definition, condition, characteristics, setting and process, isoenthalpic, exceptions and reasons, Joule- Thompson coefficient. Inadequacy of first law and the need for the second law.

Second law of Thermodynamics: Entropy, Free energy, definition and interrelations. Idea about reversible, spontaneous and non- spontaneous, cyclic process, heat engine, working substance, sink, source, insulator, working of heat engine, work done in isothermal reversible expansion, adiabatic reversible expansion (assumed) and isothermal compression and adiabatic reversible compression(assumed). Statement of second law in terms of entropy. Physical significance of entropy, relationship between adiabatic change and entropy. Entropy change of the universe and a reversible isothermal process, entropy change of the universe and irreversible process. Meaning of thermal death, energy content and work content (free energy) of the system. Helmholtz's free energy and Gibb's free energy and the change in Gibb's and Helmholtz free energy. Simple calculations. Relationship between change in Gibb's free energy and equilibrium constant of a chemical reaction.

Change in Gibb's free energy in reversible, irreversible, isobaric and isochoric process. Spontaneity of a reaction, criteria for spontaneity of a reaction in terms of entropy and enthalpy based on change in Gibb's free energy. Limitations of reversible chemical reactions.

## 11. CO-ORDINATION COMPOUNDS AND ORGANOMETALLICS.

**The Chemistry of co-ordination Compounds: formation, physico-chemical properties and nomenclature. Bonding and isomerism in co-ordination compounds, stability and application of co-ordination compounds and bonding; Organometallic compounds, classification, metal carbonyls – structure and bonding, Importance of organometallics, Wilkinson's catalyst.**

[Scope: Complex ions of metals, ligands, Types of ligands (Denticity- monodentate, bidentate and polydentate ligands), Werner's Theory of coordination compounds (main postulates), definition of some important terms pertaining to coordination compounds (coordination entity, central atom, coordination number, coordination polyhedron, Chelation and oxidation number), Rules for writing the formulae of coordination compounds (only in mononuclear), Isomerism in coordination compounds (geometric and optical, linkage isomerism, coordination isomerism, and ionisation isomerism), bonding in coordination compounds (Valence Bond theory, Crystal Field Theory, Ligand Field Theory and Molecular Orbital Theory), Magnetic Properties of coordination compounds. Colour in coordination compounds with relation to wavelength of light absorbed, stability of coordination compounds.

Organometallic compounds- Definition, classification including main group and d- and f-block organometallics; metal carbonyls – their structure and bonding, Wilkinson's catalyst and the Grignard Reagent should be taught as examples, applications of organometallics.]

## 12. A. EXTRACTION, PROPERTIES AND USES OF METALS:

i. **Cu/Pb/Sn (Reduction method/Pyrometallurgy.)**

ii. **Ag (cyanide process)**

[Scope: General idea of Metallurgy, extractive metallurgy, properties and uses of the following metals:

i. Cu from sulphide ore- pyrometallurgy

ii. Pb from Galena- pyrometallurgy

iii. Sn from tin stone-pyrometallurgy

i. Copper: Extraction from copper pyrites; ores – name and formulae. Physical properties – state, melting point, boiling point, conductivity, and density.

Chemical Properties:

a) with  $\text{HNO}_3$ ,  $\text{HCl}$  and  $\text{H}_2\text{SO}_4$

b) with conc.  $\text{HNO}_3$  and hot conc.  $\text{H}_2\text{SO}_4$

c) Reducing properties (with  $\text{FeCl}_3$ )

d) Displacement reactions with aqueous  $\text{AgNO}_3$  and aq.  $\text{HgCl}_2$

e) Complexation: with aq.  $\text{NH}_3$  and aq.  $\text{KCN}$  in presence of nascent oxygen

Uses of copper as metals and its alloys

- ii. *Lead: Extraction from galena – pyrometallurgy by self-reduction process and carbon reduction process.*  
*Ores name and formulae.*  
*Physical properties- state, melting point, boiling point, conductivity, density, specific heat.*  
*Chemical Properties:*  
 a) *with dil. HNO<sub>3</sub>, dil. CH<sub>3</sub>COOH*  
 b) *with conc. HNO<sub>3</sub> and hot conc. H<sub>2</sub>SO<sub>4</sub>*  
*Uses of Lead as metal and its alloys.*
- iii. *Tin: Extraction from tin stone – pyrometallurgy. Ores name and formulae.*  
*Physical Properties: state, melting point, boiling point density and specific heat.*  
*Chemical Properties:*  
 a) *with dil. HCl and dil. H<sub>2</sub>SO<sub>4</sub>*  
 b) *with cold and very dil. HNO<sub>3</sub> and conc. HNO<sub>3</sub>*  
 c) *with aq. NaOH*  
 d) *with O<sub>2</sub>, Cl<sub>2</sub>, and S on heating*  
*Uses of tin as metal and its alloys.*
- iv. *Silver: Extraction from native ore by Cyanide process (Hydrometallurgy)*  
*Ores name and formulae.*  
*Physical Properties: state, melting point, boiling point, conductivity, density and specific heat.*  
*Chemical Properties:*  
 a) *with aq. HNO<sub>3</sub> and conc HNO<sub>3</sub>*  
 b) *with hot . conc. H<sub>2</sub>SO<sub>4</sub>*  
 c) *with alkali cyanide*  
 d) *with S and halogens]*  
*Uses of silver as metal and its alloys.*

## **B. Isolation, Manufacture, Properties and uses of non metals:**

### **i. Si**

### **ii. P**

### **iii. Halogen (F/Br/I)**

**[Scope: Isolation, manufacture, properties and uses of Silicon, Phosphorus, fluorine, bromine and iodine.**

*Details of manufacture and chemical properties –*

#### *i. Silicon: by the reduction of SiO<sub>2</sub> using Mg.*

*Physical properties.*

*Chemical properties*

a) *Oxidation*

b) *with HF*

c) *with aq. Alkalies.*

d) *with halogens*

e) *with Mg*

f) *with C*

*Uses of silicon*

#### *ii. Phosphorus – manufacture from the rock phosphate. White and red phosphorus – structure and its reactivity, definition of allotropy, methods of preparations of the two allotropes and their interconversions.*

*Physical Properties.*

*Chemical Properties-*

a) *with O<sub>2</sub>, Cl<sub>2</sub> and S*

b) *with Na, Ca and Al*

c) *with H<sub>2</sub>O*

d) *with aq. Alkali*

*Uses of Phosphorus.*

#### *iii. Fluorine – Production of potassium hydrogen fluoride and HF by electrolytic method.*

*Physical Properties.*

*Chemical Properties-*

- a) with  $H_2$ ,  $H_2O$ ,  $H_2S$
- b) with  $Na$ ,  $Ca$ ,  $Pt$
- c) with halides (displacement)
- d) with hydrocarbons
- e) with  $KClO_3$  (oxidation)
- f) with dil. and conc. Alkalis.

*Uses of fluorine.*

- iv. *Bromine: Laboratory Preparation and Manufacture of bromine from sea water.*

*Physical Properties.*

*Chemical properties-*

- a) with  $H_2$ ,  $P$ ,  $Sb$  and  $S$
- b) with  $Na$ ,  $K$ ,  $Cu$  and  $Hg$
- c) with  $H_2O$
- d) Oxidising property of bromine water ( $Na_2SO_3$ ,  $H_2SO_3$  and  $H_2S$ )
- e) with cold and Hot alkalis.
- f) with  $NH_3$
- g) addition and substitution with hydrocarbon.
- h) Displacement of iodine from iodides

*Uses of bromine.*

- v. *Iodine: Manufacture of iodine from sea weeds.*

*Physical Properties.*

*Chemical Properties-*

- a) with  $H_2$ ,  $P$ ,  $Sb$ ,  $Hg$ ,  $K$  and  $Zn$
- b) Oxidising reactions –  $H_2S$ , aq.  $SO_2$ , aq.  $Na_2SO_3$
- c) with  $Na_2S_2O_3$  solution
- d) oxidation with conc.  $HNO_3$
- e) with alkalis
- f) with  $NH_3$
- g) addition and substitution with hydrocarbon.]

*Uses of Iodine.*

**C. Preparation, properties and uses of the following compounds:**

**$Na_2S_2O_3 \cdot 5H_2O$ ,  $AlCl_3$ , Alums,  $CuSO_4 \cdot 5H_2O$ ,  $AgNO_3$ ,  $H_2S$ ,  $H_2O_2$ ,  $O_3$ , Silicones, Silicon Carbide,  $HNO_2$ ,  $PCl_5$ ,  $H_3PO_4$ ,  $CaOCl_2$**

**[Scope: Preparation, physical and chemical properties, structure and uses of the above mentioned compounds.]**

- i.  $Na_2S_2O_3 \cdot 5H_2O$

*Preparation from  $Na_2SO_3$  and  $S$*

*Physical Properties.*

*Chemical properties:-*

- a) with dil.  $HCl$
  - b) with aq.  $AgNO_3$
  - c) complexation with  $AgBr$
- Uses of sodium thiosulphate.*

- ii.  $AlCl_3$

*Preparation by direct chlorination method*

*Physical properties.*

*Chemical properties:*

- a) with moisture
- b) with  $NH_3$
- c) dimerisation
- d) complexation with water

*Uses of Aluminium chloride.*

- iii. *Alums*  
 General formula, Preparation of potash alum from  $K_2SO_4$   
 Physical Properties.  
 Chemical properties:  
 a) action of heat (burnt alum)  
 b) action of water (nature of aq. solution)  
 Uses of Alums.
- iv.  $AgNO_3$   
 Preparation from Ag.  
 Physical Properties  
 Chemical properties:  
 a) action of heat  
 b) with NaOH  
 c) with  $NH_3$   
 d) oxidising properties on aldehydes (Tollens reagent test)  
 e) with aq. Solution of halides, thio-sulphates, chromate and sulphide (precipitation reactions – double decomposition)  
 Uses of silver nitrate.
- v.  $H_2S$   
 Lab preparation in details.  
 Physical Properties.  
 Chemical properties:  
 a) Burning in air  
 b) Thermal dissociation  
 c) with aq. alkali  
 d) Reducing properties with  $Cl_2$ ,  $Br_2$ ,  $SO_2$ ,  $Fe^{3+}$ ,  $H_2SO_4$ ,  $HNO_3$ , and acidified  $KMnO_4$   
 e) Precipitation reactions – group II, IV cations  
 Uses of hydrogen sulphide.
- vi.  $CuSO_4 \cdot 5H_2O$ :  
 Laboratory preparation and manufacture.  
 Physical Properties.  
 Chemical Properties:  
 a) Action of heat  
 b) With alkalis  
 c) With aq. KI  
 d) With  $NH_4OH$   
 e) With  $K_4[Fe(CN)_6]$   
 f) With  $H_2S$   
 Uses of copper sulphate.
- vii.  $H_2O_2$   
 Preparation from Barium Peroxide and by electrochemical method (principle).  
 Physical Properties.  
 Chemical properties:  
 a) Thermal decomposition  
 b) Acidic nature (reaction with aq. NaOH,  $Ba(OH)_2$ )  
 c) Oxidising action on PbS,  $SO_3^{2-}$ ,  $NO_2^-$ , acidified  $Fe^{2+}$   
 d) Reducing action on  $Ag_2O$ ,  $O_3$ ,  $Cl_2$ , acidified  $KMnO_4$   
 e) with  $C_2H_4$  (glycol formation)  
 Uses of hydrogen peroxide.
- viii.  $O_3$  – Laboratory preparation by electric discharge by using Siemen – Halske Ozonizer.  
 Physical properties.  
 Chemical properties:

- a) Thermal decomposition  
 b) Oxidising properties on  $PbS$ ,  $H_2S$ ,  $KI$ ,  $HCl$ , moist  $I_2$ ,  $SO_2$   
 c) with  $C_2H_2$  (ozonolysis)  
 d) Ozone layer in the atmosphere – importance of ozone layer- simple version of the chemical changes taking place in the atmosphere.  
 Uses of ozone.
- ix. Silicones: Preparation of linear and cross – linked silicones from organochlorosilicones. Properties and uses of linear and cross- linked silicones.
- x. Silicon carbide: Manufacture from  $SiO_2$  (in detail) using Acheson's process.  
 Properties and uses of silicon carbide.
- xi.  $HNO_2$ : Preparation from  $NaNO_2$ ;  
 Physical Properties.  
 Chemical properties:  
 a) Decomposition  
 b) Acidic reaction  
 c) With  $NH_4Cl$  ( $N_2$  formation)  
 d) With urea  
 e) With  $C_2H_5NH_2$   
 f) With acidified  $KI$   
 Probable structure of  $HNO_2$   
 Uses of  $HNO_2$
- xii.  $PCl_5$ : Manufacture from  $PCl_3$   
 Physical Properties.  
 Chemical properties:  
 a) Thermal decomposition  
 b) Hydrolysis  
 c) with  $C_2H_5OH$   
 d) with  $SO_2$  (thionyl chloride formation)  
 Uses of phosphorus pentachloride.
- xiii. Ortho- $H_3PO_4$ : Preparation from  $P_2O_5$ .  
 Structure of ortho phosphoric acid- electron dot diagram - relationship between basicity and structure.  
 Physical Properties.  
 Chemical properties:  
 a) as a tribasic acid with alkali  
 b) Action of heat (formation of pyro and meta phosphoric acids),  
 Structure of ortho- phosphoric acid.  
 Uses of ortho phosphoric acid.
- xiv. Bleaching powder: Manufacture from slaked lime in brief.  
 Physical properties.  
 Chemical properties:  
 a) Chloroform formation (with ethyl alcohol and acetone).  
 b) with  $COCl_2$ .  
 c) With  $Cl_2$   
 d) With  $CO_2$   
 e) Oxidising property (with acidified  $KI$ ,  $PbO$ ,  $H_2S$ ,  $NH_3$ )  
 f) Bleaching properties.  
 g) Uses of bleaching powder.

### 13. TYPES OF CHEMICAL REACTIONS AND THEIR MECHANISM

- i. Homolytic and heterolytic fission
- ii. Electrophiles and nucleophiles

- iii. Inductive, mesomeric and electromeric effects
- iv. Substitution, addition and elimination reaction
- v. Free radical and polar mechanism (in terms of fission of the bond and formation of new bonds) including  $S_N^1$  and  $S_N^2$  mechanism.

[Scope: Substitution, addition, elimination reactions – definition and examples; homolytic and heterolytic fission – definition and examples; Electrophiles and nucleophiles – definition and examples including neutral electrophiles and neutral nucleophiles); Inductive, mesomeric and electromeric effects - definition, examples and their effects in reactivities, free radicals and polar mechanism (in terms of fission of the bond and formation of new bonds) including  $S_N^1$  and  $S_N^2$  reactions.]

## SECTION C

### 14. ISOMERISM: STRUCTURAL, GEOMETRICAL AND OPTICAL ISOMERISM, OPTICAL ACTIVITY AND ITS MEASUREMENT. USES OF ISOMERISM.

[Scope: definition, classification of isomerism, structural isomerism- chain isomerism, positional isomerism, functional isomerism and metamerism. Stereo- Isomerism- a) Geometric isomerism (definition, conditions for compounds to exhibit geometric isomerism, examples). b) Optical isomerism – lactic acid and tartaric acid (definition, nicol prism, plane polarise light, polarimeter, method of measuring angle of rotation, specific rotation, condition for the optical activity, d & l form, 2- D representation, 3- D representation, external compensation – racemic mixture, meso form, internal compensation). Uses of isomerism in identifying the compound.

### 15. ETHERS, ALDEHYDES, KETONES, CARBOXYLIC ACID AND ACID DERIVATIVES: GENERAL FORMULA, STRUCTURE, NOMENCLATURE PREPARATION, PROPERTIES, USES WITH SPECIAL REFERENCE TO DIETHYL-ETHER, FORMALDEHYDE, ACETALDEHYDE, ACETONE, FORMIC ACID, ACETIC ACID, OXALIC ACID, ACETYL-CHLORIDE, ACETAMIDE, ETHYL-ACETATE, ACETIC-ANHYDRIDE, UREA (WOHLER'S SYNTHESIS).

[Scope: General formula, IUPAC nomenclature, trivial names, structural formula, physical properties and uses of all the listed compounds as mentioned above are included.

- i. Ethers – Diethyl ether  
 Lab preparation from ethanol (details not required).  
 Physical Properties.  
 Chemical properties:
  - a) with  $Cl_2$
  - b) Oxidation (peroxide formation)
  - c) with HI
  - d) with  $PCl_5$
 Test for ether. Uses of ether.
- ii. Aldehydes and Ketones: Formaldehydes, acetaldehydes and acetones - Lab methods of preparation for each in details.  
 Physical Properties.  
 Chemical reactions:
  - a) Addition reactions with hydrogen and sodium sulphite.
  - b) Substitution reactions with hydroxyl amine, hydrazine, phenyl hydrazine, phosphorus pentachloride.
  - c) Oxidation reactions- air, Tollen's reagent, Fehling's reagent, mercury chloride.
  - d) with  $NH_3$
  - e) Cannizzaro's reaction, Aldol-condensation reaction, Keto-enol tautomerism(definition, effect of keto-enol tautomerism).
  - f) Iodoform Reaction

Note: The above reactions should be dealt for formaldehyde, acetaldehyde and acetone (if no reactions, state that there is no such reactions).

*Test and differentiating tests for formaldehyde, acetaldehyde and acetone.*

*Uses of formaldehyde, acetaldehyde and acetone.*

iii. *Carboxylic acids:*

*Classification – mono and dicarboxylic acids with examples.*

*Lab preparation of formic acid from glycerol and oxalic acid in dry state. Lab preparation of acetic acid from acetaldehyde. Manufacture of acetic acid from  $C_2H_2$  (Synthesis), preparation of oxalic acid from- glycol, sodium formate and from sucrose (no details required).*

*Chemical properties of Formic and Acetic acids:*

a) *with active metals*

b) *with alkalies*

c) *Esterification*

d) *Reducing properties with Tollen's reagent and Schiff's reagent (only HCOOH)*

e) *Dehydration*

f) *with  $PCl_5$*

*Differences between HCOOH and  $CH_3COOH$*

*Test for formic and acetic acid.*

*Uses of formic and acetic acid.*

*Oxalic acid: Lab preparation (as per earlier mention).*

*Physical Properties.*

*Chemical properties:*

a) *with alkali*

b) *Esterification*

c) *Action of heat*

d) *with  $PCl_5$*

e) *Oxidation by  $KMnO_4$*

*Test for oxalic acid.*

*Uses of oxalic acid.*

iv. *Acid derivative:*

*Acetyl chloride, Acetic anhydride, Ethyl acetate, Acetamide, Urea - Lab preparation, physical properties, uses, structural formula and nomenclature of the above mentioned compounds.*

(I) *Acetyl chloride*

*Physical Properties.*

*Chemical Properties.*

a) *Hydrolysis*

b) *Acetylation of alcohol, ammonia, and amines*

c) *Rosenmund's reduction*

d) *Formation of acetic anhydride*

e) *Reaction with Grignard reagent*

*Identification and uses.*

(II) *Acetic anhydride*

*Physical Properties.*

*Chemical Properties:*

a) *Hydrolysis*

b) *Acetylation of ethanol and aniline*

c) *with  $PCl_5$*

*Identification and uses.*



(III) *Acetamide*

*Physical Properties.*

*Chemical Properties:*

- a) *Acid hydrolysis*
  - b) *with alkalis*
  - c) *Hoffmann's degradation*
  - d) *with HNO<sub>2</sub>*
  - e) *Dehydration*
  - f) *Reduction*
  - g) *Amphoteric nature (reaction with HCl and H<sub>2</sub>O)*
- Identification and uses.*

(IV) *Ethyl acetate*

*Physical Properties.*

*Chemical Properties:*

- a) *Acid hydrolysis*
- b) *Saponification*
- c) *with ammonia*
- d) *with PCl<sub>5</sub>*
- e) *Reduction*

*Identification and uses.*

- v. *Urea: Lab Preparation (Wobler's Synthesis), Manufacture from NH<sub>3</sub> and by cyanamide process.*

*Physical Properties.*

*Chemical Properties:*

- a) *Hydrolysis*
- b) *Salt formation with HNO<sub>3</sub>*
- c) *Biuret reaction*
- d) *with hot NaOH (formation of NH<sub>3</sub> and CO<sub>2</sub>).*

*Identification and uses.*

(NOTE: General formula, IUPAC Nomenclature, trivial names, structural formula of all the listed compounds are included).

**16. GLYCINE: PREPARATION FROM CHLOROACETIC ACID, PHYSICAL AND CHEMICAL PROPERTIES, ZWITTER ION, EFFECT OF HEAT ON GLYCINE – FORMATION OF DIKETOPIPERAZINE.**

**[Scope:** *Introduction, chemical formula, IUPAC name. Preparation from chloroacetic acid.*

*Physical properties.*

*Chemical properties:*

Reaction due to acid group:

- a) *with alkali (NaOH/KOH)*
- b) *with CuCO<sub>3</sub>*
- c) *Decarboxylation*
- d) *Reduction to alcohol*
- e) *Reaction with alcohol to form ester*
- f) *Reaction with ammonia to form amide*

Reaction due to amino group:

- a) *with HCl*
- b) *with HNO<sub>2</sub>*
- c) *with acetyl chloride*

Zwitter ion formation



Formation of diketo piperazine-effect of heat.  
(Identification and uses)]

## 17. OILS, FATS, SOAPS & DETERGENTS: NATURE AND GENERAL PROPERTIES

[Scope: Difference between oils and fats. Physical properties – general information of these compounds, definition, manufacture from fats / oils by saponification method. (detail not required).]

## 18. CYANIDES AND ISOCYANIDES; NITRO COMPOUNDS AND AMINES: NOMENCLATURE, GENERAL METHODS OF PREPARATION; CORRELATION OF THEIR PHYSICAL PROPERTIES, THEIR STRUCTURE, CHEMICAL PROPERTIES IDENTIFICATION AND USES; INTERCONVERSION OF PRIMARY, SECONDARY AND TERTIARY AMINES, QUATERNARY AMMONIUM SALT FROM LONG CHAIN AMINES.

[Scope: Nomenclature, structure and general method of preparation, Physical and chemical properties, identification and uses of cyanides, isocyanides, amines and nitro compounds.

i) Cyanides, isocyanides and nitro compounds- General formula, IUPAC nomenclature, Structural formula.

Physical properties.

Chemical properties:

a) Hydrolysis

b) with HCl

c) with NaOH.]

Identification and uses.

ii) Amines- Nomenclature, classification with examples, general formula, interconversion of primary, secondary and tertiary amines. Distinction between primary, secondary and tertiary amines. Brief idea of quaternary ammonium salt.

Ethyl amine: Laboratory preparation of ethyl amine by Hoffman's degradation method in detail.

Physical Properties.

Chemical Properties:

a) as a base

b) alkylation

c) acetylation

d) benzylation

e) with  $\text{HNO}_2$

f) Carbylamine reaction

## 19. CARBOHYDRATES: CLASSIFICATION, MONOSACCHARIDE – PREPARATION AND PROPERTIES OF GLUCOSE AND FRUCTOSE, PROPERTIES OF SUCROSE (DISACCHARIDES), PROPERTIES OF STARCH AND CELLULOSE (POLYSACCHARIDES).

[Scope: Classification- mono (aldose, ketose), oligo (di, tri, tetra saccharides) and polysaccharides- examples. Reducing sugar and non-reducing sugar- examples. Preparation of glucose and fructose- from cane sugar and starch. Properties of glucose and fructose, uses of glucose and fructose. Structure of glucose and fructose- Pyranose structure (notation with alpha and beta) - asymmetric carbon atoms (D&L structure)- Fischer Projection formulae, Conversion of glucose to fructose through glucosazone formation, conversion of fructose to glucose through sorbitol formation. Properties and structure of sucrose- pyranose structure with glycosidic linkage. Properties of starch and cellulose.

Test to identify glucose and fructose (Millon's test/Fehling's test).

Test to identify starch and cellulose (iodine test).

Reaction of glucose and fructose-

a) with bromine water.

b) condensation with  $\text{NH}_2\text{OH}$

c) Phenyl hydrazine

d) reduction

- e) *fermentation*  
 Reaction of sucrose-  
 a) *dehydration*  
 b) *acid hydrolysis*  
 c) *oxidation.*]

**20. AROMATIC COMPOUNDS (BENZENE AND ITS DERIVATIVES): COAL TAR AS AN IMPORTANT SOURCE OF AROMATIC COMPOUNDS; PREPARATION, PROPERTIES AND USES OF BENZENE, RESONANCE MODEL OF BENZENE.**

**Directive influence of substituents in the benzene ring; Preparation, properties and uses of: Chlorobenzene, nitrobenzene, aniline, phenol, benzaldehyds and benzoic acid.**

[**Scope:** *coal tar as an important source of aromatic compounds- a general study.*

- i. *Benzene – Preparation from sodium benzoate*  
*Resonance structure (Kekule's) of benzene. Directive influence (o-, p-and m-) of substituents in electrophilic and nucleophilic.*  
*Physical properties.*  
*Chemical Properties:*  
 a) *Oxidation (formation of maleic anhydride)*  
 b) *Pyrolysis (formation of bi- phenyl)*  
 c) *Addition reactions with  $H_2, Cl_2, Br_2$ .*  
 d) *with  $O_3$*   
 e) *Substitution reactions (halogenation, nitration and acetylation)*  
 f) *Alkylation.*  
*Test and uses of Benzene.*
- ii. *Chlorobenzene*  
*Lab preparation from aniline.*  
*Physical Properties.*  
*Chemical properties:*  
 a) *Electrophilic substitution (chlorination and nitration)*  
 b) *Replacement of chlorine with NaOH,  $NH_3$ .*  
 c) *Reduction (to benzene)*  
 d) *Wurtz- Fittig reaction*  
 e) *Addition reaction with Mg (formation of Grignard reagent)*  
 f) *Formation of DDT*  
*Test and uses of Chlorobenzene.*
- iii. *Nitrobenzene*  
*Lab method of preparation( by nitration of benzene with a mixture of concentrated nitric acid and sulphuric acid).*  
*Physical Properties.*  
*Chemical Properties:*  
 a) *Electrophilic substitution (chlorination and nitration) - meta substitution*  
 b) *Reduction (to Aniline)*  
*Test and uses of Nitrobenzene.*
- iv. *Aniline*  
*Lab preparation( by the reduction of nitrobenzene).*  
*Physical Properties.*  
*Chemical Properties:*  
 a) *with HCl and  $H_2SO_4$*   
 b) *Acetylation*  
 c) *Benzoylation*  
 d) *Alkylation( methylation with  $CH_3I$ )*  
 e) *Carbylamine reaction*  
 f) *diazotisation*

- g) Halogenation  
 Test and uses of Aniline
- v. Phenol  
 Preparation from chlorobenzene (Dow's Process) and Manufacture (from middle oil fraction of coal tar distillation)  
 Physical Properties.  
 Chemical Properties:  
 a) with NaOH  
 b) with Na  
 c) with Zn  
 d) with  $\text{CH}_3\text{COCl}$   
 e) with  $\text{PCl}_5$   
 f) with  $\text{NH}_3$   
 g) Bromination, nitration and sulphonation (electrophilic substitution reactions)  
 h) Hydrogenation  
 i) Kolbe's reaction (formation of salicylic acid)  
 Test and uses of Phenol.
- vi. Benzaldehyde  
 Lab preparation from Toluene oxidation by chromyl chloride  
 Physical Properties.  
 Chemical Properties:  
 a) Oxidation and reduction of benzaldehyde  
 b) Addition reaction ( $\text{HCN}$ ,  $\text{NaHSO}_3$ )  
 c) Condensation reaction ( $\text{NH}_2\text{OH}$ ,  $\text{C}_6\text{H}_5\text{-NH-NH}_2$ )  
 d) with  $\text{PCl}_5$   
 e) Cannizzaro reaction  
 f) Benzoin condensation  
 g) Chlorination (electrophilic substitution)  
 Test and uses of Benzaldehyde.
- vii. Benzoic acid  
 Preparation (side chain oxidation of benzaldehyde)  
 Physical properties.  
 Chemical reactions of  $-\text{COOH}$  group  
 a) with  $\text{NaOH}$ ,  $\text{Na}_2\text{CO}_3$   
 b) Esterification  
 c) with  $\text{PCl}_5$   
 d) Decarboxylation  
 e) Substitution of benzene ring (*m*-directive effect of  $\text{COOH}$  group)- nitration and sulphonation.]  
 Test and uses of Benzoic acid.

**21. POLYMERS & POLYMERISATION: ADDITION AND CONDENSATION POLYMERISATION, CLASSIFICATION OF POLYMERS – NATURAL & SYNTHETIC POLYMERS WITH STRESS ON THE GENERAL METHOD OF PREPARATION OF POLYTHENE, POLYSTYRENE, PVC, TEFLON, NYLON 66, TERYLENE.**

**[Scope:** Classification of polymers with examples, the principles of addition and condensation polymerisation illustrated by reference to natural and synthetic polymers e.g. proteins, polyolefines and synthetic fibres; thermo and thermosetting plastics, chemotrophs – definition, examples, properties (differences), reference should also be made to the effect of chain length and cross-linking on physical properties of polymers. Outline of manufacture of the following synthetic polymers and their partial structures. (stress on general method of preparation).

- i. PVC
- ii. Polyethene,
- iii. Polystyrene

- iv. Nylon 66
- v. Teflon
- vi. Terylene.]

## PAPER II

### PRACTICAL WORK

#### 1. QUALITATIVE ANALYSIS

Candidates would be required to carry out tests and make deductions.

**Cations:**  $\text{NH}_4^+$ ,  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Hg}^{2+}$ ,  $\text{Sn}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$

**Anions:**  $\text{CO}_3^{2-}$ ,  $\text{HCO}_3^-$ ,  $\text{NO}_2^-$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{SO}_4^{2-}$

[Scope: Formal analytical procedure required for the identification of the following:

a) Anions:

$\text{CO}_3^{2-}$ ,  $\text{HCO}_3^-$ ,  $\text{NO}_2^-$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{SO}_4^{2-}$

Systematic analysis of anions

i) Those identified by dilute sulphuric acid with confirmatory tests

ii) Those identified by conc. Sulphuric acid with confirmatory tests

iii) This includes anions not identified by (i) and (ii) for example  $\text{SO}_4^{2-}$

(For CONFIRMATORY TESTS i.e. WET TEST,  $\text{Na}_2\text{CO}_3$  extract must be prepared and neutralization of the extract with appropriate acid must be done).

b) Cations:

$\text{NH}_4^+$ ,  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Hg}^{2+}$ ,  $\text{Sn}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$

Systematic analysis of cations

i) Preparation of original solution for group separation (distilled water, dilute hydrochloric acid, conc. Hydrochloric acid in cold and hot condition.)

ii) Group separation of Zero, I, II, III, IV, V, VI, with appropriate group reagents and accurate procedure.

iii) Group analysis of I, II, III, IV, V, VI with at least two confirmatory test, flame test, borax bead test are not confirmatory).

c) Analysis of salt mixtures containing two cations and two anions should be practiced.

#### 2. CANDIDATES WILL BE REQUIRED, HAVING BEEN GIVEN FULL INSTRUCTIONS, TO CARRY OUT AN EXPERIMENT ON THE RATE OF REACTION, E.G. REACTION BETWEEN SODIUM THIOSULPHATE AND HYDROCHLORIC ACID.

#### 3. TITRATIONS

i. acid-base titrations

ii. oxidation-reduction titrations: iodine/sodium thiosulphate; potassium manganate (VII)/ ammonium iron (II) sulphate; potassium manganate (VII) /oxalic acid; potassium dichromate/sodium thiosulphate; potassium dichromate/copper (II) sulphate.

[Scope: The candidate may be required to determine the percentage purity of a compound and the number of molecule of water of crystallisation in hydrated salts. In such experiments sufficient working details including recognition of the end point will be given.

i) Oxidation – Reduction Titrations.

a) Self indicator

$KMnO_4$  / Oxalic acid ( $C_2O_4H_2$ ) solution  
 $KMnO_4$  / ferrous sulphate ( $FeSO_4$ ) solution.  
 $KMnO_4$  / Mohr's salt ( $(NH_4)_2SO_4 \cdot FeSO_4 \cdot 6H_2O$ ) solution.

- b) Iodometry (starch indicator)  
 $K_2Cr_2O_7$  /  $Na_2S_2O_3$  (sodium thiosulphate) solution  
 $CuSO_4$  /  $Na_2S_2O_3$  (sodium thiosulphate) solution.  
c) Iodometry (starch indicator)  
Iodine /  $Na_2S_2O_3$  (sodium thiosulphate) solution]

#### 4. IDENTIFICATION OF THE FOLLOWING COMPOUNDS BASED ON OBSERVATIONS

- Aliphatic compounds: formaldehyde; ethanol; acetic acid; acetone; glycerol; glucose.
- Aromatic compounds: benzoic acid; phenol; aniline (carblyamine reaction should be avoided); benzaldehyde.

[Scope: Candidates should do test for functional group as well as individual compounds as mentioned above. Students will be expected to perform tests given in the question paper on the above compounds.

Credit will be given for precise observations recorded and for well-drawn deductions.]

#### PERIODIC TABLE

1	2											3	4	5	6	7	8	
1 H																	1 H	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 As	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Te	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	57-71 La-Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
87 Fr	88 Ra	89 - 103 Ac - Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt										
<b>Lanthanoids</b>			58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu		
<b>Actinoids</b>			90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lw		

#### PROJECT WORK

Candidate is to creatively execute one project / assignment on any aspect of Chemistry. Teachers may assign or students may choose any project of their choice. Teacher should guide students in execution of their project. The minimum length of project should be about 1000 - 1500 words. The projects must be carried out by the candidates and the original work should be compiled and the outcome must be submitted in neatly hand written or typed form on time.

The candidates are to prepare a technical report formally written including an abstract, some theoretical discussion, experimental setup, observations with tables of data collected, analysis and discussion of results, deductions, conclusions etc (after the draft has been approved by the teacher). The report should be kept simple, but neat and elegant. No extra credit shall be given for typewritten materials/decorative cover, etc.

The Project work is to be assessed by teacher and the visiting examiner appointed by BBE.

### Suggested Topics

Bio-molecules and Chemistry of biological processes:

- i. Amino-acids
- ii. Nucleic acids – DNA and RNA
- iii. Lipids
- iv. Carbohydrates and their metabolism
- v. Immune systems
- vi. Vitamins and hormones
- vii. Chemical evolution
- viii. Polymers
- ix. Soaps and detergents, beverages, dyes, essential oils
- x. Food processing
- xi. Distillery
- xii. Chemicals in medicines, cosmetics
- xiii. Rocket propellants
- xiv. Air and water pollution
- xv. Insecticides, pesticides and chemical fertilizers
- xvi. Chemical and chemical processes in forensic studies
- xvii. Coal and coal tar as a source of many chemicals
- xviii. Traditional Bhutanese medicine and medicinal plants
- xix. Explosives
- xx. Testing of food materials for adulteration such as pure ghee (mixed with vanaspati or animal fat), butter (mixed with starch of vanaspati ghee), turmeric (mixed with starch of chromate salt), milk (either fat is removed or some starch is mixed), sweets (non- permissible colouring matter (metanil yellow).
- xxi. Testing of vitamin A and B.

### TIME ALLOCATION AND WEIGHTING

Topics	Weighting	Time in hours
<b>Section A</b>		
1. Solution	4%	5 hr
2. Nuclear Chemistry	3%	4 hr 10 min
3. Chemical bonding	4%	5 hr
4. The Solid State	3%	4 hr 10 min
5. Surface Chemistry	3%	4 hr 10 min
6. Chemical Kinetics	4%	5 hr
7. Phase equilibria	4%	4 hr 10 min
8. Ionic equilibria	5%	5 hr 50 min
9. Electrochemistry	6%	5 hr 50 min
<b>Section B</b>		
10. Chemical Thermodynamics	8%	6 hr 40 min
11. Coordination compounds	4%	5 hr
12. Extraction, properties of metals and non metals	8%	7 hr 30 min
13. Types of chemical reaction	8%	7 hr 30 min
<b>Section C</b>		
14. Isomerism	4%	4 hr 10 min
15. Ethers, aldehydes, acetone, carboxylic acid and their derivatives	10%	12 hr 30 min
16. Glycine	2%	3 hr 20 min

17. Oil, fats and detergents	2%	3 hr 20 min
18. Cyanides and isocyanides	3%	4 hr 10 min
19. Carbohydrates	4%	4 hr 10 min
20. Aromatic compounds	7%	6 hr 40 min
21. Polymers & polymerisation	4%	4 hr 10 min
	<b>100%</b>	<b>112 hr 30 min</b>
<b>Practical</b>		<b>17 hr 30 min</b>
<b>TOTAL</b>		<b>130 hours</b>

## MODE OF ASSESSMENT

The candidate will be assessed internally by the school as per the following procedures and externally by the Bhutan Board of Examinations. The purpose of internal assessment is to evaluate the candidate's progressive learning and to complete the Year's Progress Report form of individual candidate. The internally assessed marks will have no bearing on the Board Examinations.

Terms	Types of Assessment & Weighting			Total
	CA	Examinations		
		Paper I: Theory	Paper II: Practical	
<b>First</b>	10%	30%	-	40%
<b>Second</b>	10%	40%	10%	60%
<b>Total</b>	20%	70%	10%	<b>100%</b>

### 1. Continuous Assessment (CA)

The candidate will be assessed across the two terms through Continuous Assessment (CA) by the following modes.

- 1.1 **Assignment:** For CA during the FIRST term, each candidate will choose any topic from the class XII syllabus and write a short assignment of about 750 – 1000 words. This is to extend the learning through literature research. The award of marks may be based on the following marking scheme:

<i>Presentation</i>	Table of content, Bibliography, Introduction, main body and conclusion (1.5%)
<i>Content</i>	Relevant information, Analysis and depth (2.5%)
<i>Language</i>	Clarity of ideas, use of terms and grammar (1%)

- 1.2 **Presentation:** The candidate will also present the assignment to the class in the FIRST term. The presentation may be of 10 minutes duration followed by three to four questions from the class and teacher. The award of marks may be based on the following marking scheme:

<i>Content</i>	Coverage of main ideas and depth (2.5%)
<i>Language</i>	Not memorised but in student's own words (1%)
<i>Discussion</i>	Ability to respond tactfully and correctly (1.5%)

- 1.3 **Project work:** During the SECOND term, the Project Work which the candidate has been doing through out the two terms will be assessed for CA. The award of marks may be based on the following marking scheme:



<i>Presentation</i>	Table of content, bibliography, introduction, main body and conclusion (2%)
<i>Content</i>	Relevant information, analysis and depth (3%)
<i>Language</i>	Clarity of ideas, use of terms and grammar (2%)
<i>Process</i>	Draft copy, notes taken during literature research or information gathering, consultation of subject teacher, experimentation (3%)

**Note:** The Project Work marks secured by the candidate will be reflected both in the Progress Report Card (internal) as well as under Paper II of the Board Examinations.

## 2. Examination

There will be examinations at the end of the both terms. A practical work is mandatory at the end of the year. Assessment is based on the weighting given above.

The end of the year examination will cover the entire syllabus. There will be TWO papers in the subject.

### 2.1 *The question scheme for trial examination:*

<b>Paper I: Theory:</b>	3 hours	=	100 marks (with a weighting of 40%)
<b>Paper II: Practical:</b>	3 hours	=	20 marks (with a weighting of 10%)

### 2.2 *The weighting scheme and duration for the Board Examinations:*

<b>Paper I:</b>	<b>Theory:</b>	3 hours	.. 100 marks (70 %)
<b>Paper II:</b>	<b>Practical:</b>	3 hours	.. 20 marks (20%)
	<b>Project work:</b>		.. 10 marks (10 %)
(Marks for the Project Work to be brought from the CA component)			

## PAPER I (THEORY):

There will be one paper of 3 hours duration divided into 2 parts.

**Part 1 (40 marks)** will consist of compulsory 20 short answer questions, testing knowledge, application and skills relating to elementary/fundamental aspects of the entire syllabus.

**Part 2 (60 marks)** will be divided into three sections A, B and C. There shall be **six** questions in Section A (each carrying 7 marks) and candidates are required to answer **four** questions from this Section. There shall be **four** questions in Section B (each carrying 6 marks) and candidates are required to answer **three** questions from this Section. There shall be **three** questions in Section C (each carrying 7 marks) and candidates are required to answer **two** questions from this Section. Therefore, candidates are expected to answer nine questions in Part 2.

**Note:** The Trial examinations will follow the question format as set for the Board Examinations.



## LIST OF TEXT AND REFERENCE BOOKS

### Textbooks

1. *ISC Chemistry - Book I (Class XI)* by R.D Madan & Bisht, S. Chand & Company Ltd (2003)
2. *ISC Chemistry - Book II (Class XII)* by R.D Madan & Bisht, S. Chand & Company Ltd (2003)
3. *ISC Practical Chemistry Vol. I (Class XI)* by Dr VC Garg, Pitambar Publications (2000)
4. *ISC Practical Chemistry Vol. II (Class XII)* by Dr VC Garg, Pitamber Publications (2002)

### Reference books

1. *Oxford Dictionary of Chemistry*, Edited by John Daintith, Oxford University Press (2000)
2. *Chemistry (IGCSE)* by B Earl, LDR Wilford, Cambridge University Press (2002)
3. *Advanced Chemistry – Physical and Industrial* by Philip Mathews, Cambridge University Press (2003)
4. *Chemistry for Class XI*, NCERT, N. Delhi (2003)
5. *Chemistry for Class XII*, NCERT, N. Delhi (2003)

# Biology

## **RATIONALE**

With the rapid technological advancement, the role of Biology has become manifold. The knowledge of Biology has to cater the need of growing human population to cope with food, medicine, health, environment and energy crisis. Classes XI and XII syllabus should equip students with the knowledge and latest development in the field of bioscience and enable them to pursue their higher studies in the fields related to it. Biology has become a hybrid science, which requires the adequate knowledge of other related disciplines to cope with the technological world as well as with the modern sophisticated instrument. More importantly through the process of investigation and experimentation, students should develop scientific skills useful both for higher studies and their lives.

## **AIMS**

Teachers should guide the students to develop their:

1. knowledge of biological terms, concepts, facts, principles, formulae, etc.
2. understanding of biological terms, concepts, facts, principles, etc.
3. ability to apply the knowledge of biology in unfamiliar situations.
4. scientific attitude and skills of investigations, handling of apparatus, observation and drawing of conclusions to understand the biological phenomena.
5. awareness about the problems of the environment and identify measures to overcome them.
6. ability to recognise and appreciate biological phenomena in nature, contribution of biology to human welfare, and interdependence of living and non-living world.
7. interest in plants and animals and in their respective environments.
8. awareness of the avenues for exploring the biological world for the benefits of the society.

## **LEARNING EXPERIENCES**

Students should have opportunities to:

1. investigate the cause, effect and solution of the biological world.
2. experiment to verify the scientific principles and laws, and to develop better understanding of the biological phenomena.
3. work individually or in group to develop team spirit.
4. examine carefully, analyse critically and think positively about the biological science.
5. discuss the practical implications of biological science in terms of environmental, social, economic, religious, legal and ethical point of views.
6. pose questions and develop testable hypothesis.
7. integrate their findings and understanding from a range of sources.
8. explore the history of the development of scientific concepts to understand the evolving nature of knowledge and the way it is generated.
9. reflect and evaluate their investigation processes.

## **LEARNING OUTCOMES**

These experiences will enable students to:

1. exhibit understanding of basic concepts, terms, principles of biological science.
2. apply the biological knowledge for the welfare of living beings and their environment.
3. show the qualities such as perseverance, tolerance, cooperation, curiosity, integrity, honesty, self-confidence, introspection, commitment, punctuality, sincerity and adaptability.
4. negotiate roles when they work in groups, arrange the order of tasks and rotate roles.
5. test the objectivity, feasibility, reliability, internal consistency and validity of scientific explanation.

6. design investigation, carry out, draw conclusion, and prepare report to communicate their finding.
7. use symbol, conventions, analogies, models and charts to communicate their ideas.
8. analyse the practical implications of human activities on biological world and vice-versa.
9. show concern for themselves, others and the natural world in terms of social, religious, economical, legal and aesthetic view-points.
10. appreciate the biological phenomena in nature and the contribution of biological sciences towards the welfare of living beings and their environment.

## CLASS XI BIOLOGY

### PAPER I (THEORY)

#### SECTION A

##### 1. THE LIVING WORLD

- i. **Nature and Scope of Biology: Biology – The science of life, nature and methods of science, important branches of Biology, scope of Biology, Biology in Dispelling myths, misconceptions and Disbeliefs, Misuse of Biology, Careers in Biology, Biology and its relation with other sciences, Biology – a science of exception..**

*[Scope: What is Biology, common features of living organisms, basic understanding of science and scientific methods (observation, defining a problem, making a hypothesis, testing or experimenting, theorising etc), scientific attitude, serendipidity, a brief description on important branches of biology, Scope of Biology (Why to study Biology?), Biology is dispelling myths, misconceptions and Disbeliefs, misuse of Biology, professional avenues of learning Biology, interdisciplinary approach of Biology, Biology – a science of exception.]*

- ii. **Tools and Techniques : Microscopy (Dissecting microscope, Compound microscope, Electron microscope), cell-fractionation (centrifugation, chromatography, electrophoresis), radioisotopy, tissue – culture, biotechnology.**

*[Scope: Microscopy and its meaning, magnification and resolving power, working principles of dissecting microscope, compound microscope and electron microscope should be discussed and students should be given opportunity to handle dissecting and compound microscopes), Basic techniques of centrifugation, chromatography, electrophoresis, radioisotopy, tissue-culture and biotechnology should be discussed in brief.*

- iii. **Being alive: What does it mean? ; feature common to living organisms; our place in universe; laws that govern the universe and life; levels of biological organisation; cause and effect relationships; importance of micromolecules (water, common salts and glucose) and macromolecules (carbohydrates – oligo & polysaccharides; lipids, proteins, nucleicacids); Molecular approach to understand life processes – life is an expression of energy changes; Steady State and homeostasis; growth, development and reproduction; adaptation; ageing, death and its significance.**

*[Scope: A general idea of features common to living organisms; our place in universe; laws of thermodynamics that govern the universe and life; levels of biological organisation including factors responsible for levels of organization (aggregation, interaction, equilibrium and change); cause and effect relationships – an idea to show if specific circumstances lead to a certain effect, circumstances constitute the cause and event is the effect; importance of water, common salt, glucose, oligo and polysaccharides, lipids, proteins and nucleic acids. Molecular approach to understand life process should be discussed in brief with relation to energy changes, loss of energy as heat with each change and increase in entropy should be discussed; a brief discussion on Steady State and homeostasis, exergonic and endergonic reactions; open and closed system; a brief idea of feed-back system; brief discussion on growth, development and reproduction; adaptation-short term and long term with examples; a brief account of ageing, life span, death-clinical and biological, significance of death.]*

## 2. DIVERSITY OF LIFE

### i. Taxonomy and phylogeny, shortcoming of two-kingdom classification, five- kingdom classification: General idea of Monera, Protista, Plantae, Fungi and Animalia.

[Scope: Classification & need for classification, definition & explanation of terms taxonomy, taxon, species and phylogeny, hierarchy of classification, common features of plantae and animalia, shortcomings of two-kingdom system of classification.]

### ii. A brief account of the five-kingdom system of classification and characteristics of different kingdoms with examples.

#### a. Kingdoms Monera: Characteristics of Monera; Bacteria-forms of bacteria, structure of a bacterium cell, reproduction, gram + ve and gram – ve bacteria, economic importance, cyanobacteria characteristic features.

[Scope: Basis of five kingdom system, outline of five kingdom system, merits and demerits, Characteristics of Monera, Bacteria – Plant characteristics, shape, flagellation, differences between gram +ve and gram –ve bacteria, asexual and sexual reproduction, economic importance of bacteria (Students should be familiarised with microscopic slides of bacteria).]

#### b. Kingdom Protista: Characteristics of Protista, structure of a Protist cell, structure of photosynthetic protist – Euglena; structure, locomotion, and reproduction in Amoeba and Paramecium.

[Scope: General characteristics of protista with examples, general structure of a typical protist cell showing Eukaryotic organisation, structure of a photosynthetic protist – Euglena. Structure, locomotion and reproduction in Amoeba and Paramecium.]

#### c. Kingdom Fungi: Characteristics of Fungi; Zygomycetes - life cycle of Rhizopus, Ascomycetes – life cycle of Yeast; Basidiomycetes-life cycle of Mushroom, Brief idea of Lichen and Mycorrhiza.

[Scope: Characteristics of fungi with examples, Fungal structure, nutrition, reproduction in fungi, general characters and life cycle of Zygomycetes (Rhizopus), Ascomycetes (Yeast), Basidiomycetes (Mushroom), definition of Lichens, types of Lichens, brief idea about mycorrhiza, ecto and endo mycorrhiza, economic importance of mycorrhiza.]

#### d. Kingdom Plantae: Algae - Structure and life cycle of Spirogyra; Bryophyta - Morphology and life cycle of Funaria, Pteridophyta – Morphology and life cycle of Fern; Gymnosperms – Morphology and life cycle of Pinus; Angiosperms- Brief idea of habit, life span, adaptation to environment, special mode of nutrition.

[Scope: General characteristics of plants; general characters of algae with examples, detailed structure of Spirogyra cell, vegetative reproduction by fragmentation, sexual reproduction by conjugation; general characters of bryophytes with examples, description about funaria, life cycle and alternation of generation in funaria; general characters of pteridophytes with examples, description about ferns, life cycle and alternation of generation in ferns; general characters of gymnosperms, description about pinus, life cycle and alternation of generation in pinus; general characters of angiosperms, brief idea of habit (herbs, shrubs and trees), detailed about floral characters, description of flowering parts in semi- technical terms including floral whorls, floral formula, floral diagrams (real specimens of Datura/ Potato/ Petunia, Sunflower, Mustard, Pea/ Bean, etc. should be used to explain the details of floral parts), Brief idea about life span (annuals, biennials and perennials), adaptations to environment (mesophytes, hydrophytes and xerophytes), special mode of nutrition (parasitic, saprophytic, symbiotic), Insectivorous plants with examples and mode of nutrition in them.]

- e. **Kingdom Animalia: body pattern and symmetry; the development of body cavity; salient features and examples of Porifera, Coelenterata, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata and Chordata (pisces, amphibia, reptilia, aves and mammalia).**

[Scope: Students should be able to define and explain spherical, radial, and bilateral symmetry, diploblastic and triploblastic animals, acoelomate, pseudocoelomate, coelomate and haemocoel, function of coelom, highlighting major characters of different phyla and classes with examples (detailed classification is not required). Students should be familiarised with the real specimens of each representative phylum.]

### 3. ORGANISMS AND ENVIRONMENT

- i. **Species and population: Concepts of species, population and community, factors affecting population, effect of environment on population, carrying capacity, brief idea of population growth curves, inter-specific and intra-specific relationship within the community.**

[Scope: General idea of species, population and community, factors affecting population, effect of environment on population and vice-versa, carrying capacity, natality and mortality, brief idea of population growth, population growth curve, population explosion, majors to control human population, biotic relationship—commensalism, amensalism, predation, scavenging, parasitism and symbiosis with specific examples.]

- ii. **Ecology: concept of ecosystem, components of ecosystem (biotic and abiotic), trophic levels, ecological pyramid, food chain, food web, niche, major ecosystem – grassland & forest ecosystem, aquatic ecosystem, man-made ecosystem (agro), ecological succession – definition, kinds of succession, significance of ecological succession**

[Scope: General idea of the term ecosystem, abiotic and biotic component of ecosystem, concept of ecological pyramid - pyramid of number, pyramid of biomass, pyramid of energy, concept of trophic levels (producer, consumer, decomposer level), food chain, various types of food chain (terrestrial and aquatic), food webs, major types of ecosystem viz., grassland and forest ecosystem, pond or lake ecosystem, mentioned should be given about man – made ecosystem (eg. Paddy field, vegetable garden), concept of ecological succession, kinds of succession, ecological significance.]

- iii. **Natural resources of Bhutan and their conservation: Natural resources, classification of natural resources with specific examples (exhaustible and inexhaustible as well as renewable and non-renewable resources), important natural resources of Bhutan including air, water, land and minerals; economic, aesthetic, ethical, cultural and ecological importance in Bhutan, forest of Bhutan, importance of forests, explanation of the terms: deforestation, afforestation and reforestation, causes and consequences of deforestation, measures of forest conservation in Bhutan, biodiversity of Bhutan with special emphasis on flora and fauna in Bhutan, biodiversity conservation strategies (both in-situ and ex-situ) in Bhutan, concept of National Park, Sanctuary, biosphere reserve, concept of endangered, critically endangered, rare, vulnerable, extinct, etc as per IUCN, Red Data List and its uses, protected wild life species of Bhutan, social forestry program in Bhutan, importance of social forestry day – 2<sup>nd</sup> June, sustainable development in Bhutan, strategies for sustainable development in Bhutan – Middle Path; role of major groups in sustainable development such as women, children and youth, family, community and local authorities, NGOs', business and industry including workers, critical issues and future challenges to sustainability in Bhutan, Bhutan's action for the environment.**

[Scope: Self-explanatory as per the syllabus]

- iv. **Pollution: Basic concept of pollution, sources of pollution, pollutants, biodegradable and non-biodegradable pollutants, major types of pollution (soil, air, water, and noise pollution), environmental hazards of pollution, methods to control pollution (reference should be made from mega cities of Bhutan).**

[Scope: Explanation of the term pollution, different types of pollution, sources of pollution, biodegradable and non-



*biodegradable pollutants, hazards of pollution on flora, fauna & human health, concern and effect of global warming, green house effect, ozone-depletion, acid-rain, major pollution of land, air, water and sound in mega cities of Bhutan, measures to control pollution, waste management, role of school greening programme in controlling pollution.]*

## SECTION B

### 4. UNIT OF LIFE

#### i. Prokaryotic and Eukaryotic Cell: Structure and differences.

*[Scope: General structure of prokaryotic cell- Blue green alga, general structure of eukaryotic cell, differences between eukaryotic and prokaryotic cell.]*

#### ii. Biomolecules and their role in living system: Biochemistry of cellular micro and macromolecules (carbohydrate, protein, lipids and nucleic acids – DNA & RNA), Role of carbohydrate, proteins, lipids and nucleic acid in the living system.

*[Scope: Carbohydrate and its classification – mono, oligo and polysaccharides with examples, function of monosaccharides (glucose & fructose), oligosaccharides (sucrose) polysaccharides (starch, glycogen, cellulose and mucopolypeptides), idea about reducing & non-reducing sugar with examples; general structure of amino acids, essential and non-essential amino acid & their examples; classification and general function of different types of proteins, lipids and their classification, properties of fats and oils, general functions of lipids, basic structure of nucleotides, differences between nucleotides and nucleosides, detailed structure and function of nucleic acids – DNA and RNA, differences between DNA and RNA, different types of covalent bonds with reference to glycosidic bond, peptide bond, ester bond, phosphodiester bond should be dealt in detail.]*

#### iii. Enzymes: Molecular structure & chemical nature, classification & general properties, mode & mechanism of enzyme action, enzyme substrate complex, enzyme inhibition, allosteric modulation (brief), factors affecting enzyme activity.

*[Scope: General properties, holoenzymes, apoenzymes, prosthetic group, nomenclature and classification of enzyme, lock and key model, induced-fit model to explain enzyme action, brief mechanism of enzyme action including activation energy should be explained with diagram & graph, inhibition of enzyme action, factor affecting enzyme activity should be taught, a brief idea of allosteric modulation, isozymes and zymogens should be given.]*

#### iv. Cell membranes: Unit membrane concept, fluid mosaic model, membrane transport, passive and active transport, exocytosis and endocytosis.

*[Scope: Concept of biomembrane as unit membrane, description of fluid mosaic model, experiment to show fluidity of plasma membrane should be discussed; function of the plasma membrane, active and passive transport mechanism, endocytosis and exocytosis should be explained.]*

#### v. Structural organisation of the cell: a detailed light and electron microscopic views of cell and its organelles and their functions viz., nucleus, mitochondria, plastids endoplasmic reticulum, ribosome, golgi complex, lysosomes, microtubules, cell wall, cilia and flagella, vacuoles, cell inclusions.

*[Scope: Structural organisation of cell – light & electron microscopic view of the cell should be explained with the help of diagrams & charts, detailed structure & function of various cell organelles with diagrams to be taught, brief description of cell inclusions like starch grains, glycogen, sugars, etc. should be taught.]*

#### vi. Cellular respiration: A general account of cellular respiration, aerobic and anaerobic respiration, fermentation, biological oxidation – glycolysis and kreb cycle (a cyclic outline), Mitochondrial electron transport chain; high-energy bonds, oxidative phosphorylation and respiratory quotient.

*[Scope: Respiration – aerobic and anaerobic respiration, mechanism of respiration, glycolytic pathway, oxidation of pyruvate, kreb cycle, electron transport chain, high energy bond, oxidative phosphorylation, respiratory quotients, brief idea of fermentation.]*

## 5. CONTINUITY OF LIFE

### i. Cell reproduction: Cell cycle, mitosis and meiosis, significance of mitosis and meiosis.

[Scope: Idea of cell cycle with diagrams, different stages of mitosis and meiosis with the help of suitable diagrams, differences between mitosis and meiosis, biological significance of mitosis and meiosis should be discussed. (Students should be familiarised with the help of permanent slides of various stages of mitosis and meiosis to identify and write the characteristics of identified stages).]

### ii. Fundamentals of genetics: Concept of alleles, dominant and recessive, phenotype and genotype, homozygous and heterozygous, mono and dihybrid crosses

[Scope: Basic concept of the terms alleles, homozygous and heterozygous chromosomes, autosomes and sex chromosomes, dominant and recessive, phenotype, genotype, homologous chromosomes, monohybrid and dihybrid crosses, mono & dihybrid ratios should be taught to give clear idea about the terms.]

### iii. Mendel's law of inheritance: Mendel's experiment with pea plants, laws of inheritance, incomplete dominance, co-dominance.

[Scope: Explanation of the terms heredity and variation, Mendel's laws of inheritance, reasons for selecting pea plant for his experiment, reasons for Mendel's success, idea of incomplete dominance and co-dominance.]

### iv. Genes: Packaging of heredity material in prokaryotes, bacterial chromosome, plasmid and eukaryote chromosomes, gene interaction, cytoplasmic inheritance, viral genes; linkage (genetic) maps, sex determination and sex linkage; genetic material and its replication, gene manipulation, gene expression, genetic code, transcription, translation, gene regulation.

[Scope: Structure of eukaryotic chromosomes, chromosome theory of inheritance, chromosomes in eukaryotic organisms, euchromatin and heterochromatin, karyotypes, sex-linked inheritance, extra chromosomal inheritance, incomplete and complete linkages, chromosomal mapping and its significance, replication of genetic material, properties of genes, function of genes, expression of genetic information, one gene one enzyme hypothesis, protein synthesis - transcription and translation, viral gene expression, gene expression in prokaryotes and eukaryotes, genetic code and its properties.]

## PAPER II

### PRACTICAL WORK

#### 1. PHYSIOLOGY:

Students will be required to carry out sequence of instructions or experiments such as:

##### i. Food tests: Test for starch, glucose, sucrose, protein and fats

[Scope: Test should be reported in tabular form. Both positive and negative tests should be carried out to test the validity of the experiment.]

##### ii. Experiment to demonstrate the effect of heat on permeability of the cell membrane of Beetroot cells.

[Scope: Students should record the observation at very low temperature, room temperature and higher temperature to see the degree of leaching and can conclude accordingly.]

##### iii. To demonstrate the action of an inorganic catalyst ( $\text{MnO}_2$ ) and enzyme (catalase) from potato / liver on hydrogen peroxide and effect of heat on their activity.

[Scope: Living tissue from potato or animal should be used to show the presence of enzyme catalase and its action on hydrogen peroxide. Its activity should also be tested after boiling and killing the cell and the action should be compared.]



## 2. ANATOMY

Preparation of temporary slides -

- i. T. S. of stem and root of pteridophytes
- ii. T. S. of young root of sun flower (Dicot)
- iii. T. S. of young root of maize (Monocot)

*[Scope: Students should be trained about the techniques of section cutting, staining, and mounting the materials and then observing under microscope. Students should be able to make the labelled outline diagrams as well as diagrams showing microscopic details after cutting the section. They should be discouraged to draw diagrams directly from book.]*

## 3. CYTOLOGY

Preparation of:

- i. Stages of MITOSIS in onion root tips
- ii. Stages of MEIOSIS in grasshopper testes / flower bud
- iii. Temporary slides of various types of algae and Fungi

*[Scope: Correct method of selecting the root tip, fixing, staining, and mounting; different stages should be observed first under low power of microscope and after locating the area, students should see it under high power, various stages should be drawn and labelled. Students should be able to know the method of collection and preparation of slides of algae and fungus, observation of slide, identification of main characters, drawing and labelling, classification.]*

## 4. SPOTTING - SLIDES, GRAPHS, PHOTOGRAPHS, DIAGRAMS OF SPECIMENS, ORGANS. THEIR STRUCTURAL DETAILS SET FOR THE SYLLABUS MAY BE PRESENTED FOR IDENTIFICATION AND COMMENT IN THIS SECTION

- i. Study of stained preparation of -  
Monera, protista, algae, fungi, mosses, fern and pinus.

### ii. Identification of plants

1. Bacteria
2. Algae (Spirogyra, Ulothrix, Oedogonium.)
3. Model of TMV
4. Model of bacteriophage
5. Rust
6. Mucor, Rhizopus, Aspergillus, Penicillium, Yeast
7. Liverwort
8. Moss
9. Fern
10. Selaginella
11. Lycopodium
12. Pinus

### iii. Identification of animals

1. Amoeba
2. Paramecium
3. Bath Sponge
4. Hydra
5. Liver fluke
6. Ascaris
7. Leech

8. Earthworm
9. Prawn/ Crab
10. Centipede / Millipede
11. Honey bee
12. Snail (Pila)
13. Octopus
14. Starfish
15. Dogfish
16. Trout fish
17. Frog / Toad
18. Snake / Garden lizard
19. Sparrow / Pigeon
20. Rabbit / Squirrel

## 5. TESTING URINE, SUGAR, ALBUMIN AND BILE SALTS

### PROJECT WORK

Candidate is to creatively execute one project/assignment on any aspect of Biology. Below is only a suggestive list of project topics. Teachers may assign or students may choose any project of their choice. Teacher should guide students in execution of their project. The minimum length of project should be about 1000 – 1500 words. The projects must be carried out by the candidates and the original work should be compiled and the outcome must be submitted in neatly hand written or typed form on time.

#### Some Suggested Topics

1. Project related to experiment on any aspect of plant life.
2. Project related to any aspect of environment.
3. Projects related to modern researches in Biology, e.g. test-tube babies, role of genetics in investigating crimes.
4. Yeast fermentation and production of alcohol or any other commercial industry dependent on plants and / or animals or their products.
5. A detailed survey of Land Use Pattern with crops in the Dzongkhag.
6. Study of cattle and crop pests in the Dzongkhag in terms of damage, and their control measures and success of the measures.

In addition, students may study on how to culture:

- i. Earthworms
- ii. Protozoans
- iii. Moulds
- iv. Setting up of an aquarium

### TIME ALLOCATION AND WEIGHTING

Units	Total	Time in hours
<b>Section A</b>		
iii Living World	16%	15 hr 50 min
iii Diversity of life	20%	20 hr 50 min
iii Organism & environment	20%	17 hr 30 min
<b>Section B</b>		
iii Unit of life	22%	29 hr 10 min
iii Continuity of life	22%	29 hr 10 min

	<b>100%</b>	<b>112 hr 30 min</b>
<b>Practical</b>		<b>17 hr 30 min</b>
<b>TOTAL</b>		<b>130 Hours</b>

## MODE OF ASSESSMENT

The candidate will be assessed internally by the school as per the following procedures.

Terms	Types of Assessment & Weighting			Total
	CA	Examinations		
		Paper I: Theory	Paper II: Practical	
<b>First</b>	10%	30%	-	40%
<b>Second</b>	10%	40%	10%	60%
<b>Total</b>	20%	70%	10%	<b>100%</b>

### 1. Continuous Assessment (CA)

The candidate will be assessed across the two terms through Continuous Assessment (CA) by the following modes.

- 1.1 **Assignment:** For CA during the FIRST term, each candidate will choose any topic from the class XI syllabus and write a short assignment of about 750 – 1000 words. This is to extend the learning through literature research. The award of marks may be based on the following marking scheme:

<i>Presentation</i>	Table of content, Bibliography, Introduction, main body and conclusion (1.5%)
<i>Content</i>	Relevant information, analysis and depth (2.5%)
<i>Language</i>	Clarity of ideas, use of terms and grammar (1%)

- 1.2 **Presentation:** The candidate will also present the assignment to the class in the FIRST term. The presentation may be of 10 minutes duration followed by three to four questions from the class and teacher. The award of marks may be based on the following marking scheme:

<i>Content</i>	Coverage of main ideas and depth (2.5%)
<i>Language</i>	Not memorised but in student's own words (1%)
<i>Discussion</i>	Ability to respond tactfully and correctly (1.5%)

- 1.3 **Project work:** During the SECOND term, the Project Work which the candidate has been doing through out the two terms will be assessed for CA. The award of marks may be based on the following marking scheme:

<i>Presentation</i>	Table of content, bibliography, introduction, main body and conclusion (2%)
<i>Content</i>	Relevant information, analysis and depth (3%)
<i>Language</i>	Clarity of ideas, use of terms and grammar (2%)
<i>Process</i>	Draft copy, notes taken during literature research or information gathering, consultation of subject teacher, experimentation (3%)

### 2. Examination

There will be written examinations at the end of the both terms. A practical examination is mandatory at the end of the year. Assessment is based on the weighting given above.

The end of the year examination will cover the entire syllabus. There will be TWO papers in the subject.

<b>Paper I: Theory:</b>	3 hours	=	100 marks (with a weighting of 40%)
<b>Paper II: Practical:</b>	3 hours	=	20 marks (with a weighting of 10%)

### Paper I (Theory):

There will be one paper of 3 hours duration divided into 2 parts.

**Part 1 (40 marks)** will consist of compulsory 20 short answer questions, testing knowledge, application and skills relating to elementary/fundamental aspects of the entire syllabus.

**Part 2 (60 marks)** will be divided into 2 Sections A and B. Candidates are required to answer **three** out of **five** questions from Section A carrying 10 marks each and **two** out of **four** questions from Section B carrying 15 marks each.

## CLASS XII BIOLOGY

### PAPER I (THEORY)

#### SECTION A

##### 1. MULTICELLULARITY: STRUCTURE AND FUNCTION – PLANT LIFE

- i. **Tissues: Types of plant tissue - meristematic and permanent tissue, classification of meristematic tissue, Tunica – corpus theory, histogen theory, root apex, Structure and function of simple permanent tissue (parenchyma, collenchyma and sclerenchyma), Complex tissue( xylem and phloem ), types of vascular bundles, T.S. of young dicot and monocot root, T.S. of young dicot and monocot stem and V. S. of dicot and monocot leaf; secondary-growth, brief idea of formation of secondary xylem and secondary phloem by cambium ring formation, annual rings, heart wood and sap wood.**

*[Scope: Characteristics of meristematic tissue, classification of meristematic tissue based on origin and development, based on location, based on function, tunica- corpus theory, differences between root apex and shoot apex, brief understanding of histogen theory, quiescent centre, characteristics of permanent tissue, simple, complex and special permanent tissue, types of vascular bundles to be taught with the help of diagrams, anatomical differences between dicot and monocot root, stem and leaf must be taught for better understanding. Brief idea of how secondary growth takes place and formation of annual rings, structural and functional differences between heartwood and sap wood must be given.]*

- ii. **Absorption and movement of water in plants: Diffusion, osmosis, osmotic pressure, turgor pressure, wall pressure, water potential, pressure potential, diffusion pressure deficit, types of soil water, mechanism of water absorption (active and passive absorption), root pressure, guttation, transpiration pull theory for ascent of sap, transpiration, mechanism of opening and closing of stomata (active potassium theory).**

*[Scope: Transpiration and exchange of gases, stomatal mechanism, water relation in plant cells, water potential, explanation and definition of transpiration to give the students a clear idea, differences between transpiration and guttation, significance of transpiration, anti-transpirant, stomatal mechanism – starch sugar hypothesis and K<sup>+</sup> transport mechanism, importance of water, soil water (gravitational, capillary, hygroscopic and combined water) – only definition, characteristics of imbibitions, factors affecting imbibition, importance of imbibitions, characteristics and significance of diffusion, osmosis- endo and exosmosis, significance of osmosis, plasmolysis, active and passive absorption of water, water potential.]*

- iii. **Mineral nutrition: Macronutrients and micronutrients (role and deficiency symptoms), criteria for essentiality of elements, aeroponics and hydroponics, passive absorption (ion exchange mechanism) and active absorption of mineral nutrients, nitrogen nutrition in plant.**

*[Scope: Criteria for essentiality of minerals, hydroponics, aeroponics, macro and micronutrients, role and deficiency symptom of various elements, absorption and transport of mineral salts by contact exchange theory and carbonic acid*

exchange theory, active absorption by carrier ion complex formation, brief idea of nitrogen fixation and nitrogen fixing organism, importance of leg haemoglobin pigment should be discussed.]

iv. **Modes of nutrition: Parasitic, saprophytic, symbiotic and insectivorous (brief idea with examples), transport of solutes, photosynthesis, ultra structure of chloroplast, photochemical and biosynthetic phases, absorption and action spectra, factors affecting photosynthesis, photophosphorylation, photorespiration.**

[Scope: Brief idea with examples about various modes of nutrition in plants including insectivorous plant, evidences which indicates that downward movement of organic solutes takes place in phloem, mechanism of translocation, diffusion hypothesis and its objections, mass flow hypothesis with diagrams and objections cytoplasmic streaming hypothesis, mechanism of ascent of sap (should discuss various theories and their objections leading to next theory), brief idea of photosynthetic pigments, photochemical phase-pigment systems, cyclic and non-cyclic photobosphoylation, biosynthetic phase-  $C_3$  and  $C_4$  plants with examples, kranz anatomy (chloroplast diamorphism),  $C_3$  and  $C_4$  cycles, photorespiration and its pathway in brief, explanation of how RuBP carboxylase acts as RuBP oxygenase.]

v. **Reproduction and development in angiosperms:**

**Vegetative reproduction, sexual reproduction, structure and functions of flower; development of male and female gametophytes in angiosperms; pollination; fertilization.**

[Scope: Natural and artificial vegetative propagation, advantages and disadvantages of vegetative reproduction, micro propagation - plant tissue culture, plant tissue culture practices in Bhutan, advantages of tissue culture, pollination and its types, advantages of self and cross pollination, events leading to fertilization, double fertilization in angiosperms, triple fusion should be discussed. Microsporogenesis and megasporogenesis]

vi. **Differentiation and organ formation:**

[Scope: Embryo formation, endosperm formation, types of endosperm, changes in ovules, and types of ovules, fruit and seed formation (broadly classified).]

vii. **Plant growth: Phases of growth, measurement of growth, factors affecting growth, role of growth regulators, seed dormancy and germination; apical dominance; senescence and abscission; movement in plants (tropic and nastic).**

[Scope: Brief idea of various theories leading to discovery of auxins by Went, role of growth regulators in development and growth of plants, definition and explanation of dormancy and quiescence, causes and method of breaking seed dormancy, definition of hypogeal, epigeal and viviparous germination, brief idea of apical dominance, senescence, abscission, application of synthetic growth regulators, tropic and nastic movements, role of auxins in phototropic responses.]

viii. **Photomorphogenesis in plants including a brief account of phytochrome.**

[Scope: Brief idea of short day, long day, and day neutral plants, critical day length, photoperiodic induction, experiment to prove that photoperiodic induction is perceived by the leaves, brief idea of phytochromes, differences between photoperiodism and vernalisation.]

## 2. **MULTICELLULARITY: STRUCTURE AND FUNCTION – ANIMAL LIFE**

i. **Animal tissues: Epithelial; connective; muscular; nervous (location, structure, and function).**

[Scope: Location, structure and function of different types of epithelial tissue with examples, connective tissue and its types, location, structure and function of areolar tissue including function of different types of cells, adipose tissue, fibrous tissue-white and yellow fibrous tissue, differences between yellow elastic fibres and white collagen fibres, skeletal tissue – bone and cartilage, differences between bone and cartilage, hyaline cartilage, T.S. and L.S. of bone, fluid connective tissue – blood and lymph, different types of muscles and their functions, structure and function of neurons, types of neurone, myelinated and non myelinated nerve fibre, synapse.]

- ii. **Nutrition (human): Organs of digestion (histology not required), digestive process; nutritional requirements – carbohydrates, proteins, fats, minerals and vitamins, nutritional imbalances and deficiency diseases.**

[ **Scope:** *Structure and functions of digestive organs and their associated glands, digestive process (physiology of digestion), hormonal regulation of digestive juices, absorption of digested food, factors controlling the absorptive power and small intestine as principal site for absorption, assimilation of digested food, nutritional requirements for carbohydrates, proteins, fats, minerals and vitamins, balanced diet, malnutrition deficiency diseases.*]

- iii. **Respiration (human): Organs of respiration, breathing mechanism (inspiration and expiration), pulmonary gas exchange, transport of respiratory gases, chloride shift, pulmonary air volumes and lung capacities.**

[**Scope:** *Pulmonary gas exchange and organs involved, transport of gases in blood, mechanism of pulmonary gas exchange, breathing process should be explained showing the action of diaphragm and intercostal muscles, organs involved and pulmonary air volumes must be taught, transport of oxygen in the blood as dissolved oxygen and as oxyhaemoglobin, transport of CO<sub>2</sub> as carbonic acid and as bicarbonates.*]

- iv. **Circulation: Closed and open vascular systems; structure of heart (human), cardiac cycle, systemic and pulmonary circulation, portal system, arterial blood pressure, types of hearts, origin and conduction of heart beat, blood vessels (structure and adaptation), blood clotting, ABO system of blood grouping, Rh – factor, lymph and lymphatic system.**

[**Scope:** *Differences between closed and open vascular system, advantages of closed vascular system, external and internal structure of heart with the help of diagrams should be taught, function of different valves, neurogenic and myogenic heart, properties of heart muscles, working of heart (systole and diastole) and blood flow through the heart during different phases should be discussed under the following headings – auricular systole, auricular diastole, ventricular systole, ventricular diastole and joint diastole, brief idea of cardiac output, arterial blood pressure (systolic and diastolic) lymph and lymphatic system, the internal structure of artery, vein and capillary with the adaptations for their functions should be discussed, mechanism of blood clotting, ABO system of blood grouping, Rh-factor etc should be discussed.*]

- v. **Excretion: Ammonotelism; ureotelism; ureotelism, structure of human kidney (L.S.), structure of nephrons, role of skin and lungs in excretion, physiology of urine formation, counter-current mechanism, haemodialysis (artificial kidney).**

[**Scope:** *Define and explain the terms ammonotelism, ureotelism, uricotelism with examples, external and internal structure of the kidney with function of the various parts, structure of nephron, physiology of urine formation – ultra filtration and selective reabsorption, regulation of urine formation, counter current system, role of lungs and skin in excretion, brief idea of process of haemodialysis.*]

- vi. **Endocrine system: Hormones of pituitary, thyroid, parathyroid, thymus, pancreas, adrenal glands and gonads (testes and ovaries), effect of hyposecretion and hypersecretion, feedback mechanism.**

[**Scope:** *Brief idea of location of endocrine glands, tropic hormones of pituitary and their functions, feedback control of tropic hormones, hormones secreted by different lobes of pituitary and their functions, hypophysectomy, hormones of thyroid, parathyroid, pancreas, adrenal and gonads, effects of hypo and hyper secretion of various hormones, differences between mineralocorticoids and glucocorticoids.*]

- vii. **Nervous system : Central, autonomic and peripheral nervous system, structure of spinal cord, reflex action, transmission of nerve impulse, saltatory conduction, receptors (mechano, chemo, photo and thermo receptors), sense organs (eye and ear), defects of eyes and its correction).**

[**Scope:** *Nervous coordination, central, autonomic and peripheral nervous system, structure and function of various parts of the brain and spinal cord, names of cranial nerves and their function, differences between sympathetic and*



*parasympathetic nerve fibres, conduction of nerve impulse through nerve fibre and through synapse, conduction of nerve impulse through a myelinated nerve fibre, reflex arc to be taught with diagrams showing the pathway by means of arrows, physiology of reflex action, natural reflex and conditioned reflex, structure and working of eye and ear, classification of sense organs, students should know the definition of various types of receptors, common defects of the eye and their correction.]*

**viii. Locomotion: Joints, structure of skeletal muscle, sliding filament theory of muscle contraction, classification of muscles on the basis of functions, properties of muscles, red and white muscle fibres, isotonic and isometric contraction, summation, tetanus and rigor moris.**

*[Scope: Joints, muscle movements, types of skeletal movements, basic aspects of human skeleton. Functions of human skeleton; different types of joints – their location and function; general properties of muscles; types of muscles according to types of movement; sliding filament theory of muscle contraction; chemical events during muscle contraction should be dealt with separately; brief idea of isotonic and isometric contraction, summation, tetanus, rigor mortis, red and white muscle fibres.]*

**ix. Reproduction: Internal structure of human testis and ovary, menstrual cycle, gametogenesis, embryonic development in mammals (up to three germ layers).**

*[Scope: Organs of male and female reproductive system and their functions; internal structure of testis and ovary; gametogenesis-spermatogenesis and oogenesis; menstrual cycle – different phases and hormone action, fertilisation, physico-chemical events during fertilisation, implantation, embryonic development up to three germ layers, foetal membranes, placenta and its functions.]*

**x. Growth, ageing and death: Types of growth, growth curve, morphological and physiological changes during ageing, causes of death.**

*[Scope: Definition of auxetic, multiplicative and accretionary growth, sigmoid curve and J shaped curve should be discussed; brief idea of reparative and restorative regeneration should be given; general idea of changes that take place with advancement of age.]*

## **SECTION B**

### **3. ORIGIN AND EVOLUTION OF LIFE**

**i. Origin of life: Living and non-living; chemical evolution; organic evolution - Oparin ideas, Miller-Urey experiments; inter-relationship among living organisms and evidences of evolution – fossil records including geological time scale, morphological evidence, homology, analogy, vestigial organs, embryological similarities and bio-geographical evidence.**

*[Scope: Important view on the origin of life, modern concept of origin of life, Oparin. Haldan theory, coacervates, Miller and Urey experiment, evidences of evolution, vestigial organs, differences between homologous organs and analogous organs, evolution of horse, Darwin's finches, atavism.]*

**ii. Theory of Evolution: Lamarckism, evidence in favour of Lamarckism (giraffe's neck and feet of modern horse), criticism, Neo-Lamarckism, Darwinism, basic postulates of Darwinism, drawbacks of Darwinism, Neo Darwinism, variation, causes of variation, selected examples of natural selection (industrial melanism, drug resistance, malaria in relation to G-6-PD deficiency and sickle-cell anaemia), artificial selection, adaptations (Lederberg's replica platin experiment), speciation, sympatric and allopatric speciation, reproductive isolation, Human evolution – Dryopithecus, Australopithecus, Homo erectus, Homo neanderthalensis, Cromagnon man and Homo sapiens, differences between apes and man, evidences for common ancestry of apes and man, cultural vs. biological evolution.**

*[Scope: Brief idea of Lamarck's theory to be given for better understanding of evolution; salient features of Darwinism; causes of variation; examples of natural selection-industrial melanism, resistance of mosquitoes to*



*pesticides, sickle cell anaemia, G-6-PD deficiency; difference between natural and artificial selection, Lederberg's replica platin; experiment with Darwinian interpretation, mechanism of speciation, definition of gene pool, reproductive isolation, allopatric and sympatric speciation; evolution of man- brief idea of ancestors leading to man of today; comparison and homology in chromosomes of apes and man.]*

**iii Mutation: Chromosomal aberrations, gene mutations, somatic and heritable mutations, spontaneous and induced mutations, role of mutations in speciation.**

**[Scope: Chromosomal, gene, spontaneous and induced mutation in brief, role of mutation in speciation should be dealt.]**

## **APPLICATIONS OF BIOLOGY**

- i. **Role of Biology in the amelioration of human problems.**
- ii. **Domestication and introduction of plants: a historical account; improvement of crop plants; principles of plant breeding and plant introduction.**
- iii. **Fertilizers: chemical and bio-fertilizers, uses, advantages and disadvantages (comparative), green manures, crop residues, Nitrogen-fixation – symbiotic and asymbiotic.**
- iv. **Pesticides: its uses, advantages and hazards, Integrated Pest Management (IPM), Biological methods of pest control.**
- v. **Bio-energy: biomass, wood, cow-dung cakes, gobar gas, petrocrops.**
- vi. **Crops today: current concerns; gene-pool and genetic conservation, gene-bank, under-utilized crops with potential uses of oil seeds, medicines, beverages, spices, fodder, gum-resin and timber yielding plants (with at least two examples of each type with reference to locally available species)**
- vii. **Tissue culture and genetic engineering in crops: methods and its application. Tissue-culture practices in Bhutan.**
- viii. **Domestication and introduction of animals – improvement of animals, principles of animal breeding, major animal diseases with especial reference to local breeds and their control, livestock, poultry, fishes (fresh-water), Aqua-culture, insect Culture and their products (eg. Silk, honey, wax and lac)**
- ix. **Biotechnology – a brief historical account, definition, methods and its application in production of cheese, yoghurt, alcohol, yeast, vitamin, organic acid, antibiotics, production of insulin, Human Growth Hormone (hGH), Single Cell-Protein (SCP).**
- x. **Cancer: major types, causes, diagnosis and treatment; interferon.**
- xi. **AIDS: causes, symptoms, mode of transmission, present status in Bhutan, prevention and control**
- xii. **Human diseases – definition, causal organism, Incubation Period (I.P), symptoms, mode of transmission, control measures of major communicable diseases caused by Protozoan, Bacteria, Viruses and Fungi; congenital diseases and dysfunctions, sex-linked diseases; allergies and inflammation, genetic incompatibilities and genetic counselling.**
- xiii. **Immunology: Immune system, antigen-antibodies, vaccines and antiserum, vaccination, Immunity – active and passive; ELISA test.**
- xiv. **Tissues and organ transplantation: Test-tube babies, Amniocentesis, DNA finger printing, Biomedical engineering, spare parts for man (Prosthesis); instruments for diagnosis of diseases- ECG, EEG, CT – scan, ultra sound imaging, pacemaker, endoscopy, implants, disposables, future of Biology.**

- xv. **Community Health services and measures: Blood Banks, Role of Health Centres in community health services, Mental Health, Drugs- its classification, drug-addiction and its abuses – their effect on general health. Smoking and alcoholism and the hazards on human health and community, reproductive health cares.**  
*[Scope: The topics should be covered as per the sub-topics mentioned.]*

## PAPER II

### PRACTICAL WORK

1. **Taxonomy: Study of floral characteristics through dissection of flowers, drawing floral formula and diagrams of following families.**

- i. **Leguminosae-subfamily- Papilionaceae type- Sweet pea / Beans**
- ii. **Malvaceae-type- China rose / Hollyhock**
- iii. **Solanaceae-type- Petunia / Potato / Datura / Bringal**
- iv. **Brassicaceae (Cruciferae) – type- Mustard**
- v. **Amaryllidaceal – type: Lily (available in Bhutan during June-July till December closely related to Liliaceae - Monocot family.**

*[Scope: Floral characteristics should be explained by dissection of flower, students should be taught how to take vertical section of the flower and draw accordingly labelled diagrams, the techniques of drawing floral diagrams with mother axis in the right position should be taught, floral formula should be correctly written, identification of the correct family giving reasons, techniques of cutting T.S. and L.S. of ovary should be explained and accordingly correct labelled diagrams should be drawn, students should be taught the examples of plants belonging to each family with their economic importance, common names and their scientific names, description of floral parts should be written in semi-technical terms.]*

2. **Simple biochemical and physiological experiments**

- i. **Demonstration of Plasmolysis.**
- ii. **Demonstration of Osmosis in living plant cells (Potato osmoscope).**
- iii. **Demonstration of unequal transpiration in leaves by cobalt chloride method and four-leaf method.**
- iv. **To prove that oxygen evolution takes place during photosynthesis**
- v. **Demonstration of the effect of temperature on enzyme (diastase) / salivary amylase action on starch solution**
- vi. **To demonstrate that carbon dioxide is necessary for photosynthesis.**
- vii. **To show the effect of different carbon dioxide concentration on the rate of photosynthesis**

*[Scope: Students should be taught to set up and demonstrate the experiments with correct diagram of the set up and give conclusions. This will give a clear idea of the physiological processes.]*

3. **Studies of the following with the help of models. (Students would be required to sketch, label and identify the various organs and know their role in the body).**

- i. **Human digestive system**
- ii. **Human heart**
- iii. **Human eye**
- iv. **Human ear**
- v. **Human brain**

*[Scope: Students should be taught to identify a part pointed in the system or model. The role of that part should be given. Diagrams are important.]*

4. **Slide preparation**

- i. **Striated muscles of cockroach / grasshopper**
- ii. **T.S. of dicot stem**
- iii. **T.S. of monocot stem**
- iv. **Preparation of blood cells of human and toad**
- v. **Nerve cells from spinal cord of a vertebrate**

*[Scope: The technique of collecting the material from the correct location, teasing the material, staining and mounting neatly should be explained. Identification of the mount under the microscope should be taught. Students must know the use of low power and high power of microscope. They should also know how to make labelled outline drawings.]*

**5. For spotting (three minutes is to be given for each spot)**

**i. Identify and comment on permanent slides of**

- a. **T.S. of hyaline cartilage of mammal**
- b. **T.S. of bone of mammals**
- c. **T.S. of pancreas of mammals**
- d. **T.S. of dicot and monocot stem**
- e. **T.S. of dicot and monocot root**
- f. **T.S. of dicot and monocot leaf**

*[Scope: Students should be able to identify, giving reasons and draw a labelled diagram in the allotted time i.e. 3 minutes.]*

**ii. Comment on experimental set up studied in physiology**

*[Scope: Students should identify the physiological setup and write the aim and brief description of the experiment.]*

**iii. Comment and identify stages of mitosis and meiosis permanent slide**

*[Scope: Permanent slides should be shown of different stages and students should be able to identify and write the characteristics of the identified stage and draw diagrams of the stages shown.]*

## **PROJECT WORK**

Candidate is to creatively execute one project/assignment on any aspect of Biology. Teachers may assign or students may choose any project of their choice. Teacher should guide students in execution of their project. The project should be of minimum length of about 1000 – 1500 words. The projects must be carried out by the candidates and the original work should be compiled and the outcome must be submitted in neatly hand written or typed form on time.

The candidates are to prepare a technical report formally written including an abstract, some theoretical discussion, experimental setup, observations with tables of data collected, analysis and discussion of results, deductions, conclusions, etc. (after the draft has been approved by the teacher). The report should be kept simple, but neat and elegant. No extra credit shall be given for type-written materials/decorative cover.

The Project work is to be assessed by teacher and the visiting examiner appointed by BBE.

### **Suggested Topics**

- i. **Projects on diabetes**
- ii. **Behaviour as guided by Endocrine glands**
- iii. **Vegetarianism/non-vegetarianism**
- iv. **Role of micro-organism in industry**
- v. **Drug addiction and community**
- vi. **Projects on balanced diet**
- vii. **Human population**

- viii. Cancer
- ix. Aids/Hepatitis
- x. Cell organelles

### **Ecology**

- i. Abiotic and biotic factors
- ii. Food chains
- iii. Ecological pyramids
- iv. Ecosystems
- v. Biomass and bionumber
- vi. Carbon, nitrogen and minerals cycles
- vii. Environmental resistance
- viii. Ecological impact of pollution
- ix. Acid rain
- x. Ozone layer
- xi. Conservation of forests
- xii. Green House Effect

### **Further Suggestive Topics**

- xiii. Mushroom-culture practises
- xiv. Cultivation practices in Bhutan
- xv. Piggery
- xvi. Poultry
- xvii. Bee-Keeping practices in Bhutan
- xviii. Dairy farming, Fishery
- xix. Lac-Culture, medicinal plants of Bhutan, birds of Bhutan, butterfly of Bhutan.
- xx. Horticulture practices in Bhutan
- xxi. Tissue culture with reference to Bhutan.
- xxii. Natural resources of Bhutan.

### **TIME ALLOCATION AND WEIGHTING**

Unit	Total	Time in hours
<b>Section A</b>		
1. Multicellularity: structure and function – Plant life	28%	33 hr 20 min
2. Multicellularity: structure and function – Animal life	28%	33 hr 20 min
<b>Section B</b>		
3. Origin and evolution of life	22%	22 hr 30 min
4. Application of Biology	22%	23 hr 20 min
	<b>100%</b>	<b>112 hr 30 min</b>
<b>Practical</b>		<b>17 hr 30 min</b>
<b>TOTAL</b>		<b>130 Hours</b>

## MODE OF ASSESSMENT

The candidate will be assessed internally by the school as per the following procedures and externally by the Bhutan Board of Examinations. The purpose of internal assessment is to evaluate the candidate's progressive learning and to complete the Year's Progress Report form of individual candidate. The internally assessed marks will have no bearing on the Board Examinations.

Terms	Types of Assessment & Weighting			Total
	CA	Examinations		
		Paper I: Theory	Paper II: Practical	
First	10%	30%	-	40%
Second	10%	40%	10%	60%
<b>Total</b>	<b>20%</b>	<b>70%</b>	<b>10%</b>	<b>100%</b>

### 1 Continuous Assessment (CA)

The candidate will be assessed across the two terms through Continuous Assessment (CA) by the following modes.

- 1.1 Assignment:** For CA during the FIRST term, each candidate will choose any topic from the class XII syllabus and write a short assignment of about 750 – 1000 words. This is to extend the learning through literature research. The award of marks may be based on the following marking scheme:

<i>Presentation</i>	Table of content, bibliography, introduction, main body and conclusion (1.5%)
<i>Content</i>	Relevant information, analysis and depth (2.5%)
<i>Language</i>	Clarity of ideas, use of terms and grammar (1%)

- 1.2 Presentation:** The candidate will also present the assignment to the class in the FIRST term. The presentation may be of 10 minutes duration followed by three to four questions from the class and teacher. The award of marks may be based on the following marking scheme:

<i>Content</i>	Coverage of main ideas and depth (2.5%)
<i>Language</i>	Not memorised but in student's own words (1.5%)
<i>Discussion</i>	Ability to respond tactfully and correctly (1.5%)

- 1.3 Project work:** During the SECOND term, the Project Work which the candidate has been doing through out the two terms will be assessed for CA. The award of marks may be based on the following marking scheme:

<i>Presentation</i>	Table of content, bibliography, introduction, main body and conclusion (2%)
<i>Content</i>	Relevant information, analysis and depth (3%)
<i>Language</i>	Clarity of ideas, use of terms and grammar (2%)
<i>Process</i>	Draft copy, notes taken during literature research or information gathering, consultation of subject teacher, experimentation (3%)

**Note:** The Project Work marks secured by the candidate will be reflected both in the Progress Report Card (internal) as well as under Paper II of the Board Examinations.

### 2. Examination

There will be written examinations at the end of the both terms. A practical examination is mandatory at the end of the year. Assessment is based on the weighting given above.

The end of the year examination will cover the entire syllabus. There will be TWO papers in the subject.

2.1 *The question scheme for trial examination:*

**Paper I: Theory:** 3 hours = 100 marks (with a weighting of 40%)

**Paper II: Practical:** 3 hours = 20 marks (with a weighting of 10%)

2.2 *The weighting scheme and duration for the Board Examinations:*

The examinations will cover the entire syllabus. There will be TWO papers in the subject.

**Paper I: Theory:** 3 hours .. 100 marks (70 %)

**Paper II: Practical:** 3 hours .. 20 marks (20 %)

**Project work:** .. 10 marks (10 %)

(Marks for the Project Work to be brought from the CA component)

### **Paper I (Theory):**

There will be one paper of 3 hours duration divided into 2 parts.

**Part 1 (40 marks)** will consist of compulsory 20 short answer questions, testing knowledge, application and skills relating to elementary / fundamental aspects of the entire syllabus.

**Part 2 (60 marks)** will be divided into 2 Sections A and B. Candidates are required to answer **three** out of **five** questions from Section A carrying 10 marks each and **two** out of **four** questions from Section B carrying 15 marks each.

**Note:** The Trial Examinations will follow the question format as set for the Board Examinations.

## **TEXTBOOKS AND REFERENCE**

### **Textbooks**

1. *A Complete Course in ISC Biology: Vol. I (Class XI)* by Dr. (Mrs) V.B Rastogi, Pitambar Publishing Company Pvt Ltd., N Delhi (2003)
2. *A Complete Course in ISC Biology: Vol. II (Class XII)* by Dr. (Mrs) V.B Rastogi, Pitambar Publishing Company Pvt Ltd., N Delhi (2003)
3. *ISC Practical Biology, Vol. I (Class XI)* by Dr. (Mrs) V.B Rastogi Pitambar, N. Delhi (2003)
4. *ISC Practical Biology, Vol. II (Class XII)* by Dr. (Mrs) V.B Rastogi Pitambar, N Delhi (2003)
5. *Natural resources of Bhutan and their conservations (Biology Supplementary Text for Class XI)*, CAPSD (2004)
6. *Tissue Culture Practices in Bhutan (Biology Supplementary Text for Class XII)*, CAPSD (2005)

### **References**

1. *Oxford Dictionary of Biology*, Oxford University Press (2000)
2. *Biological Science*, 3<sup>rd</sup> edition by D.J Taylor, NPO Green, GW Stout, Cambridge University Press (1997)
3. *Advanced Biology – Principles and Applications* by CJ Clegg & DG Mackean, (Foundation books) Cambridge University Press (2000)
4. *Biology for Class XI*, NCERT, N. Delhi (2003)
5. *Biology for Class XII*, NCERT, N. Delhi (2003)

# History



## **CLASSES XI AND XII HISTORY**

### **RATIONALE**

The history portion of this syllabus consists of Bhutan History, Bhutan Civics, Indian History and World History. The Bhutan History course focuses on emergence of Bhutan as a Nation State, contemporary Bhutan as well as emergence of Buddhism as a religion of Bhutan, Art and Architecture, Literature and Dance Forms. The course will help the students to know the socio- economic as well as cultural and political progress of the nation and its role and position in the international forum. It would also provide an insight to the significance of Bhutanese Art and Architecture, Bhutanese Literature and Dance forms. The part on Buddhism will familiarize the students with the different Buddhist traditions as well as the important personalities associated with the Bhutanese Buddhism.

The Section on Bhutan Civics will help the students to understand the concept of Society, State and Nation. It will also familiarize the students on the form of Bhutanese Government in relation to other forms of Government. The discussion will also lead to the understanding of the characteristics and classification of constitution in relation to the Constitution of Bhutan. The powers of the Monarch and Prime Minister in relation to Parliamentary Democracy as well as the composition of the Council of Ministers will also be discussed. The students will also understand the role and significance of the Civil Service in a Parliamentary Democracy.

The Indian History portion deals with the socio-religious reforms and freedom movement. This section would enable the students to realise the evils that existed in the society and the measures adopted to eradicate it. The pertinence and the need to have unity and integrity of individuals and groups from different socio-religious as well as ethnic background for the security and sovereignty of a nation can be instilled in the students through the sacrifices made in the Freedom Movements.

The section on World History will generate awareness in the students on some of the issues and major events that had lifted the world to its glory and also dropped it in the ditches. The World History portion will consequently create a better understanding of the peoples of the world, which is an indispensable step towards harmonious human co-existence.

### **AIMS**

The History course at this level aims at developing in students:

1. a historical perspective and wider understanding of emergence of Modern Bhutan and its role in the international forum as well as its cultural and religious heritage.
2. a wider understanding of the contemporary world issues and democracy.
3. a deeper understanding of peoples of the world for harmonious co-existence.
4. a sense of unity and integrity for the security and sovereignty of the nation.
5. a vivid understanding of the historical concepts of continuity and change.
6. an appreciation of the Bhutanese cultural heritage.
7. transferable skills like conducting field work, interviewing, recording, analysing, evaluating, interpreting, synthesising, etc.
8. a sense of loyalty, responsibility and commitment to the people and the nation.

### **LEARNING EXPERIENCES**

To make the most out of history course the teachers should provide a wide range of learning experiences to the students that include:

1. group works in the classrooms.
2. use of media such as films, journals, newspapers, television, photographs and maps.
3. conducting field work/research.
4. assignments.
5. making class presentations.

6. taking notes.
7. using globes and political maps.
8. asking questions.
9. locating information in the references and using it.

## **LEARNING OUTCOMES**

At the end of the course the students will be able to:

1. explain the historical events that led to the emergence of Modern Bhutan and its role in the international forum.
2. value the significance and beauty of Bhutanese Art, Architecture, Literature and Dance Forms.
3. identify the basic principles of Buddhism and its impact on the Bhutanese tradition and culture.
4. show an understanding of some historical aspects of the Indian civilization, culture and freedom movement.
5. explain the formation of UN and its major agencies, and a few regional organisations and discuss their roles.
6. list and sequence historical events to show an understanding of time, change and continuity.
7. locate, select, organise and present historical information.
8. make deductions from a variety of historical sources (e.g. photographs, graphs, written, oral, maps, globes, artifacts).
9. value the rights and responsibilities of citizens and realise their duty as good citizens of the country.
10. value the nation's cultural heritage and work towards its preservation and promotion.
11. value the contributions made by the past generations for safeguarding the security of the nation and ensuring peace and progress, and contribute towards nation building.
12. apply the skills acquired in real situations.
13. read historical views in the light of new evidence
14. value the contributions made by world organisations in maintaining peace and order in the world and solving problems that humanity faces, and contribute towards global understanding.
15. Understand the concept of Society, State and Nation.
16. Understand the form of Bhutanese Government in relation to other forms of Government.
17. Understand the characteristics and classification of constitution in relation to the Constitution of Bhutan.
18. Understand the powers of the Monarch and Prime Minister in relation to Parliamentary Democracy.
19. Understand the composition and powers of the Council of Ministers.
20. Understand the role and significance of the Civil Service in a Parliamentary Democracy.

## CLASS XI HISTORY

### SECTION A (BHUTAN HISTORY)

#### UNIT ONE: CULTURAL HERITAGE (10%) (15 HOURS)

Zorig Chusum: The Thirteen Traditional Crafts (*Categories of crafts; its features and significance.*)

Bhutanese Literature (*Types, features and significance.*)

Dance Forms (*Types, features and significance.*)

#### UNIT TWO: EMERGENCE OF DRUKPA KAGYUD (15%) (20 HOURS)

Theravada, Mahayana and Vajrayana (*Origin of Mahayana, Theravada and Vajrayana and their differences.*)

Pioneers of Kagyud and Drukpa Kagyud (*Brief life history and contributions of Tilopa, Naropa, Marpa, Milarepa, Gampopa, Phagmodrupa, Lingrepa Pema Dorji and Tshangpa Gyay Yeshey Dorji*)

### SECTION B (BHUTAN CIVICS)

1. Society, State and Nation (*Definition of a Society, The essential attributes of a society, Definition of a State, The essential attributes of the State, Definition of a Nation, Distinction between the State and the Nation.*)  
(5%) (6 hours)
2. Forms of Government (*Background, Aristotle's Classification, Forms of Modern Government, Democratic Government, Forms of Democratic Government, Merits and Demerits, Merits, Demerits, Forms of non-Democratic Governments, The Bhutanese form of Government.*) (5%) (7 hours)
3. Constitution (*Background, Definition of the Constitution, General Characteristics of the Constitution, Classification of Constitutions, Merits of written Constitution, Demerits of written Constitution, Merits of Unwritten Constitution, Demerits of Unwritten Constitution, Merits of Flexible Constitution, Demerits of Flexible Constitution, Merits of Rigid Constitution, Demerits of Rigid Constitution, Characteristics of a Good Constitution, Constitution of Bhutan, Merits of the Bhutanese Constitution, Demerits of the Bhutanese Constitution.*)  
(5%) (7 hours)

### SECTION C (INDIAN HISTORY)

#### UNIT ONE: RISE AND GROWTH OF BRITISH POWER IN INDIA (15%) (15 HOURS)

- 1.1 The Anglo-French Struggle in India  
(*Causes, events and impact of Carnatic Wars, Reasons for English success and the French Failure in the Carnatic wars; Nawab Siraj-ud-daula and his relations with the English to the Battle of Plassey; Relation between the English and the Nawab's of Bengal from Plassey to Buxar; Relations of the company with Mir-Jafar and Mir-Kasim and the circumstances leading to the Battle of Buxar; Impact and significance of the Battle of Plassey and Buxar.*)  
Note: Teacher should introduce about the British, French and Portuguese presence in India briefly.
- 1.2 Socio-economic and cultural impact of the British rule  
(*Impact of Industrial revolution on Indian Economy; Characteristics of new thought in Europe; Impact of the new thought in Europe on Indian Society and Culture; Contributions of Lord William Bentick on Social, Humanitarian and Liberal reforms in India; Spread of Modern Education and English as a medium of Instruction; Development of Transport and Communication, British land Revenue Policy; Permanent Settlement; Ryotwari Settlement of Land revenue; Tenancy Laws under British Rule.*)

## **UNIT TWO: THE UPRISING OF 1857 (5%) (10 HOURS)**

Causes of the Uprising (*Discuss in detail.*)

Out break at Meerut and few other places like Delhi, Lucknow, Kanpur, and Jhansi.

Causes of the failure.

Nature of the rebellion. (*Discuss in detail.*)

The impact of the 1857 Uprising on the British policy in India.

## **UNIT THREE: SOCIO-RELIGIOUS MOVEMENTS (10%) (15 HOURS)**

The Brahma Samaj (*Emergence, Raja Ram Mohon Roy, Features of the Samaj, Contributions of Samaj, Division of Samaj.*)

The Prathana Samaj (*Emergence, Kashab Chandra Sen, Features and contributions of the Samaj.*)

The Arya Samaj (*Emergence, Dayanand Saraswathy, Sudbi Movement, Features and contributions of the Samaj.*)

Rama Krishna Mission (*Emergence, Sree Rama Krishna Paramakhana, Swami Vivekananda, Features and reforms of the Movement.*)

The Theosophical Societies (*Emergence, Principles of the movement, Mrs. Annie Besant, Impcat.*)

The Aligarh Movement (*Origin, Sir Syed Ahammed Khan, features and impact on the Muslim Society.*)

## **SECTION D (WORLD HISTORY)**

### **Unit One: The First World War (10%) (10 hours)**

1.1 Causes of First World War (*Anglo-German Rivalry; reasons leading to the formation of Triple Entente; Balkan Crisis; Austro-Serbian Rivalry and Sarajevo tragedy.*)

1.2 Course of the First World War (*Review of the major battles; reasons for the participation of the USA; causes of the collapse of the Central Powers.*)

### **UNIT TWO: THE SEARCH FOR INTERNATIONAL ORDER (10%) (10 HOURS)**

Peace making process after First World War (*Peace Conference in Paris and related problems; The Treaty of Versailles and its terms; German objection to the Treaty of Versailles; Merits and demerits of the Treaty of Versailles; Causes of its failure.*)

The League of Nations (*Origin and Ideas of the League of Nations; The structures, functions, objects of the League; Strengths and weaknesses of the League; causes of the failure of the League.*)

### **UNIT THREE: THE DEVELOPMENT OF COMMUNISM. (10%) (20 HOURS)**

The Bolshevik revolution (Causes, main events leading to the Revolution.)

Lenin (*Problems faced and achievements.*)

Stalin (*Reforms; concept of a State; Economic policy collectivisation; Five Year Plans; Purges; Estimate of the contribution of Stalin.*)

Chinese Republic from 1911 to 1949 (*The Revolution of 1911, internal developments to 1927, KMT and the Communists, causes of the Communist victory.*)

## TIME AND WEIGHTING

Section	Unit	Hours per unit	Weighting per unit
<b>A</b> <b>Bhutan Civics</b>	1. Society, State and Nation	6	5%
	1. Forms of Government	7	5%
	2. Constitution	7	5%
<b>B</b> <b>Bhutan History</b>	1. Cultural Heritage	15	10%
	2. 2. Emergence of Drukpa Kagyud	20	15%
<b>C</b> <b>Indian History</b>	1. Rise and Growth of British Power in India	15	15%
	2. The Uprising of 1857	10	5%
	3. Socio-religious Movement	15	10%
<b>D</b> <b>World History</b>	1. First World War	10	10%
	2. The Search for International Order	10	10%
	3. The Development of Communism	20	10%
<b>Total</b>		<b>135</b>	<b>100%</b>

## MODE OF ASSESSMENT

The students will be assessed internally by the school in class XI as per the following procedures.

Terms	Types of Assessment		
	CA	Examination	Total
First Term	10%	30%	40%
Second Term	10%	50%	60%
<b>Total</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>

### 1 Continuous Assessment

#### *Assignment and Presentation*

The students will choose any topic from the class XI syllabus and write a short assignment of about 750 words in the FIRST term and present it to the class in the SECOND term. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do Literature research on the chosen topic and find information that is not available in the textbook. Marks may be awarded as follows (*suggestive only*):

#### 1.1. Marking criteria for Assignment

##### Presentation

(Table of contents, bibliography, introduction, main body and conclusion) 3%

Content (Relevant information, analysis and depth) 5%

Language (Clarity of ideas, use of accurate terms and grammar) 2%

#### 1.2. Marking criteria class Presentation

The students will present their assignment to the class in about 10 minutes followed by at least three questions from the classmates and the subject teacher. Marks may be awarded as follows (*suggestive only*)

Content (coverage of main ideas and depth) 5%

Language (not memorized but in students' own words) 2%

Discussion (ability to respond tactfully and correctly) 3%

### 2. Examination

There will be an examination at the end of each term on one paper of three hours duration of 100 marks divided into two parts. However, while entering in the statement of marks it should be converted to 30% for the first term and 50% for the second term.

**Part One** (30%) will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be questions worth 30 marks in

all from sections, A, B, C and D. The number of questions on each section will be determined by the weighting of the sections. *There will be question worth 4 marks from Bhutan Civics, 8 marks from Bhutan History, and 9 marks each from Indian and World History.*

**Part Two** (70%). There will be four sections (A, B, C and D) on Bhutan History, Bhutan Civics, Indian History and World History. There will be two questions on Bhutan Civics worth 10 marks each of which students will attempt one question. There will be three essay type questions from each section on Bhutan, Indian and World History worth 10 marks each. Students will attempt two questions from each section. The students will choose a total of seven questions from part two. Two each from History sections (Bhutan, Indian and World) and one question from Bhutan Civics. (1+2+2+2=7 questions).

## **CLASS XII HISTORY**

### **SECTION A (BHUTAN HISTORY)**

#### **UNIT ONE: EMERGENCE OF A NATION STATE (10%) (13 HOURS)**

- 1.1 The Era of Zhabdrung and the Desis (*Contributions of Zhabdrung; Modalities of becoming a Desi; Contributions of the Desis.*)
- 1.2 The Establishment of Hereditary Monarchy. (*Contributions of Jigme Namgyal; Role of Lam Jangchub Tsondrue; Significance of the Last Civil War; Role of Ugyen Dorji; Younghusband Mission; Events leading to December 17, 1907.*)
- 1.3 The Period of Consolidation. (*Possible challenge to the Right to the Throne; The Indo-Bhutanese Treaty; Socio-cultural and economic as well as political reforms till 1972.*)

#### **UNIT TWO: EMERGENCE OF MODERN BHUTAN (10%) (13 HOURS)**

Reforms made by Druk Gyelpo Jigme Singye Wangchuck.

The International Organisations and Role of Bhutan in SAARC, NAM, and UNO. (*Brief background of each body and their functions; benefits for Bhutan, Role and contributions of Bhutan.*)

#### **Unit Three: Gross National Happiness (5%) (9 hours)**

Gross National Happiness (*Concept and features.*)

Development of Modern Education. (*History, progress, role and impact.*)

Development of Health Services. (*History, progress, role and impact.*)

Development of Modern Agriculture. (*History, progress, role and impact.*)

### **SECTION B (BHUTAN CIVICS)**

1. The Role of the Monarch in a Democratic Constitutional Monarchy (*Qualification for Ascension to the Golden Throne, Oath of Office, Term of Reign, Royal Privileges and Entitlements, Powers of the Monarch, Relations between the Monarch and the Council of Ministers.*) (4%) (6 hours)
2. The Prime Minister and the Council of Ministers (*The Prime Minister, Appointment, Term of Office, Powers and Functions, The Council of Ministers (Lhengye Zhungtshog), Appointment and Composition of the Council of Ministers, Term of Office, Powers and Functions of the Council of Ministers.*) (4%) (7 hours)



3. Directive Principles of State Policy (*Meaning of Directive Principles of State Policy, Classification of Directive Principles of State Policy, Significance of Directive Principles of State Policy, Differences between Directive Principles and Fundamental Rights*).  
(4%) (6 hours)

4. Civil Service in a Democratic Constitutional Monarchy (*Definition and meaning of Civil Service or Bureaucracy, Characteristics of Civil Service, Problems of Civil Service, Role of Civil Service in a Democratic Society, Civil Service and the Royal Civil Service Commission, Meaning of Position Classification System, Classification, Recruitment, Promotion*).  
(3%) (6 hours)

## SECTION C (INDIAN HISTORY)

### UNIT ONE: RISE AND GROWTH OF INDIAN NATIONALISM (8%) (10 HOURS)

1.1 Causes for the growth of Indian Nationalism (*Administrative and economic unity, western thought and education, racial arrogance, economic exploitation, role of the press and literature and Socio-religious movements and the discovery of India's past, Role of Lord Lytton; Ilbert Bill Controversy of 1883-1884, contributions of Important personalities, beginning of political agitation and international influences.*)

1.2 Foundation of Indian National Congress (*Hume's role should be studied critically especially his motives for initiating the congress and why the nationalists chose to follow his lead. A general look at the changing attitude of the British.*)

1.3 The Moderates. (*Programme and achievements of the moderates; Bal Gangadhar Tilak and his achievements.*)

### UNIT TWO: SWADESH AND BOYCOTT MOVEMENT (5%) (6 HOURS)

Partition of Bengal (*Impact of Curzon's policies; motives of partition; anti-partition movement.*)

Swadesh and Boycott Movement (*Factors leading to the movements; factors leading to split in the congress; consequence of the split; revolutionary dispositions.*)

#### Unit Three: Communal Factors in Indian politics (4%) (6 hours)

Factors contributing to the rise of communalism. (*Socio-economic factors, Indifference to English education, Impact of Wahib and Farazi Movement, 19<sup>th</sup> Century Revivalism, Role of Sir Syed Ahamed Khan, Role of communal organisations, Divide and Rule policy.*)

Impact of World War I on Indian politics.

### UNIT FOUR: GANDHIAN ERA FROM 1919 TO 1947 (8%) (12 HOURS)

Ideology of Gandhi. (*Passive resistance; Satyagraha; Non-violence Civil-disobedience.*)

Early political agitations (*Champaran, Kheda, and Ahmedabad Mill strikes.*)

Montagu-Chelmsford Reforms and agitation against Rowlatt Act.

Events leading to Khilafat Non-cooperation Movement (*Jallianwala Bagh Massacre of 1919, Gandhiji's first Non-cooperation movement.*)

Suspension of Non-cooperation movement (*Swarajya Party formation, contributions of Swarajists, causes of decline of Swarajya party.*)

Simon Commission (*its boycott, demand for Dominion status by 1929, impact of Nebru report; Lahore session; Poorna Swaraj.*)

Civil Disobedience Movement (1930-1934). (*Round Table Conference in London; deliberations and outcome.*)



## UNIT FIVE: LAST PHASE-1935-1947 (5%) (6 HOURS)

National Movement during World War II. (*Failure of Cripp's Mission; Quit India resolution; Government repression of the revolt of 1942.*)

Subash Chandra Bose and his contributions in the Freedom Struggle.

Independence. (*Mountbatten plan; partition and Independence.*)

## SECTION D (WORLD HISTORY)

### Unit One: Fascism and Nazism (8%) (12 hours)

1.1 Mussolini (*rise to power, main features of Mussolini's domestic policy; introduction and assessment of the fascist state.*)

1.2 Hitler (*problems facing the Weimer republic, rise to power, Nazi state from 1933 onwards.*)

### UNIT TWO: COLLAPSE OF INTERNATIONAL ORDER IN THE 1930S (8%) (10 HOURS)

Germany (*Rearmament and Foreign Policy from 1933-1939.*)

Japan (*aggressive nationalism, militarism in the 1930s, expansion of the Axis Pact, events leading to the attack of Pearl Harbour.*)

Italy (*aggressive nationalism, invasion of Abyssinia, involvement in Spanish Civil War, Mussolini's alliance with Hitler and its consequences.*)

### UNIT THREE: SECOND WORLD WAR (8%) (10 HOURS)

Factors leading to the war. (*Aggressive policy of Germany and Japan; Anglo-French Appeasement policies.*)

Events. (*Europe, Asia and Africa, American entry.*)

### UNIT FOUR: TENSION AND CO-OPERATION AFTER WORLD WAR II (6%) (8 HOURS)

Cold War (*Truman Doctrine, Marshall Plan, communist coup in Czechoslovakia, Berlin Blockade, NATO, division of Germany, Warsaw Pact of 1953-1959.*) Germany (*Rearmament and Foreign Policy from 1933-1939.*)

Regional Economic Cooperation since World War II (*EEC and ASEAN.*)

## TIME AND WEIGHTING

Section	Unit	Hours per unit	Weighting per unit
<b>A</b> <b>Bhutan Civics</b>	1. The Role of the Monarch in a Democratic Constitutional Monarchy	6	4%
	5. The Prime Minister and the Council of Ministers	7	4%
	6. Directive Principles of State Policy	6	4%
	7. Civil Service in a Democratic Constitutional Monarchy	6	3%
<b>B</b> <b>Bhutan History</b>	1. Emergence of Nation State	13	10%
	2. Emergence of Modern Bhutan	13	10%
	3. Gross National Happiness	9	5%

<b>C</b> <b>Indian History</b>	1. Rise and Growth of Indian Nationalism	10	8%
	2. Swadesh and Boycott Movement	6	5%
	3. Communal Factions in Indian Politics	6	4%
	4. Gandhian Era from 1919 to 1947	12	8%
	5. Last Phase – 1935 to 1947	6	5%
<b>D</b> <b>World History</b>	1. Fascism and Nazism	12	8%
	2. Collapse of International Order in the 1930s	10	8%
	3. Second World War	10	8%
	4. Tension and Co-operation after World War II	8	6%
<b>Total</b>		<b>140</b>	<b>100%</b>

## MODE OF ASSESSMENT

The students will be assessed **externally by the Bhutan Board of Examinations** in class XII. However, the schools will conduct internal assessments similar to that of class XI. The internal assessment will have no bearing on the external examination.

### 1. Internal Assessment

Follow the table below for the internal assessment.

Terms	Types of Assessment		
	CA	Examination	Total
First Term	10%	30%	40%
Second Term	10%	50%	60%
<b>Total</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>

#### 1.1. Continuous Assessment

##### *Assignment and Presentation*

The students will choose any topic from the class XII syllabus and write a short assignment of about 750 words in the FIRST term and present it to the class in the SECOND term. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do Literature research on the chosen topic and find information that is not available in the textbook. Marks may be awarded as follows (*suggestive only*):

- Marking criteria for Assignment
  - Presentation  
(*Table of Contents, Bibliography, Introduction, main body and conclusion*) 3%
  - Content (*Relevant Information, Analysis and depth*) 5%
  - Language (*Clarity of ideas, use of accurate terms and grammar*) 2%
- Marking criteria class Presentation
  - The students will present their assignment to the class in about 10 minutes followed by at least three questions from the classmates and the subject teacher. Marks may be awarded as follows (*suggestive only*):
  - Content (*coverage of main ideas and depth*) 5%
  - Language (*not memorized but in students' own words*) 2%
  - Discussion (*ability to respond tactfully and correctly*) 3%

## 1.2. Examination

There will be an examination at the end of first term and a Trial examination at the end of the year on one paper of three hours duration of 100 marks divided into two parts. However, while entering in the statement of marks it should be converted to 30% for the first term and 50% for the second term.

**Part One** (30%) will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be questions worth 30 marks in all from sections, A, B, C and D. The number of questions on each section will be determined by the weighting of the sections.

*There will be question worth 4 marks from Bhutan civics, 8 marks from Bhutan History, and 9 marks each from Indian and World History.*

**Part Two** (70%). There will be four sections (A, B, C and D) on Bhutan History, Bhutan Civics, Indian History and World History. There will be two questions on Bhutan Civics worth 10 marks each of which students will attempt one question. There will be three essay type questions from each section on Bhutan, Indian and World History worth 10 marks each. Students will attempt two questions from each section. The students will choose a total of seven questions from part two. Two each from History sections (Bhutan, Indian and World) and one question from Bhutan Civics. (1+2+2+2=7 questions).

## 2. External Examination by Bhutan Board of Examinations

There will be one paper of three hours duration of 100 marks divided into two parts.

**Part One** (30%) will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be questions worth 30 marks in all from sections, A, B, C and D. The number of questions on each section will be determined by the weighting of the sections.

*There will be question worth 4 marks from Bhutan civics, 8 marks from Bhutan History, and 9 marks each from Indian and World History.*

**Part Two** (70%). There will be four sections (A, B, C and D) on Bhutan History, Bhutan Civics, Indian History and World History. There will be two questions on Bhutan Civics worth 10 marks each of which students will attempt one question. There will be three essay type questions from each section on Bhutan, Indian and World History worth 10 marks each. Students will attempt two questions from each section. The students will choose a total of seven questions from part two. Two each from History sections (Bhutan, Indian and World) and one question from Bhutan Civics. (1+2+2+2=7 questions).

## TEXTBOOKS & REFERENCES

### Textbooks

1. Maity, P and Banerjee, S. (2003). *ISC History for Class XI*. Ludhiana: Kalyana Publishers
2. Banerjee, S. (2004). *ISC History for Class XII*. Ludhiana: Kalyana Publishers
3. CAPSD (2004). *Bhutan History for Class XI*. Thimphu: Ministry of Education
4. CAPSD (2004). *Bhutan History for Class XII*. Thimphu: Ministry of Education
5. CAPSD (2008). *Bhutan Civics: A Textbook for Class XI-XII*. Thimphu: Ministry of Education
6. CAPSD (2008). *Teachers' Guide for Bhutan Civics for Class XI-XII*. Thimphu: Ministry of Education

### References

1. Kundra, D.N. *A New Textbook of History of India (Part II)*. Navdeep Publications
2. Dev, Arjun, *Contemporary World History. A Textbook for Class XI, Part I*, NCERT
3. Dev, Arjun, *Contemporary World History. A Textbook for Class XII, Part II*, NCERT
4. Chandra, Bipan, *Modern India, A History Textbook for Class XI*, NCERT
5. Mittal, S. Chandra, *Modern India, A History Textbook for Class XII*, NCE

## ALLOCATION OF MARKS IN THE WRITTEN EXAMINATION

Content Area	Weighting
<b>Bhutan Civics</b>	14
Part I- Section A (compulsory)	4
Part II-Section A (essay questions-choice)	10
<b>Bhutan History</b>	28
Part I- Section A (compulsory)	8
Part II-Section A (essay questions-choice)	20
<b>Indian History</b>	29
Part I- Section A (compulsory)	9
Part II-Section A (essay questions-choice)	20
<b>World History</b>	29
Part I- Section A (compulsory)	9
Part II-Section A (essay questions-choice)	20
<b>TOTAL</b>	

# Geography

## **RATIONALE**

The course for classes XI and XII Geography is divided into Physical and Human Geography. The Physical part of the Geography familiarizes the students with general theories of physical geography and understands it in the Bhutanese context. The students will acquire skills and knowledge necessary to examine and evaluate the physical setting of the locality in which they live.

The Human Geography will inform the students on the relation that Human and Nature share. The students will acquire skills of living with natural as well as man made hazards.

In brief the study of Geography helps people to understand their environment better living and adjust with various conditions to achieve the goals of life.

## **AIMS**

The course aims at:

1. Providing adequate knowledge in the field of geographical studies.
2. Providing adequate opportunities for students to apply and analyze knowledge learnt in real life situations.
3. Developing the skills of observations, recording and interpretation of geographical data/information.
4. Developing a positive attitude towards the relationship between people and environment.
5. Enabling students to think globally and act locally.

## **LEARNING EXPERIENCES**

In order to make learning more enjoyable and meaningful, varied learning experiences needs to be provided to students. These should include:

1. Providing theoretical knowledge through lecture, reading, discussion, debate and using information and technology on various global and local geographical issues.
2. Carry out field visits to develop the skills of observation, recording and interpreting various geographical data
3. Using information provided through various media sources
4. Undertake a project work
5. Working in groups
6. Provide opportunities for independent study and library based research
7. Undertake field work and field visits

## **LEARNING OUTCOMES**

1. Cope with different areas of higher levels of studies
2. Adjust with working condition and other situation without much difficulty
3. Critically examine any information provided to them
4. Be informed about the interaction between people and environment
5. Use available information available to them in their daily life/work/studies
6. Pursue studies independently
7. Assess the impact of various aspect of development on social, economic, spiritual and cultural aspects of the life of the people
8. Cope with natural as well as human made hazards.

## CLASS XI GEOGRAPHY

### PHYSICAL GEOGRAPHY

#### UNIT ONE – THE LITHOSPHERE (31%) (36 HOURS)

- 1.1 Structure and Composition of the Earth  
*(Earth's interior/ structure, Earth's density/ temperature, Earth's Pressure and Earthquake waves and their characteristics.)*
- 1.2 Rocks  
*(Rocks and minerals, Classifications of rocks and their characteristics, Economic importance of each rocks and Rock-cycle.)*
- 1.3 Soils  
*(Definition and soil profile; Properties of soil; Factors of soil formation; Soil classification; definition of weathering; Types of Weathering- Physical, Chemical and Biological; Agents of Weathering- Physical, Chemical and Biological)*
- 1.4 Endogenetic processes and its effects on the surface on the surface  
*(Edogenetic forces- Diatrophism and sudden force; Diatrophism -folding and faulting; Land forms associated with edogeneous processes- mountains, plateaus and plains and their classification)*
- 1.5 The work of a river  
*(Development of a river valley, Drainage patterns, Landforms formed by a river and Cycle of erosion.)*
- 1.6 Aeolian Processes and associated landforms  
*(Hot deserts and type; Landforms made by wind erosion and deposition and Cycle of erosion in the arid region-Young, Mature and Old age)*
- 1.7 Work of Glacier  
*(Movement of Glacier, Types of Glacier and Landforms associated with glacier)*
- 1.8 Work of an Underground water  
*(Water table, wells, Aquifer, Artesian Well, Springs, Hot Springs and Geysers; Underground water as an agent of change; Conservation of water resources)*

#### UNIT TWO – ATMOSPHERE (22%) (28 HOURS)

- 1.1 Composition and structure of the Atmosphere
- 1.2 Importance of the Atmosphere
- 1.3 Insolation and temperature  
*(Heat budget of the earth, Latitudinal heat balance, Factors affecting solar radiation, Heating and cooling of the atmosphere, Horizontal Distribution of temperature and Inversion of temperature.)*
- 1.4 Atmospheric pressure and winds  
*(Factors affecting atmospheric pressure, Horizontal and seasonal distribution of atmospheric pressure, Types of winds, Moisture in the atmospheres, Forms of condensation and Precipitation: types and classification and distribution of rainfall.)*
- 1.5 World climatic types  
*(Weather and climate, Climatic change and Koeppen's classification of climate.)* (Refer the supplementary text for Climatic change and Koeppen's classification of climate.)



### UNIT THREE – BIOSPHERE (31%) (38 HOURS)

Ecology and ecosystem

*(Components of ecosystem, Food chain, Flow of energy through the food chain, Food web, Pyramid of numbers, Ecological balance, Role of human in the Biosphere, Environmental pollution and Resource Deterioration and depletion)*

Flora and Climate

*(Distinction between Flora and Vegetation, Distinction between vegetation and forest (the above two topics should be referred to Class XII Text book provided  
World major biomes and Types of biomes)*

Natural Hazards: Their causes and management

*(Introduction and definition; Earthquakes, volcanic, flood, landslide, forest fires, drought, epidemics and traffic hazards; Disaster management cycles; International Decade for natural disaster Reduction.)*

*(The above topics could be taken as topic for assignments)*

### UNIT FOUR – REMOTE SENSING (REFER THE SUPPLEMENTARY TEXT.) (6%) (6 HOURS)

What is remote sensing, uses, interpretation and analysis

*(What is remote sensing, Uses of remote sensing and Interpretation and analysis.)*

Map work

*On the out line map of the world; locating and labelling for examinations some aspects like physical features, climatic regions and vegetation from the textbook.*

### UNIT FIVE: MAP PROJECTIONS (PRACTICAL) (10%) (22 HOURS)

Cylindrical equal area

Simple conical with one standard parallel

Zenithal equidistant

### TIME AND WEIGHTING

Unit	Hours per unit	Weighting per unit
1. Lithosphere	36	31%
2. Atmosphere	28	22%
3. Biosphere	38	31%
4. Remote Sensing	6	6%
5. Map Projections (Practical)	22	10%
<b>Total</b>	<b>130</b>	<b>100%</b>

### MODE OF ASSESSMENT

The students will be assessed internally by the school in class XI as per the following procedures.

Terms	Types of Assessment			Total
	CA	Examinations		
		Theory	Practical	
<b>First Term</b>	10%	30%	-	40%
<b>Second Term</b>	10%	40%	10%	60%
<b>Total</b>	20%	70%	10%	<b>100%</b>

## 1. Continuous Assessment

### 1.1 Assignment

The students will choose any topic from the class XI syllabus and write a short assignment of about 750 words in the FIRST term. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do Literature research on the chosen topic and find information that is not available in the textbook. Marks may be awarded as follows (*suggestive only*):

Presentation (Table of Contents, Bibliography, Introduction, main body and conclusion)	1.5 %
Content (Relevant Information, Analysis and depth)	2.5%
Language (Clarity of ideas, use of accurate terms and grammar)	1%

### 1.2 Class Presentation

The students will also present their assignment in the first term in about 10 minutes followed by at least three questions from the classmates and the subject teacher. Marks may be awarded as follows (*suggestive only*):

Content (coverage of main ideas and depth)	2.5%
Language (not memorized but in students' own words)	1%
Discussion (ability to respond tactfully and correctly)	1.5%

### 1.3 Project Work

The topics can be taken from natural Hazards of unit three or any other in discussion with the subject teacher. The students will then write a project work on the chosen topic in about 2500 words. The students will work on it through out the two terms but will be assessed as a part of the second term CA. Marks may be awarded as follows (*suggestive only*):

Presentation (Table of Contents, Bibliography, Introduction, main body and conclusion)	2 %
Content (Relevant Information, illustration, analysis and depth)	3%
Language (Clarity of ideas, use of accurate terms and grammar)	2%
Process (Draft copy, notes taken during literature research or information gathering, consultation of subject teacher)	3%

## 2. Examination

There will be a written examination at the end of first term and a written examination as well as a practical examination at the end of second year.

### 2.1. Written Examination

The written paper for the first term and second will on one paper of three hours duration of 100 marks divided into two parts. However, while entering in the statement of marks it should be converted to 30% for first term and 40% for second term.

**Part One** (30%) will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be a minimum of 15 questions covering all the units.

**Part Two** (70%). There will be ten essay type questions from where the students will choose seven questions worth 10 marks each.

### 2.2. Practical (10%)

(Students will work through out the year but will be assessed at the end of the year only.)

Marking criteria:

- 5 % for journal. (The students will compile all their practical works and submit it to the teacher for evaluation.)
- 5% for viva-voce (The students will be asked questions from the journal).

## CLASS XII GEOGRAPHY

### HUMAN GEOGRAPHY

#### UNIT ONE - POPULATION AND SETTLEMENT (21%) (29 HOURS)

##### Population

*(Definition of population; Population of Bhutan compared with major countries; Distribution of population in Bhutan; Density of population-concepts of Arithmetic and Physiological Density; Growth of population-Basic concepts; Trends in population Growth; Migration-Basic concepts; Causes of migration - Push and pull factors; Migration trends in Bhutan; Sex composition; Age Structure; Literacy; Working population and Occupation)*

##### 1.2. Settlements

*(Definitions of settlements; Types of settlements and distinction between rural and urban settlement; Rural settlements and types; Factor determining the type of rural settlements; Urban settlement: definitions; Urbanization and major urban centres of Bhutan ; Urban classification based on size; Urban sprawl; Conurbation; Concentric zone theory; Problems and gains of urbanization.*

#### UNIT TWO - INTRODUCTION TO RESOURCES: DEFINITION OF RESOURCES AND TYPES (22%) (30 HOURS)

##### 2.1. Agriculture

*(Wet and dry agriculture; Crop Rotation, Crop combination and Intensity of cropping and types of irrigation; Problems of Bhutanese agricultur; Use of technology in agriculture;*

##### 2.2. Major food crops and Livestock of Bhutan

*(Condition of growth, production and trade; Rice, wheat, maize; Commercial crops; Condition of growth, production and trade; Potato, Ginger, Apples, Oranges, Cardamom; Market Gardening; Live stock rearing: Cattle rearing, Yak herding, Dairy farming, Pigs, and Poultry.)*

##### 2.3. Energy resources

*(Renewable and Non-renewable energy sources – distinction; Conventional Sources; Coal (Origin, types and occurrence, distribution and production in Bhutan; Petroleum – origin, types, occurrence and importance; HEP – Major power projects of Bhutan and their production and importance; Non conventional: Solar, Nuclear, Geothermal, and Wind.)*

##### 2.4. Industrial resources

*(Major industrial regions of Bhutan; Industrial development in the five year plans; Factors affecting localization of industries; Agro-based industries; The fruit processing – location and production; The milk processing – location and production; Wood based industries; Traditional paper industry – location and production; Tala board particles -location and production; Mineral based industries: Location and production; Cement industries – location and production; Ferro alloys – location and production; Bhutan Chemical and carbide limited – location and production.)*

##### 2.5. Tertiary Industries (Tourism; Banking)

##### 2.6. Human Resources (Quantity & Quality).

### UNIT THREE - TRANSPORT AND COMMUNICATION (21%) (30 HOURS)

#### 3.1. Transport

*(History of transport in Bhutan; Types of transport: Roadways, Air ways and Rope ways -Factors affecting each type of transport, distribution, problems and importance;*

#### 3.2. Communication

*History of Communication in Bhutan; Postal service-Mail system, Money order and Post Office computerisation; Telecommunication- Fax, Telegraph, Telephone and Mobile service; Mass communication – Kuensel, Bhutan Broadcasting Service, Bhutan Television Service, Cinema, Tsechus, Emails and internet; Importance of infrastructure as key to development)*

### UNIT FOUR - NATURE CONSERVATION (15%) (20 HOURS)

1. Concept of Conservation
2. Concept of sustainable development *(definition and strategy)*
3. Environmental impact assessment
4. Future Heritage
5. Importance of Heritage
6. Natural heritage
7. Cultural Heritage
8. Preservation of our heritage
9. Map work: Map of Bhutan covering entire syllabus

### UNIT FIVE - PRACTICAL (20%) (21 HOURS)

#### 5.1. Drawing of scales

*(Linear, graphic scales showing primary and secondary divisions; representative fractions and statement of scale methods.)*

#### 5.2. Drawing of cross section or profiles of important contour

*(Ridge, plateau, escarpment, valley, conical hill, types of slope waterfalls, spurs by using vertical exaggeration and horizontal equivalent.)*

#### 5.3. Map reading and interpretation of survey of Bhutan maps

*(Study will be based on representative portion of any three topographical sheets. It will include the description of location, extent, relief features drainage, land use, settlement patters, communications and inferences about human occupations and stage of economic development of the area.)*

#### 5.4. Surveying

*(Importance of Surveying, types of survey, Plane table survey, method of plane table survey, preparing two plans of the school compound or a small area using Plane Table survey method.)*

### TIME AND WEIGHTING

Unit	Hours per unit	Weighting per unit
1. Population and Settlement	29	21%
2. Introduction to Resources	30	22%
3. Transport and Communication	30	22%
4. Nature Conservation in Bhutan	20	15%
5. Practical	21	20%
<b>Total</b>	<b>130</b>	<b>100%</b>

## MODE OF ASSESSMENT

The students will be assessed internally by the school in class XII as per the following procedures and externally by the Bhutan Board of Examinations.

Terms	Types of Assessment			Total
	CA	Examinations		
		Theory	Practical	
First Term	10%	30%	-	40%
Second Term	10%	40%	10%	60%
<b>Total</b>	<b>20%</b>	<b>70%</b>	<b>10%</b>	<b>100%</b>

### 1. Continuous Assessment

#### 1.1 Assignment

The students will choose any topic from the class XII syllabus and write a short assignment of about 750 words in the first term. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do literature research on the chosen topic and find information that is not available in the textbook. Marks may be awarded as follows (*suggestive only*):

Presentation (Table of contents, bibliography, introduction, main body and conclusion)	1.5%
Content (Relevant information, analysis and depth)	2.5%
Language (Clarity of ideas, use of accurate terms and grammar)	1%

#### 1.2 Class Presentation

The students will also present their Spring term assignment to the class in the second term in about 10 minutes followed by at least three questions from the classmates and the subject teacher. Marks may be awarded as follows (*suggestive only*):

Content (coverage of main ideas and depth)	2.5%
Language (not memorized but in students' own words)	1%
Discussion (ability to respond tactfully and correctly)	1.5%

#### 1.3 Project Work

The topics can be taken from the suggested topics or any other in discussion with the subject teacher. The students will then write a project work on the chosen topic in about 2500 words. The students will work on it through out the three terms but will be assessed as a part of the second term CA. Marks may be awarded as follows (*suggestive only*):

Presentation (Table of Contents, Bibliography, Introduction, main body and conclusion)	2 %
Content (Relevant Information, illustration, analysis and depth)	3%
Language (Clarity of ideas, use of accurate terms and grammar)	2%
Process (Draft copy, notes taken during literature research or information gathering, consultation of subject teacher)	3%

**NOTE:** The marks obtained in the Project work should be reflected in the internal Progress Card as well as in that of the External Examinations.

### 2. Internal Examination

There will be a written at the end of first term as well as a practical examination at the end of second term.

#### 2.1 Written Examination

The written paper for first term and second term will on one paper of three hours duration of 100 marks divided into two parts. However, while entering in the statement of marks it should be converted to 30% for first term and 40% for second term.

**Part One** (30%) will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be a minimum of 15 questions covering all the units.

**Part Two** (70%). There will be ten essay type questions from where the students will choose seven questions worth 10 marks each.

## 2.2. Practical (10%)

(Students will work through out the year but will be assessed at the end of the year only.)

Marking criteria:

1. 5% for journal. (The students will compile all their practical works and submit it to the teacher for evaluation.)
2. 5% for viva-voce (The students will be asked questions from the journal by the subject teacher in the internal assessment and by an external examiner in the external examinations.)

## 3. External Examination

The weighting scheme for the external examinations:

Theory Paper: Three Hours	70%
Practical	20%
Project work	10%

**NOTE:** The Board Examinations will follow the question pattern as set for the term examinations.

### Suggested Project Work Topics

- (i) Agriculture land-use survey
- (ii) Household survey of about 30-60 households of a village or locality.
- (iii) Traffic flow survey of a locality at different hours of the day.
- (iv) Area served by a school.
- (v) Study of manufacturing industry or a self employed person.
- (vi) Study of an urban village in terms of change in occupancy and activities.
- (vii) Area development of multi purpose project-impact on the region.
- (viii) Land-use in a river basin – e.g., upland of forestry, dams, grazing, and intensive farming.
- (ix) Physical and chemical weathering in the local area.
- (x) Use of Glaciated mountain areas for tourism, forestry, farming.
- (xi) Any natural hazards like landslide, erosion, forest fire, pollution, etc.

## TEXTBOOKS & REFERENCES

### Textbooks

- 1 Khullar, D.R., 2003, *ISC Geography Class XI*, Kalyani Publishers.
- 2 Khullar, D.R., 2004, *ISC Geography Class XII*, Kalyani Publishers.
- 3 CAPSD, 2004, *Class XI Geography supplementary*, Ministry of Education, Thimphu.
- 4 CAPSD, 2004, *Class XII Geography supplementary*, Ministry of Education, Thimphu.

### References

1. Leong, G Cheng, 1992, *Human and Economic Geography*, Oxford University Press, Hong Kong.
2. Gupta, A.D. and Kapoor, A. N., 1997, *Principals of Physical Geography*, S. Chand and Company.
3. Singh, R.L. and Singh R.P.B., 1991, *Elements of Practical Geography*, Kalyani Publishers.
4. CAPSD, 1995, *A Geography of Bhutan: Course book for classes IX and X*, Department of Education, Thimphu.

### Other Possible References

1. Bloom L. Arthur, 1992, *Geomorphology: A systematic Analysis of late Cenozoic Landforms*, Prentice-Hall of India Private limited, New Delhi.
2. Banerjee, R.K, 2000, *Remote Sensing Techniques for Regional Development*, Concept Publishing Company, New Delhi.
3. Chandna, R.C, 1996, *A Geography of Population*, Kalyani Publishers, New Delhi.
4. Dayal P, 1995, *A Text book of Geomorphology*, Saraswati Press, Patna.
5. Lal, D.S, 1995, *Climatology*, Chaitanya Publishing House, Allahabad.



# Economics

## **RATIONALE**

The economic course in classes XI and XII is intended to provide economic literacy both in Bhutanese and global context. Being a citizen of Bhutan it is important for the students to have knowledge of the Bhutanese economy. This course is designed mainly to lay the foundations for those students pursuing higher studies, besides imparting knowledge and skills necessary for getting employment.

This syllabus treats economic theory in relation to Bhutanese economy so that students can analyse and realize the relevant and important issues. It will also enable the students to compare the theories with the real situation prevailing in the Bhutanese and global economic system.

## **AIMS**

The economics course at this level aims:

1. To acquire the knowledge (information) of facts, term, concepts, convention, trends, principles generalization, assumption, hypotheses, problems, processes, etc. in economics.
2. To develop an understanding of facts, term, concepts, conventions, trends, principles, generalization, assumption, hypotheses, problems, processes, etc. in Economics.
3. To acquaint candidates with methods of economic analysis.
4. To develop an understanding of important economic problem.
5. To acquaint candidates with the main institution through which the productive process is carried out.
6. To provide an understanding of present day economic problems and institutions and to develop an understanding of the economic structure in which the candidate lives.
7. To enable candidates to compare their own economic structure with that of other areas of the world.

## **LEARNING EXPERIENCES**

In order to make the most out off the economics course offered, the teachers should provide a wide range of learning experiences to students which should include:

1. Project works.
2. Assignments.
3. Group discussions.
4. Class presentations.
5. Films, audio-visuals.
6. Field trips.

## **LEARNING OUTCOMES**

By the end of the course the students should be able to:

1. explain the economic theories, concepts, terms and ideas.
2. identify the basic principles of economics applied in the daily life.
3. locate, select, organise and present information.
4. make deductions from a variety of sources (e.g. photographs, graphs, written, oral, statistics).
5. value the rights and responsibilities of citizens and realise their duty as good citizens of the country.
6. apply the life skills acquired in the real situations.
7. read economic theories in the light of new evidence.
8. plan, discuss and make presentations.

## CLASS XI ECONOMICS

### UNIT ONE: UNDERSTANDING ECONOMICS (30%) (36 HRS)

- 1.1 Definitions of Economics (*definitions of Adam Smith, Alfred Marshall, Lionel Robbins, and Samuelson.*)
- 1.2 Basic concepts (*Utility, price, value, wealth, welfare, money, market, investment, income, production, consumption, and savings.*)
- 1.3 Basic problems of economy (*What to produce, how to produce, for whom to produce, efficient use of resources, economic growth and development.*)
- 1.4 Types of Economies (*Developed, under-developed and developing economies; capitalism, socialism, and mixed economies; solution to basic problems faced by each economy.*)

### UNIT TWO: BHUTANESE ECONOMY (40%) (56 HRS)

- 1.1 Introduction to Bhutanese Economics
  - 1.1.1 Characteristics of Bhutanese economy (*low income, low rate of capital formation, high dependence on agriculture, high population growth rate, underdeveloped infra-structure, under-utilized natural resources, low levels of technology and skills and unemployment.*)
  - 1.1.2 Bhutanese Economy as a mixed economy underlining its necessary features.
  - 1.1.3 Bhutanese economy as a planned economy and its related features.
- 1.2 Population
  - 1.2.1 Theories of Population (*Malthusian and Optimum, demographic transition.*)
  - 1.2.2 Salient features of Bhutanese population (*High growth rate, age composition of population, sex ratio, occupational distribution, density of population.*)
  - 1.2.3 Consequences of population growth in Bhutan.
  - 1.2.4 Population policy of Bhutan.
- 1.3 Unemployment
  - 1.3.1 Meaning of unemployment.
  - 1.3.2 Nature and extent of unemployment problem in Bhutan.
  - 1.3.3 Consequences of unemployment problem.
  - 1.3.4 Remedial measures taken in the Bhutanese economy.
- 1.4 Poverty in Bhutan
  - 1.4.1 Meaning of Poverty.
  - 1.4.2 Concept of Poverty in Bhutanese context.
  - 1.4.3 Measures taken to remove poverty in Bhutan.
- 1.5 Bhutanese Agriculture
  - 1.5.1 Role of agriculture in Bhutanese Economy (*Contribution to national income, contribution to Government revenue, source of raw materials for industrial sector, contribution to international trade, and source of employment.*)
  - 1.5.2 Problems of agriculture in Bhutanese economy.
  - 1.5.3 Agricultural Finance in Bhutanese economy.
  - 1.5.4 Agricultural policy in Bhutanese economy.
- 1.6 Industrial sector in Bhutan
  - 1.6.1 Importance of Industrial growth to the Bhutanese economy.
  - 1.6.2 Types of industries in Bhutan.
  - 1.6.3 Role of Public sector industries in Bhutan.
  - 1.6.4 Role of Private sector enterprises in Bhutan.

- 1.6.5 Government assistance to the industries in Bhutan.
- 1.6.6 Export and import policy of Bhutan.
- 1.7 Service Sector in Bhutan
  - 1.7.1 Importance of service sector in Bhutan.
  - 1.7.2 Transport and its importance.
  - 1.7.3 Communication and its importance.
  - 1.7.4 Tourism and its importance.
  - 1.7.5 Education and its importance.
  - 1.7.6 Medical services and its importance.
- 1.8 Human resource development in Bhutan
  - 1.8.1 Significance of human resource.
  - 1.8.2 Components of human resource development (*Education and training, health, housing.*)

### UNIT THREE: MONEY AND BANKING (20%) (28 HRS)

- 1.1 Money (*Meaning and functions.*)
- 1.2 Banks (*Functions of commercial banks and credit creation by commercial banks.*)
- 1.3 Royal Monetary Authority of Bhutan (*Objectives, functions.*)
- 1.4 Inflation (rate of inflation and its causes, types of inflation, effects of inflation on different groups of society, measures to control inflation and inflation in Bhutan.)

### UNIT FOUR: STATISTICS (10%) (10 HRS)

- 1.1 Human resource development in Bhutan
- 1.2 Statistics (Definition, scope and limitations of statistics.)
- 1.3 Index numbers (simple and weighted.)

### TIME AND WEIGHTING

Unit	Hours per unit	Weighting per unit
1. Understanding Economics	36	30%
2. Bhutanese Economy	56	40%
3. Money and Banking	28	20%
4. Statistics	10	10%
<b>Total</b>	<b>130</b>	<b>100%</b>

### MODE OF ASSESSMENT

The students will be assessed internally by the school in **class XI** as per the following procedures.

Terms	Types of Assessment		
	CA	Examination	Total
First Term	10%	30%	40%
Second Term	10%	50%	60%
<b>Total</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>

## 1. Continuous Assessment

### *Assignment and Presentation*

The students will choose any topic from the class XI syllabus and write a short assignment of about 750 words in the FIRST term and present it to the class in the SECOND term. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do Literature research on the chosen topic and find information that is not available in the textbook. Marks may be awarded as follows (*suggestive only*):

#### 2.1. Marking criteria for Assignment

##### Presentation

(*Table of Contents, Bibliography, Introduction, main body and conclusion*) 3 %

Content (*Relevant Information, Analysis and depth*) 5%

Language (*Clarity of ideas, use of accurate terms and grammar*) 2%

#### 2.2. Marking criteria Class Presentation

The students will present their assignment to the class in about 10 minutes followed by at least three questions from the classmates and the subject teacher. Marks may be awarded as follows (*suggestive only*):

Content (*coverage of main ideas and depth*) 5%

Language (*not memorized but in students' own words*) 2%

Discussion (*ability to respond tactfully and correctly*) 3%

## 2. Examination

There will be an examination at the end of each term on one paper of three hours duration of 100 marks divided into two parts. However, while entering in the statement of marks it should be converted to 30% for first term and 50% for second term.

**Part One** (30%) will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be a minimum of 15 questions covering all the units.

**Part Two** (70%). There will be nine essay type questions from where the students will choose seven questions worth 10 marks each.

## CLASS XII ECONOMICS

### UNIT ONE: MICRO ECONOMIC THEORY (35%) (63 HRS)

1.1. Micro and macro economics. (*Meaning and difference.*)

1.2. Demand

*(Meaning; law of demand; derivation of demand curve; movement and shift of the demand curve; determinants of demand; exceptions to the law of demand; indifference curve analysis: meaning, indifference curve and map; marginal rate of substitution, properties of indifference curve, budget-line (meaning only); comparison of utility and indifference curve analysis.)*

1.3. Elasticity of Demand

*(Meaning; types of elasticity of demand; measurement of elasticity of demand; factors affecting elasticity of demand; importance of the concept of elasticity.)*

1.4. Supply

*(Meaning; difference between stock and supply; time period and supply; law of supply; movement and shift of the supply curve; determinants of supply; elasticity of supply.)*

1.5. Concept of product and production function.

*(Returns to a factor, total, average and marginal physical products; law of variable proportions and its three stages; returns to scale.)*

1.6. Equilibrium price and effect of changes in demand and supply on the Equilibrium Price.

1.7. Revenue and cost

*(Meaning of total, average and marginal revenue. Relationship between AR and MR under Perfect, Imperfect Competition and Monopoly. Fixed and variable cost. Total, average and marginal cost and their relationship. Definition and application opportunity cost; explicit and implicit cost: short run and long run cost curve; Internal and external economies, equilibrium of the firm.)*

1.8. Main market Forms

*(Perfect Competition, Imperfect Competition; Oligopoly, Monopoly – characteristics of the various market forms; equilibrium of firm under short run and long run under various market forms.)*

1.9. The Theory of Distribution

*(Marginal productivity theory of distribution: wages: determination of wages under marginal productivity theory and modern theory: collective bargaining. Rent: Ricardian theory of rent, economic rent, transfer earning; gross and net interest; gross and net profit.)*

### UNIT TWO: NATIONAL INCOME (15%) (17 HRS)

1.1. Circular flow of Income.

1.2. Nature of goods and services produced.

1.3. Concepts and definitions of NY, GNP, GDP, NNP, private income, personal disposable income and per capita income; relationship between the income concepts.

1.4. Methods of measuring National Income

*(Product or value-added method; Income Method and Expenditure Method with simple numerical example based on only “operating surplus and compensation of employees.”)*

2.5. Gross National Happiness (*Emergence, meaning, significance and its difference with GDP.*)

### UNIT THREE: TRADE (15%) (12 HRS)

- 1.1. Need for trade, meaning of trade and basis of trade in Bhutan.
- 1.2. Internal and external trade (*differences, merits and demerits.*)
- 1.3. Balance of payments (*Balance of trade; meaning and causes of disequilibrium in the B.O.P.; measures to correct disequilibrium in B.O.P.*)

### UNIT FOUR: PUBLIC FINANCE (25%) (30 HRS)

- 1.1. Public Revenue (*Meaning and types of taxes in Bhutan; Direct and indirect taxes: merits and demerits; progressive, proportional, regressive, digressive: meaning only; sources of government revenue: names only; VAT, MODVAT.*)
- 1.2. Public Expenditure (*Meaning and reasons for growth of public expenditure in recent times in Bhutan.*)
- 1.3. Public debt (*Meaning; reasons for external and internal borrowing by the government; methods of debt redemption; effects of borrowing on the Bhutanese economy.*)
- 1.4. Fiscal Policy in relation to objectives of equality, stability and growth.
- 1.5. Deficit financing (*Reasons, methods effects of deficit financing in Bhutan.*)
- 1.6. Budget (*Need; types; budgetary policy of Bhutan; budgetary procedure in the preparation of budget in Bhutan in brief.*)

### UNIT FIVE: DEVELOPMENT PLANNING (10%) (8 HRS)

- 1.1. Planning in Bhutan (*Need and objectives of planning.*)
- 1.2. The last three Five Year Plans (7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup>.)
- 1.3. Outcomes of Five Year Plans in Bhutan

### TIME AND WEIGHTING

Unit	Hours per unit	Weighting per unit
Micro Economic Theory	63	35%
National Income	17	15%
Trade	12	15%
Public Finance	30	25%
Development Planning	8	10%
Total	130	100%

### MODE OF ASSESSMENT

The students will be assessed **externally by the Bhutan Board of Examinations** in class XII. However, the schools will conduct internal assessments similar to that of class XI. The internal assessment will have no bearing on the external examination.

#### 1. Internal Assessment

Follow the table below for the internal assessment.

Terms	Types of Assessment		
	CA	Examination	Total
First Term	10%	30%	40%
Second Term	10%	50%	60%
<b>Total</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>



## 1.1 Continuous Assessment

### *Assignment and Presentation:*

The students will choose any topic from the class XII syllabus and write a short assignment of about 750 words in the FIRST term and present it to the class in the SECOND term. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do Literature research on the chosen topic and find information that is not available in the textbook. Marks may be awarded as follows (*suggestive only*):

- Marking criteria for Assignment

#### Presentation

<i>(Table of Contents, Bibliography, Introduction, main body and conclusion)</i>	3 %
<i>Content (Relevant Information, Analysis and depth)</i>	5%
<i>Language (Clarity of ideas, use of accurate terms and grammar)</i>	2%

- Marking criteria Class Presentation

The students will present their assignment to the class in about 10 minutes followed by at least three questions from the classmates and the subject teacher. Marks may be awarded as follows (*suggestive only*):

<i>Content (coverage of main ideas and depth)</i>	5%
<i>Language (not memorized but in students' own words)</i>	2%
<i>Discussion (ability to respond tactfully and correctly)</i>	3%

## 1.2 Examination

There will be an examination at the end of first term and a Trial examination at the end of the year on one paper of three hours duration of 100 marks divided into two parts. However, while entering in the statement of marks it should be converted to 30% for first term and 50% for second term.

**Part One (30%):** This will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be a minimum of 15 questions covering all units.

**Part Two (70%):** There will be nine essay type questions from where the students will choose seven questions worth 10 marks each.

## 2. External Examination by Bhutan Board of Examinations.

There will be one paper of three hours duration of 100 marks divided into two parts.

**Part One (30%)** will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be a minimum of 15 questions covering all units.

**Part Two (70%).** There will be nine essay type questions from where the students will choose seven questions worth 10 marks each.

## TEXTBOOKS & REFERENCES

### Textbooks

1. Sethi, D.K. and Andrews, U., 2003, *Frank ISC Economics for Class XI*, Frank Bros & Co. (Publishers) Ltd.
2. Sethi, D.K. and Andrews, U., 2004, *Frank ISC Economics for Class XII*, Frank Bros & Co. (Publishers) Ltd.

### References

1. Lekhi, R.K., 2003, *ISC Economics for Class XI*, Kalyani Publishers.
2. Lekhi, R.K., 2003, *ISC Economics for Class XII*, Kalyani Publishers.

# Commerce

## **RATIONALE**

The commerce syllabus for classes XI and XII is especially designed to equip students with the required commercial knowledge and information so that the students can live comfortably in the commercial environment. The course will also prepare students for higher studies as it can provide them with important fundamental foundation. The students who fail to get opportunities to undertake higher studies will also be prepared to join the world of work and find employment. The skills acquired through this course can even help the students to create self-employment like small-scale business.

The syllabus is organised in a logical order. The class XI portion will expose the students to the topics such as the study of commercial institutes and their activities. The class XII portion will be continuation of class XI but with incorporation of in-depth studies.

## **AIMS**

The course should enable the students to:

1. develop interest in the theory and practice of business, trade and industry.
2. familiarize themselves with theoretical foundations, organizing, managing and handling operations of a business firm.
3. study important aspects of the commercial world.
4. get knowledge of the activities of commerce in marketing of goods and services.
5. prepare themselves for higher studies and employment.
6. develop their potential in commercial field and apply it in their practical lives.

## **LEARNING EXPERIENCES**

The students will be provided various learning experiences as stated below:

1. Group discussion.
2. Field visits.
3. Case studies.
4. Project works.
5. Independent learning.
6. Use of media.

## **LEARNING OUTCOMES**

By the end of the course the students will be able to:

1. explain basic concepts related to business.
2. examine various factors that give rise to the need of commerce.
3. classify business organisations into various forms such as sole trader, partnership, Joint Stock Company, Public Enterprises and Cooperative form of Business Organization.
4. be aware of the importance, functions, and services of stock exchange market.
5. study the working of Royal securities exchange of Bhutan limited (RSEBL)
6. distinguish between Inland (Home) trade and Foreign (International) trade and study the various aspects related to each of them.
7. list down steps/procedures involved in formation of a Joint Stock Company.
8. distinguish between Memorandum of Association and Articles of Association.
9. explain the method of appointment of Company Directors.
10. list down powers and duties of Directors.
11. understand the causes and procedures of removal of Directors.
12. identify different sources of finance for business organisations.
13. list down the role of Development Finance Institutions (DFIs) and evaluate them.
14. examine the importance, functions and principles of management in a Business Organisation.

15. identify the different methods and channels of communication.
16. suggest various principles of effective communication.
17. get a fair/clear idea of marketing and salesmanship.

## **CLASS XI COMMERCE**

### **UNIT ONE: INTRODUCTION: NATURE AND PURPOSE OF BUSINESS (15%) (17HRS)**

1. Definition and concept of business and classification of business activities.  
*(Five to six popular definitions of business highlighting different aspects of business with a final conclusive definition. Characteristics of business. Classification of business -industry and types of industries, commerce.)*
2. Business objectives and necessity.  
*(Economic, social, profit objective in detail with relevance to all the stakeholders, necessity.)*
3. Commerce, branches of commerce and economic basis of commerce.  
*(Commerce and its nature, functions, importance of commerce. Branches of commerce-trade and aids to trade. Relationship between commerce, trade and industry. Economic basis of commerce.)*
4. Human wants and their satisfaction, classification of wants, characteristics of wants. *(Human wants-meaning and their importance towards satisfaction, classification of wants, characteristics of wants.)*
5. Division of labour: specialisation and localization factors affecting localization.  
*(Self-explanatory)*
6. Classification of human activities-economic and non-economic.  
*(classification of human activities-economic and non-economic. Types of economic and non-economic activities.)*

### **UNIT TWO: FORMS OF BUSINESS ORGANISATIONS (20%) (33 HRS)**

1. Sole trader-objectives, formation, merits and demerits.  
*(Meaning and definition of sole trader, characteristics of sole trader, formation, merits and demerits.)*
2. Partnership-formation, features, type of partners.  
*(Meaning and definition of partnership, formation of partnership firm, features of partnership firms, types of partners.)*
3. Partnership-registration, dissolution under different circumstances.  
*(Self-explanatory.)*
4. Evaluation of partnership, merits and demerits.  
*(Self-explanatory.)*
5. Comparison of sole proprietorship and partnership.  
*(Self-explanatory.)*
6. Joint-stock company: meaning, characteristics, merits and demerits, causes of popularity.  
*(Meaning and characteristics of Joint-stock company, distinction between companies and partnership firms, merits and demerits of companies, causes of popularity. The definition of a company as per the Companies Act of the Kingdom of Bhutan 2000 is also to be included)*
7. Type of companies-public and private companies-differences, advantages and disadvantages.  
*(Public and private companies- differences, advantages and disadvantages of both the types.)*
8. Public enterprise-meaning, role and growth, forms of organisation. Departmental undertakings, Public Corporations and Government companies including public utility services.  
*(Meaning of public enterprise, role and criticism. Growth of public enterprises. Forms of organization. Define and explain Departmental undertakings, Public corporations and Government companies including public utility services.)*

9. Co-operative forms of organisation- meaning; characteristics; formation. Different types of co-operatives.  
*(Co-operative forms of organization-meaning, characteristics, formation. Distinctive advantages and disadvantages of this form.)*

### **UNIT THREE: STOCK EXCHANGE (10%) (17HRS)**

1. Meaning and importance
2. Functions and services of Royal Securities Exchange of Bhutan Limited (RSEBL).
3. Types of operators-Brokers, jobbers, Bulls and Bears.
4. Terms used in Stock Exchange-ex-dividend, cum dividend, spot delivery, forward delivery.  
*(self-explanatory.)*

### **UNIT FOUR: INLAND TRADE (20%) (32 HRS)**

1. Channel of distribution: direct/indirect factors influencing the choice of channel.  
*(Channel of distribution: direct/indirect, meaning and definition along with functions. Factors influencing the choice of channel: Product, market company, and middlemen(agent and merchant middlemen) considerations.)*
2. Wholesale trade; necessity and objectives.  
*(Meaning, definition, characteristics and necessity of wholesale trade.)*
3. Services to retailer, customer, and producer.  
*(Self explanatory.)*
4. Survival or elimination of wholesalers  
*(Arguments for elimination of wholesalers and arguments against middlemen; both positive and negative sides need to be discussed critically.)*
5. Retail trade-necessity and objectives.  
*(Retail trade- meaning, definition, and characteristics of retail trade. Functions of retail trade. Distinction between wholesale and retail trade.)*
6. Functions of retailers. Factors affecting the establishment of a retail outlet. Threat to small retailers – survival of small retailers.  
*(Functions of retailers; types of retailers; factors affecting the establishment of a retail outlet; threat to small retailers-survival of small retailers.) (relevant real life industry examples can be helpful.)*
7. Types of retail organisation-departmental store, chain store, mail order houses, tele shopping, franchise, consumer's co-operative stores.  
*(Meaning, features, merits and demerits to be covered.)*
8. Consumer protection: rights of consumer, methods of consumer protection.  
*(Need for consumer protection; rights of consumers, methods of consumer protection; consumer protection and demonopolization – measures taken in Bhutan.)*
9. Documents used in home trade. Enquiry catalogues-invoice, debit note, credit note, cash discount, and trade discount.  
*(Documents and procedure used in home trade. Inquiry, quotation, catalogues, order, invoice, debit note, credit note and price quotations-cash discount and trade discount.)*
10. Role of Chambers of Commerce and Industry.  
*(Meaning of chambers of commerce and trade associations; distinction between chambers of commerce and trade associations; role and functions of chambers of commerce and trade associations in developing industry. Bhutan Chamber of Commerce and Industries.)*

## **UNIT FIVE: FOREIGN TRADE (20%) (29 HRS)**

1. Meaning, difference between internal trade and external trade.  
*(Self explanatory.)*
2. Characteristics of international trade.  
*(Characteristics of international trade; problems of international trade; advantages and disadvantages of international trade.)*
3. Export trade- Objectives and purpose.  
*(Meaning, definition and functions of export trade; objectives and purpose.)*
4. Procedure of export trade.  
*(Self explanatory.)*
5. Import trade- objectives and purpose.  
*(Meaning, definition and functions of import; objectives and purpose.)*
6. Procedure of import trade.  
*(Self explanatory.)*
7. Documents involved in international trade.  
*(Documents involved in export trade such as Indent, Letter of credit, shipping order, shipping bill, mate's receipt, bill of lading, certificate of origin, consular invoice, documentary bill of exchange (DA/ DPO, need to be explained. Documents involved in import trade such as import license, indent, letter of credit, documentary bill of exchange, bill of entry, bill of sight, port trust dues receipt, application to import, advice note, bill of lading. All need to be explained.)*
8. International Financial institutions-World Bank, Asian Development Bank and the International Monetary Fund (IMF)  
*(World Bank, International Development Association, International Monetary funds, Asian Development Bank - their functions, management, resources and financing criteria, their role in Bhutanese economy)*

## **UNIT SIX: WAREHOUSING (7%) (6 HRS)**

1. Warehousing: meaning, objective and necessity.  
*(Self explanatory)*
2. Functions of warehousing.  
*(Self explanatory)*
3. Types of warehouses-Private; Public bonded and cold storage- meaning advantages of each, documents used, warehouse receipt, warehouse warrant, delivery order.  
*(Types of warehouses-Private; Public; bonded and cold storage-meaning, advantages of each. Documents involved in each. Essential Features of an ideal warehouse.)*

## **UNIT SEVEN: INSURANCE (8%) (17 HRS)**

1. Insurance-Objectives and Purpose.  
*(Insurance- meaning, objectives and purpose; Concept of re-insurance and double insurance.)*
2. Risks in Business-insurable and non insurable.  
*(Causes of business risk-internal and external risks; risks in business-insurable and non-insurable-meaning and characteristics of both.)*
3. Principles of insurance.  
*(Six fundamental principles to be explained: utmost good faith, insurable interest, indemnity, contribution, doctrine of subrogation, causa proxima. Advantages of Insurance to businessman and to public and society.)*

4. Types of Insurance: fire, marine, life insurance. Methods of taking out policies, submission of claims.  
(Method of taking each type of insurance policy; kinds of policies of each; settlement of claims under each. Marine losses: total-actual constructive; partial-particular average loss and general average loss.)
5. Functions of Life Insurance Corporation.  
(Meaning and definition of life insurance; procedure of taking life insurance; functions/services of Royal Insurance Corporation of Bhutan (RICB))
6. Lloyds of London-Insurance underwriter.  
(Concept of undertaking. Role of Lloyds of London.)

## TIME/PERIOD ALLOCATION AND WEIGHTING

Unit	Hours per unit	Weighting per unit
1. Nature and Purpose of Business	17	15%
2. Forms of Business Organisation	33	20%
3. Stock Exchange	17	15%
4. Inland Trade	32	20%
5. Foreign Trade	29	20%
6. Warehousing	6	7%
7. Insurance	17	8%
<b>Total</b>	<b>130</b>	<b>100%</b>

## MODE OF ASSESSMENT

The students will be assessed internally by the school in **class XI** as per the following procedures.

Terms	Types of Assessment		
	CA	Examination	Total
First Term	10%	30%	40%
Second Term	10%	50%	60%
<b>Total</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>

### 1. Continuous Assessment

#### *Assignment and Presentation*

The students will choose any topic from the class XI syllabus and write a short assignment of about 750 words in the FIRST term and present it to the class in the SECOND term. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do Literature research on the chosen topic and find information that is not available in the textbook. Marks may be awarded as follows (*suggestive only*):

- 1.1. Marking criteria for Assignment:
 

Presentation (Table of contents, bibliography, introduction, main body and conclusion)	3 %
Content (Relevant information, analysis and depth)	5%
Language (Clarity of ideas, use of accurate terms and grammar)	2%
- 1.2. Marking criteria Class presentation:
 

The students will present their assignment to the class in about 10 minutes followed by at least three questions from the classmates and the subject teacher. Marks may be awarded as follows (*suggestive only*):



Content ( <i>coverage of main ideas and depth</i> )	5%
Language ( <i>not memorized but in students' own words</i> )	2%
Discussion ( <i>ability to respond tactfully and correctly</i> )	3%

## 2. Examination

There will be an examination at the end of each term on one paper of three hours duration of 100 marks divided into two parts. However, while entering in the statement of marks it should be converted to 30% for first term and 50% for second term.

**Part One** (30%) will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be a minimum of 15 questions covering all the units.

**Part Two** (70%). There will be nine essay type questions from where the students will choose seven questions worth 10 marks each.

## CLASS XII COMMERCE

### UNIT ONE: CORPORATE ORGANISATION (20%) (33 HRS)

1. Joint Stock Company: meaning and objectives.
2. Formation of a Company as per the provisions of the Companies Act of the Kingdom of Bhutan 2000.
3. Promotion, meaning and role of promoters.
4. Incorporation of Company as per the provisions of Companies Act of the Kingdom of Bhutan 2000.
5. Memorandum of Associations and Articles of Association (excluding alterations) and distinction between the two documents.
6. Filing of documents and registration as per the Companies Act of the Kingdom of Bhutan 2000.
7. Certificate of Incorporation.
8. Commencement of business.
9. Prospectus-its nature and importance, statement in lieu of prospectus.
10. Public and private companies and their comparative studies, privileges of private companies, private companies deemed to be public.
11. Government companies: objectives, necessity merits and demerits.
12. Multinational Corporations-objectives and role, various forms-branches, subsidiaries, joint venture, franchise holders, turnkey projects, merits and demerits of Multinational Corporations.  
(*Emphasis may be given to the provision laid down in the Companies Act of the Kingdom of Bhutan*)

### UNIT TWO: MANAGEMENT PERSONNEL (15%) (17 HRS)

1. Board of Directors: Numbers of Directors, Qualification of Directors, Vacation, Disqualification of Directors as per the Companies Act of the Kingdom of Bhutan 2000.
2. Methods of Appointment of Directors.
3. Powers and duties of Directors; Remuneration of Directors.
4. Directors: Full time/part time.
5. Managing Director; selection and power (excluding manager)
6. Directors: removal as per Companies Act 2000.

### **UNIT THREE: FINANCING (20%) (33 HRS)**

1. Capital: Different types of capital for sole trader; partnership; joint stock company.
2. Sources of capital for Joint Stock Company; different types of shares: equity, preference-their advantages and disadvantages.
3. Loan capital; debentures-different types of debentures.
4. Financial institutions in Bhutan: BOB, BNB, RICB, NPPF, BDFC- their workings, merits and demerits.
5. Commercial banks: services provided.
6. Acceptance of deposits: different categories of deposits.
7. Lending: different types of lending.

### **UNIT FOUR: MANAGEMENT (15%) (17 HRS)**

1. Management: objectives and concept.
2. Definition of Management, Nature of management- Science and Art.
3. Characteristics of management.
4. Importance of Management.
5. Function of Management: planning; organising; staffing; directing; controlling.
6. Principles of management: nature of principles; need for principles.

### **UNIT FIVE: COMMUNICATION (10%) (17 HRS)**

1. Meaning and objectives.
2. Communication: barrier; elimination.
3. Communication: different methods; channels.
4. Principles of communication.
5. Need for rapid and efficient communication.

### **UNIT SIX: MARKETING (20%) (33 HRS)**

1. Marketing: objectives; concept.
2. Marketing: importance; functions.
3. Advertising: meaning, objectives and functions.
4. Advertising: different media.
5. Advertising agency: meaning, need, and functions.
6. Sales promotion: relation with advertising.
7. Salesmanship: meaning; objective.
8. Qualities of a good salesman.

### **TIME AND WEIGHTING**

<b>Unit</b>	<b>Hours per unit</b>	<b>Weighting per unit</b>
1. Corporate Organisation	33	20%
2. Management Personnel	17	15%
3. Financing	33	20%
4. Management	17	15%
5. Communication	17	10%
6. Marketing	33	20%
<b>Total</b>	<b>130</b>	<b>100%</b>

## MODE OF ASSESSMENT

The students will be assessed **externally by the Bhutan Board of Examinations** in class XII. However, the schools will conduct internal assessments similar to that of class XI. The internal assessment will have no bearing on the external examination.

### 1. Internal Assessment

Follow the table below for the internal assessment.

Terms	Types of Assessment		
	CA	Examination	Total
First Term	10%	30%	40%
Second Term	10%	50%	60%
<b>Total</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>

#### 1.1. Continuous Assessment

##### *Assignment and Presentation*

The students will choose any topic from the class XII syllabus and write a short assignment of about 750 words in the FIRST term and present it to the class in the SECOND term. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do Literature research on the chosen topic and find information that is not available in the textbook. Marks may be awarded as follows (*suggestive only*):

- Marking criteria for Assignment:
  - Presentation (*Table of contents, bibliography, introduction, main body and conclusion*) 3%
  - Content (*Relevant information, analysis and depth*) 5%
  - Language (*Clarity of ideas, use of accurate terms and grammar*) 2%
- Marking criteria Class presentation:
  - The students will present their assignment to the class in about 10 minutes followed by at least three questions from the classmates and the subject teacher. Marks may be awarded as follows (*suggestive only*):
    - Content (*coverage of main ideas and depth*) 5%
    - Language (*not memorized but in students' own words*) 2%
    - Discussion (*ability to respond tactfully and correctly*) 3%

#### 1.2. Examination

There will be an examination at the end of first term and a Trial examination at the end of the year on one paper of three hours duration of 100 marks divided into two parts. However, while entering in the statement of marks it should be converted to 30% for first term and 50% for second term.

**Part One** (30%): will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be a minimum of 15 questions covering all units.

**Part Two** (70%): There will be nine essay type questions from where the students will choose seven questions worth 10 marks each.

**1. External Examination** by Bhutan Board of Examinations.

There will be one paper of three hours duration of 100 marks divided into two parts.

Part One (30%): This will consist of compulsory short questions to test factual knowledge, application and skills related to elementary/fundamental aspects of the entire syllabus. There should be a minimum of 15 questions covering all units.

Part Two (70%): There will be nine essay type questions from where the students will choose seven questions worth 10 marks each.

**TEXTBOOKS & REFERENCES**

**Textbooks**

1. Maheshwari, R.P., 2003, *A Complete Course in ISC Commerce Vol. I for Class XI*, Pitambar Publishing Co. Ltd.
2. Maheshwari, R.P., 2002, *A Complete Course in ISC Commerce Vol. II for Class XII*, Pitambar Publishing Co. Ltd.

**References**

1. Tulsian, P.C. and Tulsian, S.D., 2003, *ISC Tulsian's Commerce for Class XI*, Ratna Sagar Pvt. Ltd.
2. Tulsian, P.C. and Tulsian, S.D., 2003, *ISC Tulsian's Commerce for Class XII*, Ratna Sagar Pvt. Ltd.

# Accountancy

## **RATIONALE**

In view of the present situation of developing Bhutanese economy, the importance of accounting has been recognized by everyone, especially when there is need for best utilisation of the resources. As a result, the knowledge of accounting to all the professional students has been absolutely necessary. From this viewpoint, the concept of accounting has been introduced in classes XI and XII to cater to the basic needs of the students in Bhutan.

The syllabus for class XI is mainly based on the basic concepts of accounting, principles and rules of accounting formats of journals, ledger, trial balance, subsidiary books like cash book having different columns, petty cash book, etc.

The class XII syllabus is an in depth study focusing on accounting procedure of joint venture, partnership accounts, joint stock company accounts, analysis of financial statements, etc. The course would not only develop knowledge to pursue higher studies but also equip the students with application skills of accounting in their daily life.

## **AIMS**

Teachers should help and guide the students to:

1. develop the understanding of concepts and principles of accounting- single entry and double entry systems.
2. include the skills of recording, posting, and balancing of ledger accounts.
3. develop the skills of analyzing, classifying, summarising and interpreting the sole trader business, partnership and company accounts.
4. develop the understanding of the forms and classification of the financial statements as a means of communicating financial information.
5. promote the awareness of computerized accounting in the modern techniques of maintaining records.

## **LEARNING EXPERIENCES**

The students will be provided with a wide range of learning experiences, which include:

1. group works
2. group discussions
3. class presentations
4. media,
5. assignments

## **LEARNING OUTCOMES**

By the end of the course the students will be able to:

1. explain the basic concepts and techniques of accounting procedures.
2. demonstrate the fundamental skills in book-keeping and accounting.
3. understand and explain the principles of financial accounting and management accounting thoroughly.
4. relate and use accounting skills in their daily lives.
5. use the basic skills in drawing up the formats of various accounts.
6. use the accounting skills in solving the problems in accounting.

## CLASS XI ACCOUNTANCY (2014 onwards)

### PAPER - I (THEORY) – 80 Marks

#### 1. Basic Accounting Concepts

Background of accounting and accountancy: knowledge and understanding of IFRS (International Financial Reporting Standards); GAAP (Generally Accepted Accounting Principles), types of accounts; basic terms used in accounting, Accounting Standards and Accounting Equation.

- a. *Evolution of accounting; difference between bookkeeping, accounting and accountancy; function, characteristics, objectives, advantages and limitations of accounting; users of accounting information; subfields of accounting - meaning of financial accounting, cost accounting and management accounting.*
- b. *IFRS: Introduction to IFRS.*
- c. *GAAP: Going concern, Accounting Entity, Money Measurement, Accounting Period, Complete Disclosure, Revenue Recognition, Verifiable Objective, Matching Principle, Historical Cost, Accrual Concept, Dual Aspect Concept, Materiality, Consistency, Prudence and Timeliness.*
- d. *Accounting Standards: Concepts and objectives.*
- e. *Basic Terms: Event, Transaction, Vouchers, Debtors, Creditors, Purchases, Sales, Assets (intangible, tangible, fixed, current, liquid and fictitious), Liabilities (internal and external – current, fixed and contingent), Goods traded in, Stock (raw material, work in progress and finished goods), Profit, Loss, Expense, Revenue, Income, Drawings and Capital.*
- f. *Basis of accounting – cash basis, accrual basis and hybrid basis.*
- g. *Accounting equation – Meaning and usefulness*

#### 2. Journal, Ledger and Trial Balance

(i) Journal: recording of entries in journal with narration.

- a. *Classification of Accounts.*
- b. *Double Entry System.*
- c. *Rules of journalizing – traditional classification or modern approach.*
- d. *Meaning of journal.*
- e. *Format of journal.*
- f. *Simple and compound journal entries.*
- g. *Advantages of using a journal.*

(ii) Ledger: posting from journal to respective ledgers.

- a. *Meaning of ledger.*
- b. *Format of a ledger.*
- c. *Mechanics of posting.*
- d. *Balancing of various ledger accounts.*
- e. *Practical problems on journal and ledger.*



(iii) Sub-division of journal - cash book [including simple cash book and double column cashbook (cash and bank). Petty cash book (including simple, analytical and imprest system), sales day book, purchases day book, sales return day book, purchases return daybook, bills receivable book, bills payable book and journal proper. Mechanics of posting from special subsidiary books.

(iv) Trial balance.

- a. *Meaning, objectives, advantages and limitations of a trial balance.*
- b. *Preparation of the trial balance from given ledger account balances.*
- c. *Redrafting of a trial balance.*

### 3. Bank Reconciliation Statement

- a. *Meaning and need for bank reconciliation statement.*
- b. *Preparation of a bank reconciliation statement from the given cash book balance or pass book balance or both.*
- c. *Preparation of a bank reconciliation statement from the extract of the cash book as well as the pass book relating to the same month.*

### 4. Depreciation, Provisions and Reserves

1. Depreciation

*Depreciation - meaning, need, causes, objectives and characteristics.*

- (ii) *Methods of charging depreciation (Straight Line and Written Down Value method). Method of recording depreciation – charging to asset account, creating provision for depreciation/ accumulated depreciation, treatment of disposal of fixed assets.*
- (iii) *Problems relating to purchase and sale of assets incorporating the application of depreciation under the two stated methods. (Self-explanatory)*

**NOTE:** *Questions on change of method from SLM to WDV and vice-versa are not required.*

### 5. Bills of Exchange

(i) Introduction to Negotiable Instruments:

*Explanation of basic terms.*

*Meaning of negotiable instruments; Bills of exchange, promissory note (including specimen and distinction), cheque, advantages and disadvantages of Bills of Exchange, explanation of basic terms - drawer, drawee, payee, endorser, endorsee, bill on demand / bill on sight, bill after date, bill after sight, tenure of the bill, days of grace, due date, endorsement and discounting of bills, bill sent for collection, dishonour of a bill, noting charges, notary public, renewal of a bill, retirement of a bill and insolvency of the drawee/ acceptor.*

(ii) *Practical problems on the above in the books of drawer, drawee, endorsee and bank. (Self-explanatory)*

**NOTE:** *Accommodation Bill is not required.*

### 6. Final Accounts and Concept of Trading, Profit and Loss account and Balance Sheet (with and without adjustments), Marshalling of Balance Sheet

(i) Capital and revenue expenditure/income.

- a. *Meaning and difference between capital expenditure and revenue expenditure with examples.*
- b. *Meaning and difference between capital income and revenue income with examples.*
- c. *Meaning and difference between capital profit and revenue profit with examples.*

- d. *Meaning and difference between capital loss and revenue loss with examples.*
- e. *Meaning of deferred revenue expenditure with examples.*
- (ii) Provisions and Reserves.  
*Meaning, importance; difference between provisions and reserves; types of reserves - revenue reserve, capital reserve, general reserve, specific reserve and secret reserve.*
- (iii) Trading, Profit and Loss Account and Balance Sheet of a sole trader, (Horizontal Format) without adjustments.  
*Meaning, object, importance and preparation of Trading, Profit and Loss Account and Balance Sheet of sole trader.*
- (iv) Preparation of Trading Account, Profit and Loss Account and Balance Sheet with necessary adjustments.  
*Adjustments relating to closing stock, outstanding expenses, prepaid expenses, accrued income, income received in advance, depreciation and bad debts, provision for doubtful debts, provision for discount on debtors, creditors and manager's commission, goods distributed as free samples and goods taken by the owner for personal use, abnormal loss, interest on capital and drawings.*
- (v) Marshalling of a Balance Sheet: Order of permanence and order of liquidity. (Self-explanatory)

## 7. Accounts from incomplete records

- (i) Single entry and difference with double entry.  
*(a) Meaning, characteristics and limitations.*  
*(b) Difference between Statement of Affairs and Balance Sheet.*
- (ii) Ascertainment of profit/loss by statement of affairs method including application. (Self-explanatory)
- (iii) Conversion of Single entry into double entry: *Preparation of Trading and Profit & Loss Account and Balance Sheet (with reference to missing figures in total debtors account, total creditors account, Bills Receivable account, Bills Payable account).*

**NOTE:** *Single entry system as applied to partnership firms is not required.*

## 8. Non Trading Organisation

- (i) Non trading organization: Meaning, objectives, necessity and treatment of specific items. (Self-explanatory)
- (ii) Different books maintained and differences between them.  
*a. Receipts and Payments Accounts: meaning, features, differences between Receipts and Payments Account and Cash Book.*  
*b. Income and Expenditure Accounts: meaning, features, difference, between Income and Expenditure account and Profit and Loss account.*  
*c. Balance Sheets and its role.*
- (iii) Preparation of Income and Expenditure Account and Closing Balance Sheet: *Preparation of Income and Expenditure Account and Balance Sheet when Receipts and Payments Account and other information are given.*

**NOTE:** *Preparation of a Receipt and Payments Account only or an Income and Expenditure Account with a Balance Sheet from incomplete records need not be covered.*

## 9. Rectification of Errors

Errors and types of errors: errors of omission; errors of commission; errors of principle; compensating errors.

(a) Errors disclosed by the trial balance.

(b) Errors not disclosed by the trial balance.

(c) Rectification of errors after the preparation of trial balance and use of suspense account.

(d) Rectification of Errors after the preparation of Final Accounts.

## 10. Introduction to the use of Computers in Accounting

- **Introduction to Computerised Accounting System:** Components of CAS, Features, Grouping of Accounts. Advantages and Limitations of CAS, Accounting Information System. (*Self-explanatory*).
- Application of computers in Accounting (Only theory) — Automation of accounting process, designing accounting reports (MIS reports) – Chart of accounts – Assets/liabilities/ income/ expenses/ capital, customer and supplier masters, type of transaction: cash, bank, sale, purchase, journal vouchers; general ledger/trial balance, balance sheet, profit and loss, data exchange with other information systems.
- Comparison of accounting processes in manual and computerised accounting.
- *Introduction to Computerised Accounting systems: basic understanding and advantages and disadvantages of ready to use, customised, tailor-made accounting systems (E.g.: Tally, VISHESH or any other accounting system).*

## TIME AND WEIGHTING

Unit	Hours per unit	Weighting per unit
1. Basic Accounting Concepts	8	5%
2. Journal, Ledger, Trial Balance	24	15%
3. Bank Reconciliation Statement	10	5%
4. Depreciation, Provisions and Reserves	12	8%
5. Bills of Exchange	12	7%
6. Final Accounts	25	14%
7. Accounts from Incomplete Records	12	7%
8. Non-trading Organisation	14	10%
9. Rectification of Errors	8	4%
10. Introduction to the use of Computers in Accounting	5	5%
<b>Total</b>	<b>130</b>	<b>80%</b>

## MODE OF ASSESSMENT

The students will be assessed internally by the school in class XI as per the following procedures.

Terms	Types of Assessment			
	Assignments	Examination	Project Work	Total
First Term	10%	30%	-	40%
Second Term	-	50%	10%	60%
<b>Total</b>	<b>10%</b>	<b>80%</b>	<b>10%</b>	<b>100%</b>

### 1. Assignment

The students will choose any topic from the class XI syllabus and write a short assignment of about 750 words in the **first term**. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do literature research on the chosen topic and find information that is not available in the

#### Marking criteria for Assignment

Presentation: (*Table of contents, bibliography, introduction, main body and conclusion*) 3%

Content: (*Relevant information, analysis and depth*) 5%

Language: (*Clarity of ideas, use of accurate terms and grammar*) 2%

### 2. Written Examination

There will be a written examination at the end of first and second terms of 80 marks divided into two parts for 3 hours. However, while entering in the statement of marks the written examination marks should be converted to 30% for first term and 50% for second term.

## PAPER - I (THEORY) – 80 MARKS

There will be one paper of 3 hours duration of 80 marks divided into two Parts, I and II.

**Part I (20 Marks):** will consist of **Question 1 (compulsory)** with **10 questions of 2 marks each**. This question will include short answer questions testing knowledge, application and skills relating to elementary/fundamental aspects of the entire syllabus.

**Part II (60 marks):** Candidates will be required to answer any six questions out of **eight** from this Part II. Each question shall carry 10 marks. This section will also be based on the entire syllabus.

### 3. Project Work-10 Marks

The topics can be selected from any chapters of the syllabus in discussion with the subject teacher. The students will then write a project work on the chosen topic in about 2500 words. The students will work on it throughout the two terms but will be assessed as a part of the project work mark. Marks may be awarded as follows:

Mark allocation for the Project work [10 marks]:

Overall format (table of contents, bibliography, introduction, main body and conclusion)	1 mark
Content (relevant information, illustration, analysis and depth)	4 marks
Findings	2 marks
Viva-voce based on the Project	3 marks

**A list of suggested Projects is given below:**

1. Preparation of Journal, Ledger, Trial balance and Financial Statements of a trading organization on the basis of a case study.
  - Develop a case study of a sole trader starting business with a certain amount of capital. He/she could have got the amount from his/her past savings or by borrowing from a bank by mortgaging his/her personal assets or by winning a lottery or any other source.
  - Write in detail, his/her transactions during the year- purchases - cash and credit, sales cash and credit, expenses, purchase of fixed assets and depreciation charged on them, any outstanding expenses, prepaid expenses, accrued income, drawing bills of exchange, accepting bills payable, etc.
  - From this case study developed (which should have at least 15 transactions), pass the journal entries, post them into the ledger, prepare a Trial Balance and the Trading and Profit and Loss Account and Balance Sheet.
  - The various expenses for comparison purposes, could be depicted in the form of bar diagrams, pie charts, etc.
2. Preparation of the accounts of a Non-Profit-Organisation (NPO) on the basis of the theoretical knowledge gained from syllabus.
  - Develop at least 20 to 25 transactions and prepare the NPO's Receipts and Payment Account, Income and Expenditure Account and its Balance Sheet.
  - The various expenses, for comparison purposes, could be depicted in the form of bar diagrams, pie charts, etc.
3. Prepare a Bank Reconciliation Statement and Amended Cash Book from the information given in the Cash Book and Bank Statement (Pass Book) on the basis of a case study.
4. Complete the labels.

(i) Prepare a Spreadsheet as per the following format:

Revenue	Jan.	Feb.	March	April
Cash Sales				
Credit Sales				
<b>Total Sales</b>				
Expenses				
Salaries				
Rent & Utilities				
Others				
<b>Total Expenses</b>				
<b>Net profit</b>				

- (ii) Fill the Sales and Expenses for the months in lakhs and calculate the Total Sales and Total Expenses.
- (iii) Calculate the Net Profit using the excel formulas by subtracting the expenses from revenue.
- (iv) Highlight all the numbers and prepare a bar chart showing the indoor and outdoor sales for the months.
- (v) Save your work on the desktop as Label Project.
- (vi) Print a hard copy of your work and close the file.

## **CLASS XII ACCOUNTANCY** (2015 onwards)

### **UNIT-1**

#### **1. Joint Venture (10 hours)**

Joint Venture: objectives; necessity and methods of accounting (recording of transactions in the books of one Co-venturer, recording of transactions in the books of all Co-venturers, recording of transactions in separate set of books).

*Joint Venture: meaning, features, objectives and problems under the three methods of accounting.*

- a. *Recording of transactions in the books of one Co-venturer only.*
- b. *Recording of respective transactions in the books of all Co-venturers (memorandum method).*
- c. *method).*
- d. *Recording of transactions in separate set of books.*

#### **NOTE:**

- 1. *Valuation of closing stock in Joint Venture including abnormal and normal losses and civil contract works are included.*
- 2. *Interim settlement of accounts, interest calculation, incomplete ventures on the date of final settlement of accounts, Joint Ventures for underwriting shares and conversion of consignment into joint venture are excluded from the syllabus.*

#### **2. Partnership Accounts (37 hours)**

##### **A. Fundamentals of Partnership**

- (i) Definition, meaning and features of a Partnership. (Self-explanatory)
- (ii) Provisions of The Indian Partnership Act, 1932, with respect to books of accounts.
  - (a) *Meaning and importance.*
  - (b) *Rules applicable in the absence of a partnership deed.*
- (iii) Preparation of Profit and Loss Appropriation Account and Capital Accounts.
  - (a) *Profit and Loss Appropriation Account.*
  - (b) *Partners' capital accounts: fixed and fluctuating.*

*Interest on capital, interest on drawings, salary, commission to partners and managers, transfer to reserves, division of profit among partners and guarantee of profits and past adjustments (Relating to interest on capital, interest on drawing, salary and Profit Sharing Ratio)*

- (iv) Goodwill - concept and mode of valuation.
- (a) Meaning, nature and features of Goodwill.
  - (b) Factors affecting the value of goodwill.
  - (c) Mode of Valuation.

- Average profit method.
  - Simple average.
  - Weighted average method.
- Super profit method.
- Capitalization method.
  - Capitalization of average profit.
  - Capitalization of super profit.

**NOTE 1:**

*Capital Employed/Net assets are Total assets (excluding goodwill if existing in the balance sheets and fictitious assets) less outside liabilities.*

**NOTE 2:**

- *Interest on partner's loan to be taken as a charge against profits.*
- *Interest on loan should be credited to a separate loan account.*
- *Rent paid to a partner is a charge against profit and is to be credited to partner's current account in case of fixed capital system or to partner's capital account when capitals are fluctuating.*
- *Manager's commission and Partners commission to be calculated on corrected Net Profit of the Profit and Loss account, if question is silent.*
- *Interest is to be charged or allowed on current account only when specifically instructed.*
- *Admission of manager as a Partner is excluded.*

**B. Reconstitution of Partnership**

**I. Admission**

- (i) Calculation of new profit sharing ratio, sacrificing ratio and gaining ratio. (Self-Explanatory)

- (ii) Accounting treatment of goodwill on admission of a partner.

*Based on Accounting Standard –26 issued by the Institute of Chartered Accountants of India in the context of Intangible Assets.*

- (a) *Premium for goodwill paid privately.*
- (b) *Premium for goodwill paid (in cash or kind) and retained in the business.*
- (c) *Premium for goodwill paid and withdrawn by the old partners.*
- (d) *When the incoming partner cannot bring premium for goodwill in cash, adjustments are to be done through the current account.*
- (e) *Hidden goodwill.*
- (f) *When goodwill appears in the old Balance Sheet.*



**NOTE:**

*Personal Goodwill and loan account raised when the incoming partner does not bring in cash for his share of goodwill are excluded from the syllabus.*

- (iii) Preparation of Revaluation Account.

Preparation of a Revaluation Account where changes in the values of assets and liabilities are reflected in the new Balance Sheet after reconstitution of a partnership firm.

**NOTE:** *Memorandum revaluation account is excluded from the syllabus.*

- (iv) Accounting treatment of accumulated profits and losses.

*General Reserve / Reserve Fund, Workmen Compensation Reserve/ Fund, Investment Fluctuation Reserve/ Fund, Contingency Reserve, Profit and Loss Account (Debit and Credit balance) and Advertisement Suspense Account/ Deferred Revenue Expenditure.*

- (v) Adjustment of Capitals.

(a) *Adjustment of old partner's Capital Accounts on the basis of the new partner's capital.*

(b) *Calculation of new partner's capital on the basis of old partner's adjusted capital.*

**II. Change in profit sharing ratio**

- (i) Calculation of new profit sharing ratio, sacrificing and gaining ratio. (Self-Explanatory)  
(ii) Accounting treatment of goodwill. (Self-Explanatory)  
(iii) Accounting treatment of accumulated profits and losses

*General Reserve/Reserve Fund, Workmen Compensation Reserve/Fund, Investment Fluctuation Reserve/Fund, Contingency Reserve, Profit and Loss Account (Debit and Credit balance) and Advertisement Suspense Account/Deferred Revenue Expenditure.*

- (iv) Revaluation of assets and reassessment of liabilities. (Self-explanatory)

NOTE: Admission of a partner during an accounting year, Joint Life Policy and Individual Life Policy are excluded from the syllabus.

**III. Retirement and death of a partner**

- (i) Calculation of new profit sharing ratio, gaining ratio and sacrificing ratio. (Self-Explanatory)  
(ii) Adjustment with regard to goodwill including hidden goodwill. (Self-Explanatory)  
(iii) Adjustment with regard to undistributed profits and losses. (Self-Explanatory)  
(iv) Adjustment with regard to share of profits from the date of the last Balance Sheet to the date of retirement or death (on the basis of time or turnover). (Self-Explanatory)  
(v) Preparation of Revaluation Account on retirement or death of a partner. (Self-Explanatory)  
(vi) Adjustment of capitals.  
a) Readjusting the adjusted capital of the continuing partners in the new profit sharing ratio.  
b) Adjusting the capitals of the continuing partners on the basis of the total capital of the new firm.

- c) When the continuing partners bring in cash to pay off the retiring partners.
- (vii) Calculation and payment of amount due to retiring partner (Self-Explanatory)
- (viii) Construction of loan account and executor's account. (Self-Explanatory)

**NOTE:** Memorandum Revaluation Account, Joint Life Policy, Individual life policy and calculation of interest accrued but not due in the outgoing partners / executors account are excluded from the syllabus.

#### **IV. Dissolution of a Partnership firm.**

- (i) *Meaning of dissolution, modes of settlement of accounts. (Self-Explanatory)*
- (ii) *Preparation of Realization Account.*

*Accounting treatment of realization expenses:*

- *Paid by the firm –*  
*Realization account Dr.*  
*To cash account*
- *Paid by the partner on behalf of the firm –*  
*Realization account Dr.*  
*To partner's capital account*
- *The firm pays a fixed amount to the partner and the partner has to bear the expenses –*  
*(a) Realization account Dr.*  
*To partner's capital account*  
*(b) If the amount is paid by the partner from firm's cash, then only -*  
*Partner's capital account Dr.*  
*To cash account*

*(No entry (b) will be passed if the expenses are borne or paid by the partner out of his/her pocket)*

- (iii) *Treatment of undistributed profits and losses. (Self-Explanatory)*
- (iv) *Preparation of Cash / Bank Account. (Self-Explanatory)*
- (v) *Preparation of memorandum balance sheet. (Self-Explanatory)*

#### **NOTE:**

- *When an asset or a liability is taken to the realization account any corresponding/ related fund or reserve is also transferred to realization account and not to capital account.*
- *When accounts are prepared on a fixed basis, partners current account balances are to be transferred to capital account. No adjustments are required to be passed through current account.*
- *Admission cum retirement, amalgamation of firms and conversion/sale to a company together with piecemeal distribution and insolvency of a partner / partners not required.*
- *Bank overdraft is not to be transferred to realization account but bank loan must be transferred to realization account.*
- *If question is silent about the payment of a liability, then it has to be paid out in full.*

- *If the question is silent about the realization of an asset, its value is assumed to be nil.*
- *Loan given to a partner or taken from a partner will be passed through cash or bank account.*

### **3. Joint Stock company Accounts (30 hours)**

#### **A. Issue of Shares.**

Problems on issue of shares.

- Issue of shares at par, premium and discount under Companies Act, 1956.
  - Issue of shares for considerations other than cash:
    - To promoters (can be considered either through Goodwill account or Incorporation costs account).
    - To underwriters.
    - To vendors.
- Calls in arrears, calls in advance and interest thereon including the preparation of ledger accounts.
- Over and under subscription (including simple problems on pro-rata allotment).

#### **NOTE:**

*In pro-rata allotment when shares are issued at a premium, excess money received on application will first be adjusted towards the share capital. Any excess thereon will be utilized towards the securities premium.*

*When allotment or any call money is due, it is to be transferred to the calls in arrears account, on which interest if provided in the Articles of Association will be calculated.*

- Forfeiture and reissue of shares at par, premium or discount. (*Self-Explanatory*)

#### **NOTE:**

*Issue of bonus and rights shares, private placement of shares, sweat equity shares, employees' stock option scheme, reservations for small individual participants and minimum tradable lots are not required.*

#### **B. Issue of Debentures**

Problems on issue of debentures (at par, at premium and at discount.)

*Problems on issue of debentures to include:*

- Issue of debentures at par, at premium and at discount under Companies Act.*
- Issue of debentures as collateral security for a loan.*
- Issue of debentures for considerations other than cash.*
  - *To promoters.*
  - *To underwriters.*
  - *To vendors*

- (d) *Accounting entries at the time of issue when debentures are redeemable at par and premium.*
- (e) *Interest on debentures.*
- (f) *Methods and accounting treatment of writing off discount and loss on issue of debentures.*

**NOTE:**

*Premium on the redemption of debentures to be recorded under the sub-head 'Provisions'. Redemption of debentures with or without sinking funds is excluded.*

**C. Final Accounts of Companies**

*Application of Schedule VI Part I and II of Companies Act, 1956.*

*Schedule VI Part I under Companies Act-Preparation of a company Balance Sheet (Horizontal Form).*

*Schedule VI Part II under Companies Act- preparation of a company Profit & Loss Account and Profit & Loss Appropriation Account.*

*Preparation of Final Accounts of a company from a trial balance with or without adjustments.*

**NOTE:**

1. *According to Companies Act of Kingdom of Bhutan 2000 Balance sheet is prepared as per Schedule XIII A Part I and Profit and Loss account is prepared as per Schedule XIII A Part II.*
2. *Managerial remuneration and taxation are not required.*
3. *Debit balance of profit and loss account is to be shown in the asset side of balance sheet to the extent not written off.*
4. *Calls in advance is to be taken as a current liability.*

**UNIT-2**

**4. Financial Statement Analysis (9hours)**

*Comparative Statements and Common Size Statements.*

*Meaning, significance and limitations of Comparative Statements and Common Size Statements.*

*Preparation of comparative balance sheet and income statement (inter-firm and intra-firm) relating to two different periods showing absolute change and percentage change.*

*Common size balance sheet to be prepared as a percentage of total assets and total liabilities.*

*Common size income statement to be prepared as a percentage of net sales.*

**5. Cash Flow Statement (Only for Non-Financing Companies) (10 hours)**

- (i) *Meaning, importance and preparation of a Cash Flow Statement.*

**NOTE:***Based on Accounting Standard – 3 (revised) issued by the Institute of Chartered Accountants of India.*

- (ii) Calculation of net cash flows from operating activities based on Indirect Meth only.

*Preparation of a Cash Flow Statement from two consecutive years' Balance Sheet with or without adjustments.*

**NOTE:** *Any adjustment or an item in the Balance Sheet relating to issue of bonus shares, Foreign Currency Cash Flows; Extraordinary items; Investment in Subsidiaries, Associates and Joint Ventures; Acquisitions and Disposals of Subsidiaries and other Business Units; and Non Cash Transactions are not required. Redemption of preference shares and debentures with or without sinking funds and refund of tax are excluded.*

- (iii) Preparation of Cash Flow Statement on basis of operating, investing and financing activities.

*The following items are to be taken when calculating net cash flows from financing activities:*

- *Issue or redemption of shares and debentures at par, at a premium or at a discount.*
- *Interest and dividend paid on debentures, shares and public deposits.*
- *Cash proceeds from public deposits.*
- *Any loan (long term, medium term or short term) whether taken or repaid.*
- *Share issue expenses paid.*

*The following items are to be taken when calculating net cash flows from investing activities:*

- *Cash purchase of fixed assets.*
- *Cash sale of fixed assets.*
- *Purchase of shares or debentures or long term investments of other companies.*
- *Interest and dividend received on shares or debentures or long term investments of other companies.*
- *Sale of shares or debentures or long term investments of other companies.*

*The following items are to be taken for cash and cash equivalents:*

- *Cash*
- *Bank*
- *Short term investments*
- *Marketable securities*
- *Bank overdraft*
- *Cash credit*

**NOTE:**

1. *Adjustments relating to provision for taxation, proposed dividend, interim dividend, amortization of intangible assets, profit or loss on sale of fixed assets including provision for depreciation on them, Profit or loss on sale of investment are included.*
2. *The Adjusted Profit and Loss Account is not acceptable as per AS-3 for the calculation of cash flow from operating activities.*

## 6. Ratio Analysis (9 hours)

Meaning, advantages and limitations of ratio analysis.

- (i) Problems on ratio analysis (excluding interpretation, analysis, comparisons, conclusions and the preparation of Trading, Profit & Loss Account and Balance Sheet).

### (a) Liquidity Ratio: Current Ratio and Quick Ratio.

$$1. \text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}} \quad \text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

$$2. \text{Quick/Liquid/Acid Test Ratio} = \frac{\text{All Current Assets} - \text{Stock} - \text{Prepaid Expenses}}{\text{All Current Liabilities} - \text{Bank Overdraft}}$$

(b) Solvency Ratios: Debt to Equity Ratio, Total Asset to Debt Ratio, Proprietary Ratio, Interest Coverage Ratio.

$$\text{Quick/Liquid/Acid Test Ratio} = \frac{\text{All Current Assets} - \text{Stock} - \text{Prepaid Expenses}}{\text{All Current Liabilities} - \text{Bank Overdraft}}$$

$$1. \text{Debt Equity Ratio} = \frac{\text{Long term debts}}{\text{Shareholders' Fund}}$$

$$2. \text{Total Assets to Debt Ratio} = \frac{\text{Total Assets} - \text{Fictitious Assets}}{\text{Long Term Debts}}$$

$$3. \text{Proprietary Ratio} = \frac{\text{Shareholders' Fund}}{\text{Total Assets} - \text{Fictitious Assets}}$$

NOTE: Shareholders' fund is equal to Equity share capital + Preference share capital + Reserves and Surplus – Fictitious assets.]

$$4. \text{Interest Coverage Ratio} = \frac{\text{Net profit before interest and taxes}}{\text{Interest}}$$

(c) Activity Ratios: Stock turnover ratio, debtors turnover ratio, creditors turnover ratio, working capital turnover ratio

$$1. \text{Debtors Turnover Ratio} = \frac{\text{Net credit sales}}{\text{Average debtors} + \text{Average bills receivable}} = \text{number of times}$$

$$2. \text{Creditors Turnover Ratio} = \frac{\text{Net credit purchases}}{\text{Average creditors} + \text{Average bills payable}} = \text{number of times}$$

$$3. \text{Working Capital Turnover Ratio} = \frac{\text{Net sales}}{\text{Working capital}} = \text{number of times}$$

$$4. \text{Stock Turnover Ratio} = \frac{\text{Cost of goods sold}}{\text{Average stock}} = \text{number of times}$$

(d) **Profitability Ratios: Gross profit ratio, operating ratio, operating profit ratio, net profit ratio.**

1. **Gross Profit Ratio** =  $\frac{\text{Gross profit}}{\text{Net sales}} \times 100$
2. **Net Profit Ratio** =  $\frac{\text{Net profit}}{\text{Net sales}} \times 100$
3. **Operating Ratio** =  $\frac{\text{Cost of goods sold} + \text{Operating expenses}}{\text{Net sales}} \times 100$
4. **Operating Profit Ratio** =  $\frac{\text{Operating profit}}{\text{Net sales}} \times 100$
5. **Earning per share** =  $\frac{\text{Profit After Tax} - \text{Preference dividend}}{\text{Number of equity shares}}$

**NOTE:**

*Net = Gross – returns*

$$\text{Average} = \frac{\text{Opening} + \text{closing}}{2}$$

*Working capital = current assets – current liabilities.*

*Loose tools and spare parts are not to be taken in the calculation of Current Ratio.*

*Current assets = cash in hand, cash at bank, marketable securities, short-term investments, sundry debtors, bills receivable, accrued income, prepaid expenses, stock in trade.*

*Current liabilities = Sundry creditor, bills payable, liability for taxes, outstanding expenses, income received in advance, provision for taxation, proposed dividend, bank overdraft, short term loan.*

*Long term debts = Secured loans + Unsecured loans.*

*Cost of Goods sold = opening stock + net purchases + direct expenses - closing stock.*

OR

*Cost of Goods sold = Net sales - gross profit.*

*Operating ratio = 100 – operating profit ratio.*

*Operating profit = Gross profit - Administrative expenses - selling and Distribution expenses.*

OR

*Operating profit = Net profit + non-operating expenses - non-operating incomes.*

**NOTE:**

*Current Ratio includes Net Debtors (Gross Debtors – Provision for doubtful debts) while Debtors Turnover Ratio includes Gross Debtors.*

### UNIT-3

#### 7. Accounting Application of Electronic Spread Sheet (10 hours)

- (i) Concept of Electronic Spreadsheet.

*Meaning, utility, merits and demerits of Electronic spreadsheets.*

- (ii) Features offered by Electronic Spreadsheet.

*An understanding of basic features of electronic spreadsheets such as: Creating worksheet, entering data into*



*worksheet, heading information, data, text, dates, alphanumeric values, saving & quitting worksheet. Opening and moving around in an existing worksheet. Toolbars and Menus, keyboard shortcuts. Working with single and multiple workbooks - copying, renaming, moving, adding and deleting, copying entries and moving between workbooks. Formatting of worksheet- Auto format, changing - alignment, character styles, column width, date format, borders and colours. Previewing and Printing worksheet - Page setting, Print titles, Adjusting margins, Page break, headers and footers. Formulas – summation, subtraction, division, multiplication, average and percentage. Functions: date, if-then- else, freezing panes.*

(iii) Application of spreadsheets in generating the following accounting information:

1. Payroll

*Components of payroll – Basic Pay, House Rent Allowance( HRA), Dearness Allowance(DA) and Travelling Allowance (TA), Remote Posting Allowance (RPA), deduction for Provident Fund (PF),Health Contribution (HC) and Tax Deducted at Source (TDS).*

2. Data Presentation

*Graphs and charts- using wizards, various charts type, formatting grid lines and legends, previewing & printing charts Database - creation, sorting, query and filtering a database.*

## **8. Database Management System (DBMS) (15 hours)**

(i) Concept and Features of DBMS.

*Types and features of DBMS system.*

(ii) DBMS in Business Application.

*Database design, tables, fields, relationships, forms reports and indexing.*

*The following examples of DBMS in business application:*

- *Accounting Information*
- *Debtors and Creditors*
- *Asset Accounting*

## TIME AND WEIGHTING

Unit	Chapter	Hours per unit	Weighting per Chapter	Weighting per unit
Unit 1	1. Joint Venture	10	10%	60%
	2. Partnership Accounts	37	30%	
	3. Joint Stock Company Accounts	30	20%	
Unit 2	4. Financial Statement Analysis	9	5%	20%
	5. Cash Flow Statement	10	5%	
	6. Ratio Analysis	9	5%	
Unit 3	7. Accounting Application of Electronic Spreadsheet	10	3%	
	8. Data Base Management System	15	2%	
Project Work		-		
Assignment (Mid-Term)/Practical (External)		-		10%
<b>Total</b>		<b>130 hours</b>	<b>80%</b>	<b>100%</b>

## MODE OF ASSESSMENT

The students will be assessed **externally by the Bhutan Council of School Examinations and Assessments (BCSEA)** in class XII. However, the schools can conduct first and second term examinations in the following manner. But the internal assessment will have no bearing on the external examination.

Terms	Types of Assessment				
	Project Work	Assignment	Examinations	Practical	Total
First Term	-	10%	30%	-	40%
Second Term	10%	-	40%	10%	60%
<b>Total</b>	<b>10%</b>	<b>10%</b>	<b>70%</b>	<b>10%</b>	<b>100%</b>

### 1. Assignment

The students will choose any topic from the class XII syllabus and write an assignment of about 750 words in the **first term**. The work should not be something that is already covered by other classmates. The main purpose of this assignment is to make the students do literature research on the chosen topic and find information that is not available in the textbook. Marks may be awarded as follows (*suggestive only*):

<b>Presentation:</b> (Table of contents, bibliography, introduction, main body and conclusion)	3 mark
<b>Content:</b> (Relevant information, analysis and depth)	5 mark
<b>Language:</b> (Clarity of ideas, use of accurate terms and grammar)	2 mark
<b>TOTAL</b>	<b>10 mark</b>

## 2. Examinations

There will be school based examination at the end of first term and a Trial examination at the end of the academic year on a paper of three hours duration of 80 marks divided into two sections. However, while entering in the statement of marks it should be converted to 30% for first term and 40% for second term. A practical exam on Section C of the syllabus should be conducted for 10 marks for the trial examination. The project work by students for external examinations can be evaluated by subject teacher and included in the trial examinations result sheet. However this mark will have no bearing on the external examination.

### 2.1 PAPER - I (THEORY) – 80 MARKS

*There will be one paper of 3 hours duration of 80 marks divided into two Parts, I and II.*

**Part I (20 Marks):** will consist of **Question 1 (compulsory)** with 10 questions of 2 marks each. This question will include short answer questions testing knowledge, application and skills relating elementary/fundamental aspects of the syllabus.

**Part II (60 Marks):** Candidates will be required to answer **six** questions out of **eight** from this part. Each question shall carry 10 marks. This section will also be based on the entire syllabus.

### 2.2 PRACTICAL EXAMINATION ON SPREADSHEET AND DATA BASED MANAGEMENT SYSTEM - 10 Marks.

3 External Examination is conducted by the Bhutan Council of School Examinations and Assessments (BCSEA).

There will be three papers in the subject for the external examination.

#### 3.1 Paper I - Theory: 3 hours - 80 marks

There will be one paper of 3 hours duration of 80 marks divided into two Parts, I and II.

**Part I (20 Marks):** will consist of **Question 1 (compulsory)** with 10 questions of 2 marks each. This question will include short answer questions testing knowledge, application and skills relating elementary/fundamental aspects of the syllabus. Question 1 will be based on entire syllabus.

**Part II (60 Marks):** Candidates will be required to answer **six** questions out of **eight** from this part. Each question shall carry 10 marks. Part II will also be based on entire syllabus.

#### 3.2 Paper II- Project Work .....10 marks

Candidates will be required to have completed a project from any topic covered in Theory in discussion with the subject teacher. The students will then write a project work on the chosen topic in about 2500 words. The students will work on it throughout the two terms but will be assessed as a part of the external examinations. Marks may be awarded as follows:

<b>Overall format:</b> (Table of Contents, Bibliography, Introduction, main body and conclusion)	1 mark
<b>Content:</b> (Relevant Information, illustration, analysis and depth)	4 marks
<b>Findings</b>	2 marks
<b>Viva-voce based on the Project</b>	3 marks

The project work will be assessed by the subject teacher and visiting examiner appointed by the **Bhutan Council of School Examinations and Assessments (BCSEA)**.

**NOTE:** *The marks obtained in the Project work should be reflected in the Statement of Marks of the External Examinations.*

### **3.3 Paper III- Practical exam on Spreadsheet and DBMS:30 minutes - 10 marks**

The practical examination is conducted by BCSEA based on UNIT 3 of the syllabus for 10 marks of 30 minutes duration. The question paper for practical exam will be set by BCSEA and administered by the visiting examiner appointed by the BCSEA. The final of the practical paper will be assessed by BCSEA.

#### **A list of suggested Project and Computer Practical are given below:**

1. Preparation of Journal, Ledger, Trial balance and Financial Statements of a partnership form of business on the basis of a case study.
  - Develop a case study showing how two or more friends decide to come together and start a business with a certain amount of capital.
  - Prepare their Partnership Deed.
  - Write in detail, their transactions during the year: purchases - cash and credit, sales - cash and credit, expenses, purchase of fixed assets and depreciation charged on them, any outstanding expenses, prepaid expenses, accrued income, drawing bills of exchange, accepting bills payable etc.
  - From this case study developed (which should have at least 15 transactions), pass the journal entries, post them into the ledger, prepare a Trial Balance and the Trading and Profit and Loss Account, Profit and Loss Appropriation Account and Balance Sheet.
  - The various expenses, for comparison purposes, could be depicted in the form of bar diagrams, pie charts, etc.
  - Calculate relevant accounting ratios- giving their formulae, computation and significance (all this could be part of the viva-voce).
  - The ratios could also be shown graphically and/ or pictorially (bar diagrams, pie charts) and if possible, could be compared with the ratios of the industry.
2. Preparation of a Cash Flow Statement with the help of imaginary Balance Sheets of a company for two consecutive years could be taken along with at least five additional information (depreciation, purchase/ sale of fixed assets, Dividend paid/ proposed, Tax paid/ proposed).
  - The results of the operating, investing and financing activities could be shown graphically and/ or pictorially (bar diagrams, pie charts).
3. Preparation of Common Size and Comparative statements Income Statement and Balance Sheet of a company by taking into account its audited financial results of two quarters of an accounting year.

- The comparison has to be made in the form of Common Size and Comparative Income Statement and Balance Sheet.
  - The comparison could also be shown graphically and/ or pictorially (bar diagrams, pie charts).
4. Taking the audited/ unaudited financial results of any leading company, its liquidity, solvency, turnover and profitability ratios of two years should be calculated and the comparison of the ratios of both the years should be shown graphically and/ or pictorially (bar diagrams, pie charts).

5. Employee Salary Sheet:

- (i) Design a spreadsheet using the following fields:

Employee's Name: String Variable of maximum size of 40 characters

Date of Joining: Date in English U.K. format

Basic Salary: upto 2 places after decimal

Calculate their net salary using the Employee's data. [Feed in random data for 20 to 25 employees]

Some of the instructions are given below:

- (ii) Important Instructions:

Dearness Allowance (DA) is paid @ 45% of Basic Salary.

House Rent Allowance (HRA) is paid @ 15% of (Basic Salary + DA)

Remote Posting Allowance (RPA) is paid @ 8.3% of (Basic Salary + DA + HRA)

Provident Fund (PF) is deducted @ 12% of (Basic Salary + DA)

Tax Deducted at Source (TDS) is deducted @ 10% of (Basic Salary + DA + HRA + RPA)

Net Salary is summation of Basic Salary + DA + HRA + RPA less PF and TDS

- (iii) Save your worksheet on the desktop as Employee Salary.

- (iv) Print a Hard Copy of your work and close the file.

6. Revenue and Commission Statement.

Prepare a Spreadsheet for a certain Company which pays a commission based upon books sold.

Prepare a revenue and commission statement based upon the following information:

Name of Salesperson	No. of Note Books Sold	No. of Text Books Sold
Namgay Tshering	1540	380
Gopal Subha	1688	345
Kinley Nima	1249	213
Thinley Wangchuk	1216	705
Karma Jigme	898	549

**Assumption:**

Price of Note Books: @Nu.38 per Book

Price of Text Books: @ Nu.65 per Book

Commission on Note Books: 9.0%

Commission on Text Books: 12%

Prepare a spreadsheet showing your calculation to determine:

- (i) Revenue (Note Books and Text Books)
- (ii) Total Revenue
- (iii) Commission (Note Books and Text Books)
- (iv) Total Commission
- (v) Create a Chart (any style) showing the above information.

Open the original page (with lines and shading) as well as a formula page. (The entire formula must be shown)

Use “=round(.0)” where applicable so that all columns add correctly.

### 7. Database Management

- (i) Create a Database with at least 10 records with each record having the following fields:  
Employees Details: ID Number, Name, Address and Phone Number, Position
- (ii) Sort the names in alphabetical order.
- (iii) The Employee database has another table called Loan Details that stores the details of loan taken by various employees. Create a query that gives a list of employee’s names along with loan details.  
The loan details table has following fields:  
Loan Amount, Loan Date, Interest Rate, Amount Paid and Amount Balance.
- (iv) Create a Report as per the format given below:

Employee Loan Details:

Emp. No.	Emp. Name	Loan Amount	Loan Date	Amount Paid	Balance Amount
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Design tables, relationships etc. on your own.

### 8. Database Management:

- (i) Create an Accounts Table by following the steps given below:
  - (a) Click on the new button and highlight. Design View in the dialog box that appears.
  - (b) Click the OK button and the Table Design View will appear.
  - (c) Fill in the Field Name, Data Type and Description for each column/field in the Account Table.

Field Name	Data Type	Description
Customer ID	Number	The Unique Identifier for a Customer
Account No	Number	The Unique Identifier for a Bank Account
Account Type	Text	The type of account (Current, Saving etc.)
Date Opened	Date	The date the account was opened
Balance	Number	The current balance (money) in this account

- (ii) Define a Primary Key for the Accounts table.  
Click on the Account Number field with the right mouse button and choose Primary Key from the pop-up menu.

(iii) Save the new Accounts Table.

### 9. Selection Grade Card

(i) Make a Spreadsheet of a Selection Grading Chart using the following details:

Candidate's Name:	String type
Test 1:	Integer type
Test 2:	Integer type
Test 3:	Integer type
Test 4:	Integer type

The Worksheet format is as follows:

Sl. No.	Name of the Candidate	Test1 (Max 25 Mks)	Test2 (Max 25 Mks)	Test3 (Max 25 Mks)	Test4 (Max25 Mks)
1	Dorji	25	23	16	24
2	Karma	16	24	18	19
3	Ugyen	21	16	20	23
4	Dema	18	19	19	24
5	Dendup	20	23	22	17

(ii) Compute the percentage for each candidate's total. Show the total score and the percentage for each candidate.

(iii) Create a Header for the Chart. Include your name.

(iv) Save your work on the desktop as Merit\_Project.

(v) Print a hard copy of your work and close the file.

## TEXTBOOKS & REFERENCES

### Textbooks

1. Double Entry Book Keeping Class XI – T.S Grewal (2014)- Sultan Chand and Sons Pvt. Ltd.
2. *ISC Accountancy for Class XII- C.M Juneja* -Kalyani Publishers.

### References

3. *ISC Accountancy for Class XI- C.M Juneja* - Kalyani Publishers.
  4. Tulsian Accountancy for Class XI- P.C Tulsian –RatnaSagar Publishers.
  5. Tulsian Accountancy for Class XII- P.C Tulsian –RatnaSagar Publishers.
  6. Pitambar Text Book A Complete Course in ISC Accounting for Class XII Vol.2 by N. D. Kapoor, B. Bhushan
  7. *ISC Tulsian Accountancy for Class XII- P.C Tulsian& S.D Tulsian* –RatnaSagar Publishers.



# Computer Studies

## **RATIONALE**

Information and Communication Technology (ICT) is a rapidly evolving industry area that is experiencing considerable and sustained growth. Increasingly, information technology will provide products and services which will have significant influence upon the lives of Bhutanese. There is market demand for skilled ICT workforce. Investment in ICT in schools would have a far-reaching and favourable impact of producing qualified human resource in the country. ICT could become an important industry contributing significantly to the country's socio-economic development.

In a global, innovation-based economy, the preparation of a workforce to function effectively in this fast-changing environment is crucial to the economic and developmental well-being of a country. In a knowledge- and innovation-based economy, ICT are seen as key drivers of the economic engine.

The course, Computer Studies, at this level aims to provide the basis upon which students in schools can be exposed to essential ICT knowledge, skills and values that will contribute to their being able to function effectively in this new and fast-changing environment. It also aims to provide a balance that will offer the best possible fit to present and immediate future ICT learning needs of students in Bhutan for classes 11 and 12.

This course will open up wider areas of ICT for students who aspire to specialize further. It provides them enough confidence and understanding to go for either higher studies or training programmes. It aims to provide a balance that will offer the best possible fit to present and immediate future ICT learning needs of students in classes 11 and 12.

## **AIMS**

Teachers should help the students to:

- Develop skills in applying clear logical thinking in solving problems.
- Develop skills in designing solutions using creative and methodical processes.
- Appreciate the simplicity and elegance in computer-based solutions.
- Appreciate the need to make informed and objective judgments in decision making.
- Critically evaluate design solutions.
- Prepare for the demands of university studies.
- Acquire the necessary ICT skills to undertake the challenges of an innovation-based economy.

## **LEARNING EXPERIENCES**

Students should:

- Have opportunities to practice their skills of designing solutions for a variety of real-world problems.
- Be provided adequate opportunities to apply logical algorithms in problem solving.
- Be encouraged to act ethically in decision making.
- Have practical hands-on experiences in using requisite software for designing solutions.

## **LEARNING OUTCOMES**

These experiences should help the students to:

- Demonstrate the understanding and knowledge of computing concepts through the use of appropriate terminology in the correct context.
- Identify the common components of a computer and describe their functions.
- Search for online resources using search engines.
- Demonstrate the knowledge of evaluating the online resources.

- Demonstrate the understanding of ethical and security issues in using online resources.
- Apply basic principles of programming in writing simple programs.
- Use common HTML tags to create a web page.
- Apply the knowledge and skill of using HTML to design simple web sites.
- Learn independently through inquiry, exploration and experimentation.

## **CLASS XI COMPUTER STUDIES**

Recommended teaching time (in hours) for each topic is indicated within brackets. Time calculation is based on relative importance of each section and scope set out under it.

### **SECTION A: IT LITERACY (48 HOURS)**

#### **A1. Advanced Word Processing (MS Word) (12 hours)**

- Insert graphics (clip arts and photos) and position graphics within text flow
- Format tables: insert or delete rows and columns; adjusting width of columns and rows; adding or changing border lines and shading; merging or splitting cells; convert table to text or vice versa
- Insert equations using Equation Editor
- Using text boxes: creating and connecting textboxes
- Inserting text files
- Inserting page breaks, section breaks and page numbers

#### **A2. Simple Computer Graphics (MS Paint/Office Drawing Tools) (8 hours)**

- Using drawing tools: draw shapes and manipulate the objects (fill, rotate, resize, move)
- Combining paint tools, text tools and drawing tools in creating an object
- Insert graphics from files and edit them

#### **A3. Desktop Publishing (MS Word) (16 hours)**

- Plan a layout using textboxes, tables and column feature (design concepts)
- Format the flow of text around the graphics (text wrapping)
- Position graphics in the document
- Create custom header, footer and page number
- Design a cover page with different header and footer

#### **A4. Spreadsheet (MS Excel) (10 hours)**

- Using functions: SUM; AVERAGE; FREQUENCY; COUNT; MAX; LARGE; MIN; RANK; SMALL
- Create and use formulas: IF; AND; OR; NOT
- Create simple spreadsheets with real problems (e.g. accounting, mark sheet, school records, etc.)
- Import data from external sources
- Setting page orientation (portrait/landscape), header/footer and sheet features in page setup

#### **A5. Computers in Real Life (2 hours)**

- Identify areas where computers have helped in commerce and industries – banking (e.g. bank accounts), census records (e.g. new citizenship ID card)
- Describe the presence of computers in transportation, every day devices, and in wireless mobile communication (e.g. cell phones)
- Describe how computers have changed ways of conducting business and life in general (e.g. email, ATM cards, scanners in stores, etc.)

## **SECTION B: SYSTEMS (26 HOURS)**

### **B1. Overview of Computer Systems (3 hours)**

- Development of computers from the invention of mechanical calculator by Leonardo da Vinci in 1500 to present
- Functions and uses of computers
- Describe briefly how network works
- Examples of how computer systems have impacted daily life

### **B2. Components of Computers (5 hours)**

- Role and composition (a complex collection of transistors for handling data) of microprocessors
- Explain the function of BIOS (Basic Input/Output System)
- Describe the function of RAM and its features
- Describe the function of the CMOS and CMOS battery
- Explain that hard drive is the main repository of applications and files
- Describe the functions and features of CD-ROM, CD-Writer and combo drives
- Describe the features and limitations of removable drives such as the Zip drive
- Describe the function and features of floppy drives
- Describe the function of a tape drive
- Explain what is a mother board and its main functions
- Describe the function of a video card and explain how it works
- Describe the function of a sound card and explain how it works
- Explain the function of a port
- Describe the function of USB, mouse and keyboard ports
- Distinguish between a parallel port and a serial port; and describe their respective functions
- Distinguish between AGP and PCI expansion slots
- Describe the function and features of a modem
- Describe the functions of the heat sink and fan (cooling mechanism)
- Describe the power supply of the computer

### **B3. Operating Systems (2 hours)**

- Understand that an operating system is a piece of software that the PC must have to make it work
- Describe the functions of an operating system
- Describe the functions of an application software
- Explain the function of drivers, e.g. for printing
- Explain the relationship among OS, BIOS and drivers
- Describe how the OS, BIOS and drivers work together to allow the smooth functioning of an external device plugged into the computer

### **B4. Microprocessor (5 hours)**

- Understand the concept of a binary system
- Inter-conversion between decimal and binary numbers
- Perform simple mathematical operations in binary system
- Describe the use of transistors as logic gates and their combination to form half and full adders for handling the manipulation of binary arrays
- Describe the functions of a CPU and its relationship with all other components
- Explain how addition is done in a computer

### **B5. Data Storage (4 hours)**

- Understand the main concepts of access time, bit, byte, cluster, compression, data transfer rate, directory, format, fragmentation, write and read
- Explain why formatting a disk is necessary

- Describe the function of the File Allocation Table (FAT)
- Explain how writing and reading is done on a floppy disk
- Explain briefly how writing/reading a file to/from disk is done
- Explain briefly the disk compression process
- Explain briefly the compression of files
- Explain briefly the defragmentation process

#### **B6. Printers (3 hours)**

- Understand the main concepts of dot matrix, point, resolution, font and bitmap
- Describe the basic printing mechanism based on dot matrix
- Describe how a laser printer work
- Describe how colour printing is done in ink-jet and laser printers

#### **B7. Troubleshooting/Preventive Measures (4 hours)**

Troubleshooting a PC and related devices such as printers require experience and patience. It is recommended that students learn troubleshooting via a guided hands-on exposure. However, there are some general guidelines which may be adopted. Here are some:

- Adopt a positive ‘can-solve’ attitude
- Obtain complete and accurate description of problem
- Assess the worst-case damage scenario
- Re-produce the problem
- Use an elimination process to narrow down the possible causes of the problem
- Test the solution

Often, problems stem from lack of awareness and skills in preventive measures related to

- Handling of storage devices (floppy disks, CD-ROMs, etc.)
- Use of computer equipment and peripherals (keyboard, mouse, cables, etc.)
- Dusting and cleaning of mouse, monitor, keyboard, etc.

### **SECTION C: INFORMATION LITERACY (56 HOURS)**

#### **C1. Introduction to ICT (3 hours)**

- List the different types of ICT – internet phones, e-mails, internet videos, discussions, forums, e-groups, chats, etc.
- List down the advantages and disadvantages of the various types of ICT

#### **C2. Internet Fundamentals (13 hours)**

- Describe how the Internet started and its reason for its usage
- Explain the concept of the Internet and the philosophy
- Connect to the ISP through either modem or leased line
- Introduction to Internet browser and its menu
- Describe the address elements in a URL (data transfer protocol, domain name, domain extension, country code)
- Navigate between pages and sites
- Saving links to Favourites folder (in Internet Explorer)
- Downloading materials
- Save pages, graphics and photos
- Differentiate between TCP and IP

#### **C3. Search Engines (15 hours)**

- Describe the basic principles of how search engine works

- Give an example of a strategy to search
- Compare results from different search engines
- Generalise the characteristics of different search engines
- Describe how information and web pages are tagged with meta information
- Use meta-search engines (e.g. Copernicus) to search for information
- Explain how the meta-search engines work

#### C4. Online Resources (25 hours)

- Differentiate different file formats (PDF, XLS, DOC, PPT, etc.)
- Download and save relevant files and documents
- Issues in downloading online intellectual property: copyright, patent, trademark
- Security issues in downloading and using online resources: viruses, hackers, worms, Trojans, etc.
- Evaluate the online materials for accuracy; currency (up-to-date); authority of the source; relevancy and reliability
- Identify the source by looking at the URL
- Identify the organisation that host the resources
- Name some online databases (e.g. AskEric; online scientific databases; medical databases)
- Locate and identify databases which are directly relevant to subject areas
- Search for relevant documents by author, title, keywords; journals; topics
- Evaluate the usefulness of databases: scope, accuracy, documentation, accessibility, outputs, support, value-to-cost ratio
- Evaluate the usefulness of information from the databases

### MODES OF ASSESSMENT

The assessment at this level will be done internally by the school in the following manner:

Terms	Types of Assessment & Weighting			Total
	CA	Examinations		
First	Class Presentation (on a topic) 15%	Mid Term		45%
		Theory	Practical	
		10%	20%	
Second	Word Processing or Spreadsheet Project 10%	Annual or Trial		55%
		Theory	Practical	
		15%	30%	
<b>Total</b>	<b>25%</b>	<b>25%</b>	<b>50%</b>	<b>100%</b>

#### 1. Continuous Assessment (CA)

**During the First Term, every student will be expected to do a presentation each on a chosen topic from the syllabus.** The aim of the presentation is to build up the communication and presentation skills of the students. It also allows for peer evaluation within a collaborative setting. The preparation of presentation itself would allow the students to apply the IT literacy skills appropriately. However, the actual mode of presentation will be left up to the discretion of the teacher, depending upon the facilities available. In general, the following elements are expected in presentation assessment:

- Appropriate use of IT
- Clear articulation of ideas
- Proficient understanding of the concepts involved
- Ability to handle questions

**During the Second Term, the students should be given a spreadsheet or word processing project that requires them to apply skills to real-world situations.** For instance, two students could share a project – one develops a *spreadsheet* that will automate the calculation of marks for a class and the other designs a *user guide* for the spreadsheet.

The process of completing such a project allows the student to explore at greater depth the use of IT skills. It would also allow the student to acquire a set of important life skills that include interdisciplinary knowledge application, communication, collaboration and independent learning.

In general, the following elements will be considered while assessing the project work. However, *the main focus should be on how much the student has explored and applied the requisite ICT skills in developing, doing and presenting the project.*

- Presentation – organisation, design principles, creativity
- Content – information relevance, referencing
- Process – note taking or information gathering, consultation with subject teacher, experimentation, collaboration with friends

## 2. Examinations

There will be two examinations in a year – Mid Term at the end of First Term and Annual Examination at the end of Second Term. There will be two papers for each examination. The *written paper* is meant to be a comprehensive test of the theoretical knowledge and thinking skills of the students. The thinking skills involved include:

- Organising: comparing, sequencing, categorising
- Analysing: identifying attributes, pattern, errors and relationships
- Deducing: arriving at conclusions based on available facts
- Creating: formulating and generating possibilities

The *practical examination* at the end of the year is to test the students' ability to apply the knowledge and skills learnt. This task should be designed to effectively ascertain the level of competencies in the application of skills and knowledge.

### TIME ALLOCATION AND WEIGHTING OF TOPICS FOR EXAMINATION

The weighting scheme provided below is based on the relative importance of each topic strand. This translates to the emphasis given on each section when setting questions for theory examination.

Section	Time (in hours)	Weighting (in %)
<b>Section A: IT Literacy</b>	<b>48</b>	<b>35</b>
A1. Advanced Word Processing	12	7
A2. Simple Computer Graphics	8	7
A3. Desktop Publishing	16	7
A4. Spreadsheet	10	11
A5. Computers in Real Life	2	3
<b>Section B: Systems</b>	<b>26</b>	<b>35</b>
B1. Overview of Computer Systems	3	5
B2. Components of Computers	5	6
B3. Operating Systems	2	3
B4. Microprocessors	5	10
B5. Data Storage	4	4
B6. Printers	3	4
B7. Troubleshooting/Preventive Measures	4	3
<b>Section C: Information Literacy</b>	<b>56</b>	<b>30</b>



C1. Introduction to ICT	3	5
C2. Internet Fundamentals	13	10
C3. Search Engines	15	5
C4. Online Resources	25	10
<b>Total</b>	<b>130</b>	<b>100</b>

### EXAMINATION SPECIFICATIONS

There will be two papers in the subject to be evaluated *internally by the school*. Paper 1 is a written examination on theory, which will be conducted over duration of 3 hours, and assessed out of 100 marks. Paper 2 is a practical examination, also conducted over duration of 3 hours, and assessed out of 100 marks.

### PAPER 1 (THEORY EXAMINATION)

This paper will consist of two parts:

#### Part I

This part is worth 50 marks. It will consist of compulsory objective type of questions (multiple choice, fill in the blanks, short answer type) covering the entire syllabus.

#### Part II

This part is worth 50 marks. It will consist of 7 questions (10 marks each) out of which students are required to attempt only five questions. Questions will be set from all sections of the syllabus.

### PAPER 2 (PRACTICAL EXAMINATION)

This paper shall consist of 3-hour practical examination at the end of the year. The questions for the terminal practical examinations shall be set only from the following sections of the syllabus:

Section A (IT Literacy)	Section C (Information Literacy)
<ul style="list-style-type: none"> <li>⇒ Advanced word processing</li> <li>⇒ Simple computer graphics</li> <li>⇒ Desk top publishing</li> <li>⇒ Spreadsheet</li> </ul>	<ul style="list-style-type: none"> <li>⇒ Search engines</li> <li>⇒ Online resources</li> </ul>

### TEXTBOOKS, REFERENCES & MATERIALS

#### SUPPLIED TEXTBOOKS AND REFERENCES

##### Textbook

- **Excellence in Computer Education. Computer System & Application Software: MS Office (2003).** C.K. Seth and Shashi Seth. Prachi India Pvt. Ltd., India.

##### References

- **Introductory Information Technology. The Complete Textbook for Class X (2002).** Satish Jain and Shashank Jain. BPB Publications, India.
- PGCTIS course handouts & reference books
- PGCTIS course CDs

## CLASS XII COMPUTER STUDIES

Recommended teaching time (in hours) for each topic is indicated within brackets. Time calculation is based on relative importance of each section and scope set out under it.

### SECTION A: WEB DESIGN (60 HOURS)

#### A1. Basics of Web Design (5 hours)

- Introduction to HTML (Hyper Text Markup Language)
- Understand the concept of tags and containers
- Design elements/considerations in web designing

#### A2. Basic HTML Tags (15 hours)

- Use an appropriate editor to write HTML codes
- Apply head, title, body and paragraph commands to create a simple web page
- Use line break, anchor, list, image and align commands in a web page

#### A3. Advanced HTML Tags (15 hours)

- Create tables within HTML documents using table commands: table, tr, td, th, caption
- Add effects to the whole table: alignment, border, cell spacing, cell padding, width
- Add colour and background graphics to tables
- Understand the differences between tables, forms and frames

#### A4. Web Designing Applications (25 hours)

- Create web pages from within Word, Excel and PowerPoint
- Introduce using FrontPage as a visual editor to design web pages
- Analyse the HTML codes used in a web page from the Internet using FrontPage
- Understand what a web hosting means and what it involves (domain name registration, web space, website design, web server, internet connection)
- Practical project-based tasks (designing simple website for a class, school, etc.)

### SECTION B: SCRIPTING LANGUAGE (70 HOURS)

#### B1. Introduction to JavaScript (5 hours)

##### Objectives

- Define what JavaScript is.
- Explain the historical development of JavaScript.
- Identify at least three types of scripting language.
- Differentiate between JavaScript and general purpose language.
- Explain what JavaScript can and cannot do.
- Explain differences in browser support for JavaScript.

##### Topics

- Introduction to scripting language
  - Examples (JavaScript, VBScript, Perl)
  - Differences between scripting, HTML and general purpose language (e.g. C++, Java, Visual Basic)
- History of JavaScript
- Strengths and limitations of JavaScript
- Support and compatibility with different browsers (IE, Netscape, FireFox, Opera)

## **B2. Fundamentals of JavaScript (10 hours)**

### **Objectives:**

- Use appropriate editor to write a script.
- Add appropriate tags to begin and end scripts.
- Add JavaScript statements and comments within a script.
- Use script within HTML tags to display the output.
- Test and debug a script.
- Use good programming practice to minimize errors.
- Explain how event handlers work.

### **Topics:**

- Tools for scripting
  - Examples: Notepad, Homesite, FrontPage, Dreamweaver, GoLive
- The script tag
  - Beginning and ending
  - JavaScript statements
  - JavaScript comments
  - Hiding script from older browsers
- Creating output
  - Document.write()
  - Embedding JavaScript within HTML
- Testing and debugging a script
  - Errors and case sensitivity
  - Debugging tools
  - Good programming practices
- Events and event handlers
  - Concept of event and event handler
  - Using common event handlers: onClick(), onMouseOver(), onMouseOut()

## **B3. Variables, Operators, Statements and Arrays (25 hours)**

### **Objectives**

- Declare and use variables in a program.
- Describe and use different types of operators in a program.
- Apply appropriate condition and loop statements in a program.
- Define arrays.
- Sort data stored in an array.

### **Topics**

- Variables and values
  - Types of variables and values (numbers, string, Boolean, functions, null)
  - Declaring and initializing variables
- Types of Operators (arithmetic, incremental, assignment, logical, comparison, conditional)
- Condition Statements (If, If ... else, If ... elseIf, Switch case)

- Loop Statements (For, While, Do While)
- Concept of Array
  - Declaration and initialization
  - Defining array elements
  - Looping array
  - Sorting array elements

#### **B4. Functions and Document Object Model (20 hours)**

##### **Objectives**

- Define functions and parameters
- Create a user-defined function
- Declare global and local variables for a function
- Explain hierarchy in Document Object Model [DOM]
- Explain the relationship between objects, properties and methods
- Access properties and methods of an object with DOT syntax
- Call function into HTML document

##### **Topics**

- Functions
  - Concept of a function
  - Writing a function (key word, function name, parenthesis, code block)
  - Scope of variables (global, local)
  - Built in (math, string, date and time) and user defined functions
  - Passing an argument/parameter
  - Calling a function defined within the HTML document or outside
- Document Object Model [DOM]
  - DOM hierarchy
  - Window and Document Object, Property and Method (with examples)
  - The Dot Syntax

#### **B5. Application of JavaScript (10 hours)**

##### **Objectives**

- Apply scripts to HTML project
- Customize freely available scripts

##### **Topics**

- Adding interactivity to HTML project
- Customizing available scripts for use in the project

### **MODES OF ASSESSMENT**

The final assessment for class 12, which will determine the students' result, will be done through two external examinations (theory and practical) conducted by the Bhutan Board of Examination (BBE) at the end of the academic session. The Board examinations will follow the specifications provided in this syllabus.

However, for the purpose of monitoring students' learning and for school's internal records, the school must conduct the assessments in the following manner till the trial examinations.

Terms	Types of Assessment & Weighting			Total
	CA	Examinations		
First	HTML Project 15%	Mid Term		45%
		Theory	Practical	
		10%	20%	
Second	HTML Project Continued (enhance using JavaScript) 10%	Annual or Trial		55%
		Theory	Practical	
		15%	30%	
<b>Total</b>	<b>25%</b>	<b>25%</b>	<b>50%</b>	<b>100%</b>

### 1. Continuous Assessment (CA)

Students will be assessed across both the terms through a project that they would be carrying out. The process of completing the project allows the student to explore at greater depth the use of IT skills. It would also allow the student to acquire a set of important life skills that include interdisciplinary knowledge application, communication, collaboration and independent learning.

**During the First Term, the students should be given a project that entails designing a website using HTML.** In this term, the website created should be *more or less functional* at least in terms of structure, links and navigation.

**In the Second Term, the students continue with their HTML project done in the First Term.** However, the emphasis in this term will be in enhancing and adding interactivity to their web pages using JavaScript. They could either create their own scripts or customise some freely available scripts for use in their website. The website should be *complete and fully functional*.

*Every student will also be expected to do a presentation on their final project.* The aim of the presentation is build up the communication and presentation skills of the students. It also allows for peer evaluation within a collaborative setting. The preparation of presentation itself would allow the students to apply the IT skills appropriately. However, the actual mode of presentation will be left up to the discretion of the teacher, depending upon the facilities available. In general, the following elements are expected in presentation assessment:

- Clear articulation of ideas
- Proficient understanding of the concepts involved
- Ability to handle questions

In general, the following elements will be considered while assessing the project work. However, *the main focus should be on how much the student has explored and applied the requisite ICT skills in developing, doing and presenting the project.*

- Presentation – organisation, design principles, creativity
- Content – information relevance, referencing
- Process – note taking or information gathering, consultation with subject teacher, experimentation, collaboration with friends

### 2. Examinations

There will be two examinations in a year – Mid Term Examination at the end of First Term and Trial Examination at the end of Second Term. There will be two papers for each examination.

The *written paper* is meant to be a comprehensive test of the theoretical knowledge and thinking skills of the students. The thinking skills involved include:

- Organising: comparing, sequencing, categorising
- Analysing: identifying attributes, pattern, errors and relationships

- Deducing: arriving at conclusions based on available facts
- Creating: formulating and generating possibilities

The *practical examination* is to test the students' ability to apply the knowledge and skills learnt. This task should be designed to effectively ascertain the level of competencies in the application of skills and knowledge.

### TIME ALLOCATION AND WEIGHTING OF TOPICS FOR EXAMINATION

The weighting scheme provided below is based on the relative importance of each topic strand. This translates to the emphasis given on each section when setting questions for theory examination.

Section	Time (in hours)	Weighting (in %)
<b>Section A: Web Design</b>	<b>60</b>	<b>46</b>
A1. Basics of Web Design	5	4
A2. Basic HTML Tags	15	16
A3. Advanced HTML Tags	15	16
A4. Web Designing Applications	25	10
<b>Section B: Scripting Language</b>	<b>70</b>	<b>54</b>
B1. Introduction to JavaScript	5	4
B2. Fundamentals of JavaScript	10	10
B3. Variables, Operators, Statements and Arrays	25	25
B4. Functions and Document Object Model	20	15
B5. Application of JavaScript	10	0
<b>Total</b>	<b>130</b>	<b>100</b>

### EXAMINATION SPECIFICATIONS

There will be two papers in the subject, which will be evaluated *externally by the Bhutan Board of Examination (BBE)*. Paper 1 is a written examination which will be conducted over duration of 3 hours, and assessed out of 100 marks. Paper 2 is a practical examination, also conducted over duration of 3 hours, and assessed out of 100 marks.

### PAPER 1 (THEORY EXAMINATION)

This paper will consist of two parts:

#### Part I

This part is worth 50 marks. It will consist of compulsory objective type of questions (multiple choice, fill in the blanks, short answer type) covering the entire syllabus.

#### Part II

This part is worth 50 marks. It will consist of 7 questions (10 marks each) out of which students are required to attempt only five questions. Questions will be set from all sections of the syllabus.

## **PAPER 2 (PRACTICAL EXAMINATION)**

This paper shall consist of 3-hour practical examination at the end of the year. The questions for the practical examination shall be set from the entire syllabus (HTML and JavaScript).

The basic structure of the website and other resources (text, images, audio, etc) required will be provided. The candidate will make changes to it according to the instructions in the question paper.

Candidates are required to save their work. Both printout and soft copy of their works will be collected by the Examiner for evaluation.

## **TEXTBOOKS, REFERENCES & MATERIALS**

### **SUPPLIED TEXTBOOKS AND REFERENCES**

#### **Textbooks**

- **Excellence in Computer Education: Internet, Website Designing & MS Access (2003).** C.K. Seth & Shashi Seth. Prachi India Pvt Ltd.
- **Sams Teach Yourself JavaScript in 24 Hours 4th ed. (2006).** Michael Moncur.

#### **References**

- **Introductory IT: The Complete Textbook for Class X (2002).** Satish Jain & Shashank Jain. BPB Publications.
- **Learning Web Design (2006).** Jennifer Niederst. Shroff Publishers and Distributors Pvt. Ltd.
- PGCTIS course handouts & reference books
- PGCTIS course CDs

### **OTHER POSSIBLE REFERENCES (NOT SUPPLIED)**

- **JavaScript: A Beginners' Guide, 2nd ed. (2004).** J. Pollock. The McGraw-Hill Companies, California.
- **JavaScript Demystified (2005).** J. Keogh. The McGraw-Hill Companies, California.



# **Socially Useful and Productive Work (SUPW**

## **RATIONALE**

The Socially Useful and Productive Work (SUPW) is another learning area besides the Values Education, Physical Education, Career Education and Art and Craft that contributes towards the personal development. This curriculum is intended to lend opportunities for the candidate to explore and assess their abilities and aptitude on varieties of life related skills and knowledge. This should also offer opportunities for candidates to develop better understanding of their social and environmental issues.

In the light of providing wholesome education and in preparation of candidate to the realities of work life, the SUPW is perceived to be crucial at this level. The school should ensure that candidates are encouraged to take up varieties of activities, which are productive and useful for the school and the community.

## **AIMS**

The Socially Useful and Productive Work that is of practical nature and undertaken under appropriate supervision and planning, will help achieve the following:

1. Inculcation of positive attitudes towards work in students;
2. Develop understanding and skills about the world of works;
3. Develop the healthy habits of works – co-cooperativeness, commitment and consistency.
4. Learning to apply one's classroom and vocational knowledge to solve day-to-day problems of the community;
5. Instil the interest to participate in the community and nation building activities;
6. Develop awareness of social, personal and environmental issues.

## **LEARNING EXPERIENCES**

To develop positive attitude towards works and life of works, candidates should be:

1. encouraged to participate in an organized gainful and productive activities;
2. encouraged to take initiative to organize and conduct social services activities;
3. provided opportunity to work in groups or individually;
4. involved to assess and prioritize the social services;
5. involved to solve simple problems in the community scientifically – need assessment, planning, designing and implementation and evaluation.

## **LEARNING OUTCOMES**

Students will be able to:

1. do any given work willingly and confidently;
2. practice the habit of planning any type of work;
3. co-operate with others;
4. contribute to community and nation building;
5. deal with social, personal and environmental issues; and
6. exhibit responsible behaviour whenever required to do so.

## **SUGGESTED AREAS AND ACTIVITIES**

The SUPW activities must be of planned tasks whose outcomes contribute towards the school or the community. The daily school's chores like morning cleaning, weekly agricultural works, clearing bushes, social forestry

day, sport day, fete day should not be considered as SUPW activities and therefore should not be assessed as practiced in many schools.

Sl. #	Suggested Activities	Time allocation
<b>I. School Campus Enrichment</b>		1. One period in a week is allotted for SUPW.  2. The SUPW related activities could be planned according to the conveniences of the candidates.
	Nature garden development and maintenance	
	Religious / cultural area development and maintenance	
	Footpath development	
	Social forestry development and maintenance	
<b>II. Agriculture</b>		
	Poultry development and maintenance	
	Piggery development and maintenance	
	Vegetable gardening	
	Orchard development and maintenance	
<b>III. Art and Craft</b>		
	Embroidery	
	Metallurgy	
	Wood / Bamboo craft	
	Knitting and weaving	
	Photography	
	Painting	
	Recycling of used materials	
	Cooking	
<b>IV. Community Services</b>		
	Forest management	
	Water catchments management	
	Support the needy farmers	
	Health / Education campaign	
	Environment conservation activities	

**Table 1**

**NOTE:**

The categorisation of the topics into four broad areas is only to provide idea about the coverage of the varieties of area of activities and should not have bearing on the choice of activities by candidates.

**ORGANISATION OF THE ACTIVITIES**

The activities for SUPW could be organised in several ways. Below are a few suggestions:

1. The candidates could be grouped into CLUBS or COMMITTEES with a teacher in charge. The clubs or committees could be based on the above suggested areas and activities.
2. Each section or candidate could be given an Area / Topic with the class teacher in charge.
3. Each section could be EQUALLY DIVIDED into groups for different areas / a teacher could look after topics and each group.

## MODES OF ASSESSMENT

The assessment of the SUPW is subjected to the discretion of the schools as to how students might be assessed on their SUPW. However, the concerned teachers MUST follow some criteria (see Table 2) for awarding points and then translating to grades (see Table 3).

1. The candidates/section/group should choose at least TWO activities in two years of classes 11 and 12 from the suggested list of topics. These activities can be either from the same group or from two groups suggested above.
2. The candidates/section/group should have the liberty to undertake activities not listed above but deemed useful for the school or community in consultation with the concerned teacher.
3. Each activity will be assessed from 100 points.
4. The total points secured by each individual/group/section will be worked down to percentages from the total points secured and the number of activities undertaken and then translated to grades (see Table 3).
5. For every activity, the candidate/group/club/section must maintain a record of the activities and submit the report on completion.
6. The concerned teacher must maintain the records and reports of SUPW activities carried out by every candidate/group/section. The visiting examiner as is of the case with project works could check the reports of varieties of SUPW activities.

## ASSESSMENT CRITERIA FOR SUPW

### Awarding points for one activity

Sl No	Criteria	Weighting (100 points)
1	Completion of work	10
2	Planning of work	10
3	Management of resources	15
4	Utility of the work	20
5	Extent of the work (minimum of 5 hours duration)	20
6	Quality	15
7	Report writing	10
	<b>Total</b>	<b>100</b>

Table 2

### NOTE:

The total points secured by the candidate/group/section must be converted to percentage from the total number of activities undertaken and assessed. The percentage then is translated to grades based on the scheme given in Table 3.

### Translation of points to grades

Percentage secured	Grades to be awarded
Above 80 %	A: Excellent
60 – 79 %	B: Very good
50 – 59%	C: Good
40 – 49%	D: Fair
Below 40 %	E: Fail

Table 3

**NOTE: Candidates failing in SUPW will fail the BHSEC examination.**