

HOLY CROSS SCHOOL, AGARTALA
SYLLABUS FOR CLASS V – 2020

FINAL EXAMINATION - 2020

1. ENGLISH LANGUAGE

1. Simple Present Tense
2. Present Continuous Tense
3. Present Perfect Tense
4. Simple Past Tense
5. Past Continuous Tense
6. Simple Future Tense
7. Future Continuous Tense
8. Active and Passive Voice

2. ENGLISH LITERATURE

Ch. 9 - The Secret Garden (Story)

Ch. 10 – The Rescue (Story)

Poem

1) God Save the Beetle, (2) The Moon

Work Book(Selected Exercises)

Ch. 9, 10

Pg. 25 – 26 (Poem)

Pg. 47 – 48 (Poem)

3. HIGHER HINDI

Text Book

Chapter 6 – Apnaa Sthan Swayam Banaay

Chapter 9 – Suman Ek Upwan Ke

Chapter 10 – Baapu Ki Seekh

Chapter 12 – Mahadaani Karn

Chapter 13 – Rakt Ki Kahani

(Work Book chapters same as text book chapters)

Grammar

Chapter 8 – Sarvanaam

Chapter 9 – Visheshan

Chapter 10 – Kriyaa

Chapter 11 – Kaal

Chapter 12 – Avikari Sabd

Chapter 14 – Shabad Bhandar- Synonyms,
Antonyms, One Word Substitution

4. BENGALI

Prose:

1. Mama Go
2. Apur Pathshala
3. Achhuter Seba

Poem:

1. Debotar Thai
2. Sukh

Grammar

1. Pader Srenibibhag (Page 33)
2. Pad Paribartan (Page 79 - 80)

5. SANSKRIT :

8. Lat Lakaar Madhyam Purush
9. Lat Lakaar Uttam Purush
10. Dwitiya Vibhakti
11. Tritiya Vibhakti
12. Chaturthi Vibhakti

Work Book

7. Lat Lakaar Madhyam Purush
8. Lat Lakaar Uttam Purush
9. Dwitiya Vibhakti
10. Tritiya Vibhakti
11. Chaturthi Vibhakti

6. LOWER HINDI :

6. Payassa Kowa
7. Chidiyaa Ghar Ki Sair
8. Sangit Sabha
9. Dasharay Ka Mella
11. Sabjiyo Ka Kheyt
12. Imandaara Chatra
13. Bulbul Ki Jaan Bachi
14. Gudiya Ka Bukhar
15. Chidiyaa or Chinti

7. MATHEMATICS :

- Ch. 4 – Roman Numerals
- Ch. 6 – Rounding Off – Estimations
- Ch. 8 – Factors and Multiples
- Ch. 9 – Fractions
- Ch. 10 – Decimal Fractions
- Ch. 14 – Introduction to Negative Numbers
- Ch. 15 – Geometry [Ex – A, B, D]
- Ch. 16 – Measurement
- Ch. 17 – Perimeter and Area [Ex-A & C]
- Ch. 20 – Time [Ex-20 A,B,C]

8. GENERAL SCIENCE :

- Chapter 7. Interdependence in living beings –
Plants & Animals
- Chapter 8. Sound & Noise
- Chapter 9. Work & Energy
- Chapter 10. Light & Shadows
- Chapter 11. Simple Machines
- Chapter 12. Cleanliness & Hygiene
- Revision Test 2 &
(Assignments based on the above mentioned
chapters)

9. SOCIAL STUDIES :

Chapter 9. India – Location and Extent
Chapter 10. Our Neighbouring Countries
Chapter 11. The Climate of India
Chapter 12. Natural Vegetation
Chapter 13. Our Environment
Chapter 14. Natural Disaster
Chapter 15. Precautions for Natural Disasters
Chapter 16. Natural Resources
Chapter 17. Agriculture in India

10. COMPUTER

Chapter 2. Types of Computer
Chapter 4. Presentation Software – special effect
Chapter 6. Internet Services
Q Basic Programming
(REM, LET, INPUT, PRINT, MOD)

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HOLY CROSS SCHOOL, AGARTALA

SYLLABUS FOR CLASS - VI - 2020

FINAL EXAMINATION

1) English Language

1. Verbs
2. The Tense
3. Simple Present Tense
4. Simple Past Tense
5. Simple Future Tense, the 'Going to' form
6. Continuous Tenses
7. Preposition
9. Direct and Indirect Speech

2) English Literature

Story

Chapter 11. A Handful of Salt
Chapter 18 The Voice of Conscience

Poem:

Chapter 14 – Spring Quiet
Chapter 17 – Stopping by woods on a Snowy Evening

Reader

Robinson Crusoe - 4 to 6

Work Book (Selected Exercises)

Chapter 11(Ex –B,C,D), Chapter 14 (Ex-B,C),
Chapter 17 (Ex B,C,D), Chapter 18(Ex A,B,C,D,E)

3) Higher Hindi

- 10) Suraj Ka Intazar
- 12) Sachha Veer
- 15) Bin Chidiya Ka Jungle
- 16) Meera Magan Bhai

Grammar

- 1) Chapter 7 to 14

4) Bengali

Prose

- 1) Pahare Jangale
- 2) Jibanu Abiskar
- 3) Amajoner Utsa Sandhane

Poem

- 1) Prarthanateet Dan
- 2) Sagar Tarpan

Grammar

- 1) Biparitarthak Shabda (Page No. 86 – 88)
- 2) Samarthak Shabda (Page No. 92 – 93)
- 3) Swara Sandhi (Pg 20 – 22) Sutra – 6 to 12

5) Lower Hindi

- 10) Rangu – Changu Ki Jori
- 11) Khet Mae Khajana
- 12) Aaram hai haram
- 13) Abraham Linkan
- 16) Seva Bhavi Balak
- 17) Kichad Ki Boochar

18) Kachua Aur Khargosh Ki Dor

19) Mai Ka lal

6) Sanskrit

- 9) Chatur Kak
- 10) Swatantrata Diwas
- 11) Kachan Khaga
- 14) Upadesh Sloka

Work Book

- 4) Ekaranth Pulling
- 5) Ekaranth Striling

7) Maths

Lesson 4 – Fractions(Ex C,D,F,G)

Lesson 5 – Decimal Fractions (Ex D,E)

Lesson 6 – Playing With Numbers(Ex C,D)

Lesson 10 – Percentage(Ex A,B,C)

Lesson12–Fundamental Concepts of Algebra(Ex.- D,E,F)

Lesson 13 – Simple Equations

Lesson 15 – Angles

Lesson 17 - Quadrilaterals (Ex A -Q6 to 16 only)

Lesson 23 – Perimeter and area of plane figures

(excluding perimeter)

Lesson 25 – Graphical representation of data(Ex B)

8) Physics

Chapter 2- Physical Quantities and Measurement
(excluding measurement of Temperature and Measurement of Area)

Chapter 5- Light (excluding application of Rectilinear Propagation of Light- Pinhole camera)

Chapter 6 - Magnetism (excluding Earth's magnetic field, making a magnet & electromagnet, Choice of material for the core of an electromagnet)

9) Chemistry

Chapter-2 - Common Laboratory Apparatus and Equipments (from Half Yearly)

Chapter 3 – Matter (from Half Yearly)

Chapter - 4 – Elements, Compounds, Symbols and Formulae

Chapter – 5 – Pure Substances and Mixtures: Separation of Mixtures

10) Biology

Chapter-1 - The Leaf (From half Yearly)

Chapter 3 - Cell – The Structure and Functions
(from half Yearly)

Chapter 7 – Diseases & Hygiene (from Half yearly)
(Excluding Protozoal diseases, diseases caused by worms, Non-communicable diseases: examples, ways to prevent them)

Chapter-4 - Digestive System (excluding Process of digestion particularly of Carbohydrates, Proteins and Fats)
Chapter-5 - Respiratory System (excluding the common respiratory diseases- Asthma, Bronchitis, tuberculosis, Pneumonia)

11) History & Civics

History

Chapter 2 – The Indus Valley Civilization(From Half Yearly)
Chapter 7 – The Later Vedic Age (From Half Yearly)
Chapter 8 – Jainism and Buddhism(Excluding a comparative study between Jainism & Buddhism at Pg 73)
Chapter 10 – The Mauryan Empire (Excluding Ashoka's welfare state at Pg-86 & Bindusara at Pg-84)
Chapter -11 The Gupta Empire(Excluding Administration at Pg-95 & Art and Architecture at Pg-97)

Civics

Chapter 14 – Urban Local Self Government
(Excluding Composition of Municipal Corporation at Pg 121 & Municipalities at Pg 122.)

12) Geography

Ch. 1 – Representation of Geographical Features
(from half yearly)
(Topics : Introduction, Globe- Merits & Demerits, Map -Merits& Demerits, Importance of maps, Comparison between Map, Sketch & Plan, Direction)

Ch. 2 – Major Landforms of the Earth (from half Yearly) **Unit Test – I**
(Topics: Introduction, Endogenic & Exogenic Processes, Mountains, Volcanic Mountains, Table 2.1(Fold & Volcanic Mountains), Importance of Mountains, valleys, Plateaus- Tectonic & volcanic, Table 2.2 (Continental/Intermontane /Piedmont), Plains- Erosional & Depositional Plains, Table 2.3- Erosional & Depositional, landforms& People – A Comparative Study(pg-20)

Ch. 5 – Minerals
(Topics: Introduction, , Types of Minerals, Mineral Resources, Distribution of mineral resources, , Iron- Copper- Bauxite, Manganese, Conservation of minerals, Sources of power, Coal-Petroleum-Natural gas

Ch. 7 – South America – Location and Physical Features
Map – South America

Computer

Chapter-3- Word Processor Tabular Presentation
Chapter-6 –Scratch Programming (from half yearly)
(only exercise Summary)
Chapter-8- Internet
Q-Basic Programming
(STR\$,VAL\$,LEFT\$, RIGHT\$,MID\$,LEN)

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The above mentioned topics are there in the syllabus.

HOLY CROSS SCHOOL, AGARTALA
SYLLABUS FOR CLASS - VII - 2020

FINAL EXAMINATION – 2020

1. ENGLISH LANGUAGE:

- Ch- 22 Active and Passive Voice (Ex.39,40,41,42,44)
- Ch-24 Tenses: Introduction (Ex.45)
- Ch-25 The Uses of Present & Past Tenses (Ex. 46,47)
- Ch-26 The Future Tense (Ex.48)
- Ch-28 The Infinitive (Ex.50)
- Ch-29 The Participle (Ex 53, 54)

2. ENGLISH LITERATURE

- Ch-6 A Grain as Big as a Hen's Egg (Story)
- Ch-9 Rain in Summer (Poem)
- Ch-14 The Laburnum (Poem)
- Ch-17 Learning to be a Lady (Story)

Reader:

- Ch – 1 Dhruvas' Groom

Work Book (Selected Exercises)

- Ch. 6, 9, 14, 17

3. BENGALI

Prose

- 1) Borof Bichano Deshe
- 2) Sobcheye Bhalo
- 3) Arkimidisar Abishkar

Poem

- 1) Debotar Bidaye
- 2) Sneher Joy

Grammar

- 1. Pray Samochharita Shabder Artha Parthakya (Page: 94 – 95)
- 2. Ek Kathay Prakash (Page: 91- 93)
- 3. Byanjan Sandhi (Page 9 - 11) Sutra (8 – 16)
- 4. Padh Paribortan (Page 81 – 83)

4. HIGHER HINDI

- Ch. 11: Adwitya Purvouttar Bharat
- Ch. 12: Surdas Ke Pad
- Ch.15 : Tuffano Ki Oar
- Ch. 16: Sushrut

Grammar

- Ch. 7 : Sangya
- Ch. 8 : Linga
- Ch. 9 : Vachan
- Ch. 10 : Kaarak
- Ch. 11 : Sarvanaam
- Ch. 12 : Visheshan
- Ch. 13 : Kriya

5. LOWER HINDI

- 9. Iswarchandra Vidyasagar
- 11. Arjun Ki Safalta
- 12. Hamari Prithwi – 1
- 13. Hamari Prithwi – 2
- 14. Sidharth Aur Hans
- 15. Pandrah August
- 16. Raksha Bandhan
- 18.Dato Ki Safai

6. SANSKRIT

Text Book:

- Ch. 9: Patram Pitram Prati
- Ch. 14: Virha Abhimanyu
- Ch. 15: Lobho Na Kartavya
- Ch.16: Sanskrit Bhasha Mahatvam

Work Book

- Ch. 7: Rikarant Pulling
- Ch .9: Nakarant Pulling
- Ch. 10: Nakarant Nopunsakling

7. MATHEMATICS

- Ch. 2: Rational Number (excluding word problems)
- Ch.4 : Decimals (Ex 4C,4D)
- Ch. 6: Sets (Ex 6A,6B,6C)
- Ch. 9: Percentage (Ex 9A)
- Ch. 10: Profit & Loss
- Ch. 14: Linear Equations
- Ch. 18: Properties of Triangles (Ex 18A)
- Ch.21: Congruence
- Ch. 23: Mensuration (Ex 23 E)
- Ch. 24: Data Handling (Ex 24 C)

8. PHYSICS

- Ch. 3: Energy
- Ch. 4: Light Energy (excluding Primary& Secondary Colour, Subtraction of colour, appearance of colour of an object based on reflection and absorption)
- Ch. 5: Heat (excluding Thermos Flask)
- Ch. 7.: Electricity and Magnetism (from Half yearly) (Excluding Electromagnetism, Electromagnets and their applications – Electric bell, Electric cell as source of electricity, Simple electric circuit : Series and parallel)

9. CHEMISTRY

- Ch. 4: Atoms, Molecules and Radicals
- Ch. 5: Language of Chemistry
- Ch. 6: Metals and Non-Metals (excluding metalloids & Inert gases)

10. BIOLOGY

- Ch. 1: Plant and Animal Tissues (From Half Yearly)
- Ch. 3: Classification of Animals (From Half Yearly)
- Ch. 4: Photosynthesis and Respiration
- Ch. 5: Excretion in Human (Excluding the role of kidneys in urine formation; Structure of nephron; Common disorders of the urinary system like kidney stones, Urinary Tract Infection)

11. HISTORY & CIVICS

HISTORY

- Ch. 8 Mughal India
(Topics :India on the eve of the Mughal Conquest, The Early Mughals, Babur- The return of the Mughals,the coming of portugese)
- Ch. 9 Akbar
(Topics :The second battle of Panipat, Expansion of the empire under Akbar, Land revenue system, The Mansabdare System, Akbar's policy on Religion, Akbar's place in History)
- Ch. 10 Jahangir Shah Jahan and Aurangzeb
(Topics :Shah Jahan, Aurangzeb, Shivaji & Aurangzeb, The decline of the Mughal Empire)

CIVICS

- Ch.13 The Constitution of India (From Half yearly)
(Topics :The Constitution of India, What is a constitution, Framing of the Indian Constitution, Preamble of the Indian Constitution(not the Terms & objectives), The Indian Constitution and its special features)
- Ch. 14 The Directive Principles of State Policy
(Topics :India as a welfare state, Directive Principles of state policy(3 paras only), Fundamental Rights, Suspension of Fundamental rights, Fundamental Duties)
The above mentioned topics are there in the syllabus.

12. GEOGRAPHY

- Ch. 2 Atmosphere (From Half yearly)
(Topics: Introduction, Atmosphere, Composition ,Structure & Importance of atmosphere)
- Ch. 5 – Industries
(Topics: What is Industry, Need & Classification (agro based Industry), factors that influence the location of industry, Major Industries- Iron & Steel, Textile, Information Technology & Fishing, Industrial Pollution)
- Ch. 7 – Europe Map – Europe
- Ch. 9 – Australia
The above mentioned topics are there in the syllabus.

13. COMPUTER

- Ch.2: Number System (From half yearly)
 - Ch. 4: Ethics and safety Measures in Computing
 - Ch. 9: HTML Advance Features
Loops and Conditional QBASIC Programming
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CLASS – VIII SYLLABUS

FINAL EXAMINATION 2020

1. ENGLISH LANGUAGE

- L 10 -Transformation of sentences –Ex: 59, 60, 61
L 12 - Synthesis of sentences – Ex: 88, 92
L 16 -Direct and indirect speech- Ex: 105, 108
L 17 -Agreement of the verb with the subject – Ex: 110
L 18 -Nouns and Pronouns – Ex: 111, 114

2. ENGLISH LITERATURE:

- Ch. 7 – Break, Break, Break (Poem)
Ch. 8 – The First Pup (Story)
Ch.12 – The Shoemaker (Story)
Ch. 18 – If (Poem)
Work Book (Selected Exercises)
Chapters – 7, 8, 12, 18
Reader: The Tempest

3. HIGHER HINDI

- Ch. 13 - Anokha Badala (story)
Ch. 14 - Aatha Abimanyun (story)
Ch. 15 - Kapi Kari Hridaya Vichar (poem)
Ch. 16 - Pardesh Main Basa Bharat (story)

Grammar

- L - 10, 11, 12, 13, 14, 15

4. BENGALI

Prose

- 1) Gouri Teoarir Meye
2) Khajanchibabu
3) Punch theke Noushera

Poem

- 1) Bangladesh
3) Dadheechir Atmatyeg

Grammar

- a) Pratyae (Pg – 79 to 81)
b) Ashuddhi Sangshodhan (Pg- 85-88)
c) Bachan O Purush (Pg – 18 – 29)

5. SANSKRIT

- Ch. 2. Chatur Sashaka
Ch. 9. Sarva Dharma Bharta (I)
Ch. 10. Sarvadamno Bharta (II)
Ch. 13. Devashwamin Katha
Work Book: Ch. 1,2,3,4

6. LOWER HINDI

- Ch.10. Anmol Vachan
Ch. 11. Gopal Krishna Gokhale
Ch.12. Railgari Ke Kahani
Ch.15. Everest Vijay
Ch.18. Karat Karat Abhyas Ke
Ch. 20. Netaji Subhash Chandra Bose

Vyakaran

- Ch. 2 Varna ke bhed
Ch. 3. Matraye, shabd Aur vakya
Ch. 4 Sangya
Ch. 5. Ling

7. MATHEMATICS

- Ch. 3 – Square Root & Cube Root
Ch-5 - Sets
Ch. 7 – Profit & Loss(Ex-7B)
Ch. 8- Simple Interest and Compound Interest
(Ex 8B,8C,8D)
Ch. 11 – Time and work
Ch. 14 – Factorisation(Ex-14A, 14B)
Ch. 15 – Linear Equations (Ex-15A, 15B)
(Problems of age, Upstream,Downstream & Area excluded)
Ch. 16 – Linear Inequations
Ch. 23 Perimeter and Area of plane figures (Ex-23A)

8. PHYSICS

- Ch: 2 Physical quantities and Measurement (Excluding vessels for measuring Volume- Eureka Can, Measuring Cylinder)
Ch: 5 Light Energy(Excluding Rules for drawing ray Diagrams& Real & Virtual images, Ray Diagram with curved mirrors where real images are formed)
Ch: 7 Sound (Excluding Ways of changing the pitch in different instruments, Monotone)
Ch: 8 Electricity (Excluding Formulas & Numericals on Household Consumptions of Electricity, Dangers of Electricity)

9. CHEMISTRY

- Ch.4. Atomic Structure(From Half yearly)
Ch. 6. Chemical Reaction
Ch.9 – Carbon & its compounds.

10. BIOLOGY

- Ch: 3 Reproduction in Humans
(Full Chapter is included) From Half Yearly
Ch : 4 Ecosystem
(Deleted portion- The abiotic or non-living components like sunlight, air, water, temperature and soil-Pg 35 -36)
Ch: 5. Endocrine system and Adolescence (Full chapter is included)
Ch. 7 Nervous System
(Deleted portion- The types of nerves- sensory, motor and mixed nerves given on Pg 66 ; Nerves of Somatic Nervous System like cranial and spinal nerves given on Pg -68)

✓ **The Structure of Neuron is included**

11. HISTORY & CIVICS

History: Section- A

Ch 5- India in the 18th Century(The causes for the decline of the Mughal Empire)

Ch 7 - The British conquest of India – Part – I (From Half yearly)

(The conquest of Bengal, Tha battle of Plassey , Buxar and their results)

Ch 11 -The Revolt of 1857

(Political, Socio-religious & Military causes, The Immediate cause of the revolt, Leaders, Consequences, Nature of uprising)

Civics:

Ch 15 - The Central government – The Legislature and the Executive (From Half yearly)

The Legislature- The parliament(Lok sabha & Rajya sabha- Composition, term, Election,Qualification, Presiding Officer)

The Executive- the President, The Vice President, prime Ministers- Qualification, Election,The council of Ministers)

Ch 16 -The Judiciary

(The Supreme Court & High Courts- Composition, Structure, Qualification of Judges, Appointment)

Ch 17 – The United Nations

Formation, Aims, Organs, Agencies, programmes & Funds, Achievements.

The above mentioned topics are there in the syllabus.

12. GEOGRAPHY

Ch 2. Population Dynamics (From Half Yearly)

Ch 3. Migration (From Half Yearly)

Ch 4. Urbanisatioin – Causes and effects

Ch 7. India – Location and Physical Features.

* Map – India Physical Map

13. COMPUTER

Ch. 4 Programming Coding JAVA

Ch: 5 App Development (Exercise only)

Ch: 6 Communication and Networking (Definition of Network & its components, Types of Network, Cloud Computing)

ENGLISH (01)

CLASS IX

There will be **two** papers:

Paper 1: English Language;

Paper 2: Literature in English.

Each of these papers will be of **two hours** duration.

Paper 1: English Language (80 Marks)
Internal Assessment (20 Marks)

Paper 2: Literature in English (80 Marks)
Internal Assessment (20 Marks)

PAPER 1 - ENGLISH LANGUAGE

(Two hours) - 80 Marks

Five questions will be set, all of which will be compulsory.

Question 1: Candidates will be required to write a composition of about **300– 350** words from a choice of subjects which will test their ability to: Organise, describe, narrate, report, explain or present ideas coherently with accuracy and precision, compare and contrast ideas and arrive at conclusions and use correct style and format.

The subjects will be varied and may be suggested by language or by other stimuli such as pictures. The subjects will be so chosen so as to allow the candidates to draw on first-hand experience or to stimulate their imagination.

With one subject, a number of suggestions about the content of the composition will be given, but the use of the suggestions will be optional and a candidate will be free to treat the subject in any way that he/she chooses.

The organisation of subject matter, syntax, punctuation, correctness of grammatical constructions and spelling will be expected to be appropriate to the mode of treatment required by the subject.

Question 2: Candidates will have to write a letter from a choice of two subjects requiring either a formal or an informal mode of treatment. Suggestions regarding the content of the letter may be given. The layout of the letter with address, introduction, conclusion, etc., will form part of the assessment. Special attention must be paid to the format of the letter with emphasis on vocabulary appropriate to the context.

Question 3: Candidates will be given a specific situation and will be required to:

- (a) Write the text for a notice based on given directions.
- (b) Write an e-mail on the same content as the notice.

Question 4: An unseen prose passage of about **450** words will be given. Uncommon items of vocabulary, or structure will be avoided. One question will be set to test vocabulary. Candidates will be required to show an understanding of the words/phrases in the context in which they have been used.

A number of questions requiring short answers will also be asked on the passage. These questions will test the candidates' ability to comprehend the explicit content and organisation of the passage and to infer information, intention and attitude from it.

The last question will consist of a summary that will test the candidates' ability to distinguish main ideas from supporting details and to extract salient points to re-write them in the form of a summary. Candidates will be given clear indications of what they are to summarise and of the length of the summary.

Question 5: There will be a number of short answer questions to test the candidates' knowledge of **functional** grammar, structure and use of the language.

All the items in this question will be compulsory. They will consist of correct use of prepositions, verbs and transformation of sentences.

PAPER 2 - LITERATURE IN ENGLISH

(Two hours) - 80 Marks

Candidates will be required to answer five questions from the prescribed textbooks, which include Drama, Prose (Short Stories) and Poetry.

Drama and Prose (Short Stories)

Questions set will be central to the text. Candidates will be required to show that they have understood the passage and are able to clearly give their interpretation of the questions set, which should be in their own words and relevant to the text.

Excerpts may be given from the drama and prose texts leading to questions on the specific book.

Poetry

A poem, or passages from poems, will be given and questions will be set to test the candidates' response to the poem. The questions will focus on the content, understanding and the personal response of candidates to the poem as a whole.

NOTE: *The Class IX examination will be conducted on the portion of this syllabus that is to be covered during the academic year.*

Syllabus to be covered in Class IX

1. THE MERCHANT OF VENICE (Shakespeare's **unabridged** play by A.W. Verity)

Drama: *Act 1 – Scenes 1, 2 & 3, Act 2 – Scenes 1 to 9, Act 3 – Scene 1 ONLY.*

TREASURE TROVE - *A collection of ICSE Poems and Short Stories* (Evergreen Publications)

2. POETRY:

- (i) *The Cold Within* – James Patrick Kinney
- (ii) *The Bangle Sellers* – Sarojini Naidu
- (iii) *After Blenheim* – Robert Southey
- (iv) *Television* – Roald Dahl
- (v) *Daffodils* – William Wordsworth

3. PROSE (Short Stories):

- (i) *Old Man at the Bridge* – Ernest Miller Hemingway
- (ii) *A Horse and Two Goats* – R.K. Narayan
- (iii) *Hearts and Hands* – O. Henry
- (iv) *A Face in the Dark* – Ruskin Bond
- (v) *An Angel in Disguise* – T.S. Arthur

*** Please note that the Class X - ICSE Examination paper will be set on the entire syllabus prescribed for the subject.**

Note: For list of prescribed text-books see Appendix- I.

INTERNAL ASSESSMENT

Paper 1 - English Language

1. Schools will prepare, conduct and record assessments of the **Listening and Speaking Skills of candidates as follows:**

Three assessments are to be done in the course of the year.

2. Pattern of Assessment

a) Listening Skills

A passage of about 300 words is read aloud by the examiner *twice*, the first time at normal reading speed (about 110 words a minute) and the next time at a slower speed. Candidates may make brief notes during the readings. They then answer an objective type test based on the passage, on the paper provided.

The recommended number of candidates at a sitting is 30.

b) Speaking Skills

Each candidate is required to make an oral presentation for about two minutes, which will be followed by a discussion on the subject with the examiners, for about three minutes.

Subjects for presentation may include narrating an experience, providing a description, giving directions how to make or operate something, expressing an opinion, giving a report, relating an anecdote or commenting on a current event.

A candidate may refer to brief notes in the course of the presentation but reading or excessive dependence on notes will be penalized.

It is recommended that candidates be given an hour for preparation of their subject for presentation and that they be given a choice of subject, on a common paper.

EVALUATION

The assessment will be conducted by the subject teacher.

Award of Marks (20 Marks)

Listening Skills: 10 marks

Speaking Skills: 10 marks

Schools are required to maintain a record of all assessments conducted in **Listening and Speaking Skills**. These include copies of the assessment tests,

topics for presentation and marks awarded. The record will be maintained for a period of 2 months after the ICSE (10) examinations of the candidates concerned.

Paper 2 - Literature in English

Schools will set, assess and record written assignments by the candidates as given below:

Two or three assignments of approximately 300 to 400 words each.

SUGGESTED ASSIGNMENTS

Assignments should be based on the prescribed textbooks on the following lines:

- (i) Character/thematic analysis;
- (ii) Socio-economic, cultural, historical relevance / background;
- (iii) Summary / paraphrase.
- (iv) Appreciation of literary qualities.
- (v) Identifying with a character. Putting oneself in the place of a character in given circumstances and explaining one's actions.
- (vi) Imagine alternative outcomes or endings in a literary piece and the effect on all concerned.

EVALUATION

The assignments/projects are to be evaluated by the subject teacher.

INTERNAL ASSESSMENT IN ENGLISH LANGUAGE-GUIDELINES FOR MARKING WITH GRADES - AURAL ASSIGNMENT (CLASSES IX & X)

Grade	Understanding/ Comprehension Main Idea, Central Theme	Recall	Vocabulary	Context/ Correlation to Other Areas	Marks
I	The candidate accurately understands the central idea of the passage as well as the relevant points in the selected passage/ talk.	The candidate recalls all the important points made (written/ verbal).	The candidate uses appropriate and correct vocabulary while recalling the points made.	The candidate clearly understands the context and can widely correlate the passage to the other areas.	3
II	The candidate gives ideas fairly close to the central / main idea of the passage as well as understands some of the relevant points heard in the selected passage/ talk.	The candidate recalls some of the important points made (written/ verbal).	The candidate uses correct but simple vocabulary while recalling the points made.	The candidate can moderately understand the context of the passage and can moderately correlate the passage to the other areas.	2
III	The candidate cannot fully comprehend the passage and gives only a few ideas related to the central theme of the passage.	The candidate recalls very few of the important points made (written/verbal).	The candidate makes various errors in vocabulary while recalling the points made.	The candidate can only faintly understand the context of the passage and relate it to the other areas.	1
IV	The candidate is neither able to understand the central/main idea of the passage; nor able to understand relevant points heard in the passage/talk.	The candidate is unable to recall the important points made (written/verbal)	The candidate uses incorrect vocabulary while recalling the points made.	The candidate is unable to understand the context of the passage and is unable to correlate the passage to the other areas.	0

INTERNAL ASSESSMENT IN ENGLISH LANGUAGE - GUIDELINES FOR MARKING WITH GRADES - ORAL ASSIGNMENT (CLASSES IX & X)

Grade	Fluency of Language	Subject Matter	Organization	Vocabulary/ Delivery	Understanding	Gesture	Marks
I	Speaks with fluency and has full operational command over the language.	Matter is relevant, rich in content and original.	Content is well sequenced and well organized.	Uses appropriate vocabulary and pronounces words correctly.	While speaking, the candidate emphasizes the important points.	Uses natural and spontaneous gestures that are not out of place.	3
II	The candidate speaks with fairly good fluency and has reasonable operational command of the language.	The subject matter is mostly relevant, consisting of a few original ideas.	The content is satisfactorily sequenced and well organized.	The candidate pronounces most words correctly and uses simple vocabulary.	While speaking, the candidate emphasizes most important points.	Uses some natural gestures.	2
III	The candidate speaks with poor fluency and does not communicate except for the most basic information.	The subject matter is irrelevant and lacks originality.	The subject content is very poor and lacks organisational structure.	The candidate pronounces many words incorrectly and uses inappropriate vocabulary.	While speaking, the candidate emphasizes some important points.	Uses very few natural gestures.	1
IV	The candidate cannot communicate even the most basic information.	The subject matter is negligible.	The subject content comprises of mere words with no structured sentences.	The candidate is unable to correctly pronounce most words and has a limited vocabulary.	While speaking, the candidate is unable to emphasize important points.	Uses no natural gestures.	0

INTERNAL ASSESSMENT IN LITERATURE IN ENGLISH -GUIDELINES FOR MARKING WITH GRADES (CLASSES IX & X)

Grade	Understanding of Text (Narrative)	Examples from Text	Understanding of text- Interpretation and Evaluation	Appreciation of Language, Characterization	Critical Appreciation - Personal Response	Marks
I	The candidate demonstrates expertise in giving an appropriate account of the text, with well-chosen reference to narrative and situation.	The account is suitably supported by relevant examples from the text.	The candidate understands the text with due emphasis on interpretation and evaluation.	The candidate appreciates and evaluates significant ways (structure, character, imagery) in which writers have achieved their effects.	The candidate is able to effectively reflect personal response (critical appreciation) to the text.	4
II	The candidate demonstrates a high level of competence in giving an account of the text, with appropriate references to the narrative and situation.	The account is supported by examples from the text.	The candidate understands text with some emphasis on interpretation and evaluation.	The candidate appreciates and evaluates significant ways in which writers have achieved their effects.	The candidate is able to reflect a personal response to the text.	3
III	The candidate demonstrates competence in giving an account of the text with some reference to the narrative and situation.	The candidate understands the text and shows a basic recognition of the theme and can support it by a few examples.	The candidate recognizes some aspects of the text used by authors to present ideas.	The candidate recognizes some of the significant ways in which the writers have used the language.	The candidate is able to communicate a personal response, which shows appreciation.	2
IV	The candidate gives a broad account of the text with reference to the narrative and situation.	The candidate understands the basic meaning of the text.	The candidate relates the text to other texts studied.	The candidate recognizes differences in the way authors write.	The candidate communicates a straightforward personal response to the text.	1
V	The candidate is unable to demonstrate an understanding of the basic events in the text.	The candidate is unable to understand the text or support it with any examples.	The candidate is unable to relate the text to the other texts studied.	The candidate is unable to recognize the differences in the way authors write.	The candidate is unable to give a personal view of the text studied.	0

SECOND LANGUAGE

Aims:

1. To appreciate the language as an effective means of communication.
2. To acquire knowledge of the elements of the language.
3. To develop an interest in the language.
4. To understand the language when spoken at normal conversational speed.
5. To understand the basic structural patterns of the language, vocabulary and constructions.

INDIAN LANGUAGES

CLASSES IX AND X

Papers will be set in the following languages:

Ao-Naga, Assamese, Bengali, Dzongkha, Garo, Gujarati, Hindi, Kannada, Khasi, Lepcha, Malayalam, Manipuri, Marathi, Mizo, Nepali, Odia, Punjabi, Sanskrit, Tamil, Tangkhul, Telugu, Urdu or any other language of an Indian community approved by the Council.

*There will be one paper of **three** hours duration carrying 80 marks and Internal Assessment of 20 marks.*

The paper will be divided into two sections, Section A and Section B.

Section A: Language (40 Marks)

Section B: Prescribed Texts (40 Marks)

*Candidates will be required to attempt **all** questions from Section A. They must attempt **four** questions from Section B from **ONLY two** of the prescribed textbooks.*

SECTION A: LANGUAGE - 40 Marks

This section will consist of four questions, all of which will be compulsory.

1. **Composition:** Candidates will be required to write one composition, in the language, which may include short explanations, directions, descriptions or narratives. There will be a choice of subjects, which will be varied and may be suggested by language or other stimuli such as pictures and objects. (15 Marks)

2. **Letter:** Candidates will be required to write a letter from a choice of two subjects. Suggestions may be given. The layout of the letter with address, introduction, conclusion, etc., will form part of the assessment. (7 Marks)
3. **Comprehension:** An unseen passage of about 250 words will be given in the language. Questions on the passage will be set for answers in the language, designed to test the candidates' understanding of the content of the passage. (10 Marks)
4. **Grammar:** This will consist of tests in the use of language vocabulary, syntax and idioms, synthesis in sentence construction, formation of sentences in the language correctly embodying given words or forms. The question will not require any knowledge of grammatical terms. (8 Marks)

SECTION B: PRESCRIBED TEXTS - 40 Marks

The question paper will consist of structured and short answer questions. Candidates will be required to answer four questions from **ONLY two** of the prescribed text books. All questions will be set in the language and candidates will be required to answer in the language. The questions set will be designed to test the candidates' understanding of the subject matter of the prescribed books.

Note: For list of Prescribed Textbooks, see Appendix - I.

The Class X – ICSE examination paper will be set on the entire syllabus prescribed for the subject. The Class IX internal examination is to be conducted on the portion of this syllabus that is covered during the academic year. ***The Council has not prescribed bifurcation of the syllabus prescribed for this subject.***

INTERNAL ASSESSMENT

Language and Literature:

Class IX: Two or three assignments of reasonable length/duration of which two should be written assignments – one from the language and one from the literature component of the syllabus.

Class X: Two or three assignments of reasonable length/duration of which two should be written assignments – one from the language and one from the literature component of the syllabus.

SUGGESTED ASSIGNMENTS

Language:

Class IX: Creative Writing: Students are to write short compositions (approximately 300 to 400 words each), the stimuli being:

- (i) a piece of recorded music;
- (ii) a recorded series of sounds;
- (iii) a picture/photograph;
- (iv) an opening sentence or phrase;
- (v) a newspaper/magazine clipping or report;

One piece of factual writing which should be informative or argumentative; one piece of expressive writing which is descriptive and imaginative; preparation of film/book review.

Aural: Listening to a conversation/talk/reading of a short passage and then writing down the relevant or main points in the specified number of words and answering the given questions.

Class X: Oral: Prepared speech/ declamation; impromptu speech/ debate/ discussion; report/interview; elocution; role-play/general conversation on selected topics.

Creative Writing: Students are to write short compositions (approximately 300 to 400 words each), the stimuli being:

- (i) a piece of recorded music;
- (ii) a recorded series of sounds;
- (iii) a picture/photograph;
- (iv) an opening sentence or phrase;
- (v) a newspaper/magazine clipping or report;

One piece of factual writing which should be informative or argumentative; one piece of expressive writing which is descriptive and imaginative; preparation of film/book review.

Literature (Prescribed Texts):

Classes IX and X

Assignments should be based on the prescribed textbooks on the following lines:

- (i) Character/thematic analysis.
- (ii) Socio-economic, cultural, historical relevance / background.
- (iii) Summary / paraphrase.

EVALUATION

The assignments/project work are to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Head of the school, who could be from the faculty, **but not teaching the subject in the section/class**. For example, a teacher of the language of Class VIII may be deputed to be an External Examiner for Class X projects in the language.)

The Internal Examiner and the External Examiner will assess the assignments independently.

Award of Marks (20 Marks)

Subject Teacher (Internal Examiner)	10 marks
External Examiner	10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

**INTERNAL ASSESSMENT IN INDIAN LANGUAGES - GUIDELINES FOR MARKING WITH GRADES - CREATIVE WRITING
(CLASSES IX & X)**

Grade	Content/Analysis of Idea, Thought/ Feeling.	Expression/ Effective Expression of Idea	Structure/ Organisation of Material	Vocabulary/ Use of Words, Phrases	Originality/ Imaginative/ Innovative	Marks
I	The candidate analyses the ideas, feelings and experiences effectively. Reasoning is logical and effective.	The candidate expresses the ideas, thoughts and feelings effectively.	The work is very well structured with a sense of introduction, body, middle and conclusion, paragraphing and appropriate sentence construction.	The use of vocabulary exhibits a high level of competence in handling language.	The work is imaginative, interesting and engrossing.	4
II	The candidate analyses the ideas, feelings and experiences with well-defined explanations, reasoning is logical and persuasive.	The candidate expresses the ideas, thoughts and feelings well and with clarity.	The work is very well structured with some sense of conclusion and of paragraph lengths.	The vocabulary exhibits competence of word usage; correctness of grammar and spelling.	The candidate's work is quite interesting and engrossing.	3
III	The candidate analyses the ideas, feelings and experiences with a fair degree of detail and explanation. Reasoning is fairly logical and persuasive.	The candidate expresses the ideas, thoughts and feelings fairly well and with a fair degree of clarity.	The work is fairly well structured; candidate follows simple paragraphing.	The candidate uses straightforward vocabulary and fairly good pattern of spellings.	The candidate demonstrates the ability to sustain the interest of the reader.	2
IV	The candidate attempts to analyze ideas, feelings and experiences with simple explanation and detail. Reasoning and arguments are not very convincing.	The candidate expresses the ideas, thoughts and feelings intelligibly and in simple language.	The work shows some understanding of paragraphing and structure.	The candidate's vocabulary is limited and the spelling, punctuation and grammar is sometimes poor.	The candidate is, to some extent, able to sustain the interest of the reader.	1
V	The candidate attempts a basic analysis of ideas, feelings and experiences with few simple explanations and few details. Is unable to present proper arguments.	The candidate is unable to express the ideas, thoughts and feelings, uses simple language and the work is not very intelligible.	The candidate does not display an understanding of structure and paragraphing.	There is consistent weakness in spelling, punctuation and grammar.	The candidate is unable to sustain the interest of the reader.	0

**INTERNAL ASSESSMENT IN INDIAN LANGUAGES - GUIDELINES FOR MARKING WITH GRADES-AURAL ASSIGNMENT
(CLASS IX)**

Grade	Understanding/ Comprehension Main Idea, Central Theme	Recall	Vocabulary	Context/ Correlation to Other Areas	Marks
I	The candidate accurately understands the central idea of the passage as well as the relevant points in the selected passage/ talk.	The candidate recalls all the important points made (written/ verbal).	The candidate uses appropriate and correct vocabulary while recalling the points made.	The candidate clearly understands the context and can widely correlate the passage to the other areas.	3
II	The candidate gives ideas fairly close to the central / main idea of the passage as well as understand some of the relevant points heard in the selected passage/ talk.	The candidate recalls some of the important points made (written/ verbal).	The candidate uses correct but simple vocabulary while recalling the points made.	The candidate can moderately understand the context of the passage and can moderately correlate the passage to the other areas.	2
III	The candidate cannot fully comprehend the passage and gives only a few ideas related to the central theme of the passage.	The candidate recalls very few of the important points made (written/verbal).	The candidate makes various errors in vocabulary while recalling the points made.	The candidate can only faintly understand the context of the passage and relate it to the other areas.	1
IV	The candidate is neither able to understand the central/main idea of the passage; nor able to understand relevant points heard in the passage/talk.	The candidate is unable to recall the important points made (written/verbal)	The candidate uses incorrect vocabulary while recalling the points made.	The candidate is unable to understand the context of the passage and is unable to correlate the passage to the other areas.	0

**INTERNAL ASSESSMENT IN INDIAN LANGUAGES - GUIDELINES FOR MARKING WITH GRADES- ORAL ASSIGNMENT
(CLASS X)**

Grade	Fluency of Language	Subject Matter	Organization	Vocabulary/ Delivery	Understanding	Gesture	Marks
I	Speaks with fluency and has full operational command over the language.	Matter is relevant, rich in content and original.	Content is well sequenced and well organized.	Uses appropriate vocabulary and pronounces words correctly.	While speaking, the candidate emphasizes the important points.	Uses natural and spontaneous gestures that are not out of place.	3
II	The candidate speaks with fairly good fluency and has reasonable operational command of the language.	The subject matter is mostly relevant, consisting of a few original ideas.	The content is satisfactorily sequenced and well organized.	The candidate pronounces most words correctly and uses simple vocabulary.	While speaking the candidate emphasizes most important points.	Uses some natural gestures.	2
III	The candidate speaks with poor fluency and does not communicate except for the most basic information.	The subject matter is irrelevant and lacks originality.	The subject content is very poor and lacks organisational structure.	The candidate pronounces many words incorrectly and uses inappropriate vocabulary.	While speaking, the candidate emphasizes some important points.	Uses very few natural gestures.	1
IV	The candidate cannot communicate even the most basic information.	The subject matter is negligible.	The subject content comprises of mere words with no structured sentences.	The candidate is unable to correctly pronounce most words and has a limited vocabulary.	While speaking, the candidate is unable to emphasize important points.	Uses no natural gestures.	0

**INTERNAL ASSESSMENT IN INDIAN LANGUAGES (LITERATURE - PRESCRIBED TEXTS) - GUIDELINES FOR MARKING
WITH GRADES (CLASSES IX & X)**

Grade	Understanding of Text (Narrative)	Examples from Text	Understanding of text- Interpretation and Evaluation	Appreciation of Language, Characterization	Critical Appreciation -Personal Response	Marks
I	The candidate demonstrates expertise in giving an appropriate account of the text, with well-chosen reference to narrative and situation.	The account is suitably supported by relevant examples from the text.	The candidate understands the text with due emphasis on interpretation and evaluation.	The candidate appreciates and evaluates significant ways (structure, character, imagery) in which writers have achieved their effects.	The candidate is able to effectively reflect personal response (critical appreciation) to the text.	4
II	The candidate demonstrates a high level of competence in giving an account of the text, with appropriate references to the narrative and situation.	The account is supported by examples from the text.	The candidate understands the text with some emphasis on interpretation and evaluation.	The candidate appreciates and evaluates significant ways in which writers have achieved their effects.	The candidate is able to reflect a personal response to the text.	3
III	The candidate demonstrates competence in giving an account of the text with some reference to the narrative and situation.	The candidate understands the text and shows a basic recognition of the theme and can support it by a very few examples.	The candidate recognizes some aspects of the text used by authors to present ideas.	The candidate recognizes some of the significant ways in which the writers have used the language.	The candidate is able to communicate a personal response which shows appreciation.	2
IV	The candidate gives broad account of the text with reference to the narrative and situation.	The candidate understands the basic meaning of the text.	The candidate relates the text to other texts studied.	The candidate recognizes differences in the way authors write.	The candidate communicates straight forward personal response to the text.	1
V	The candidate is unable to demonstrate an understanding of the basic events in the text.	The candidate is unable to understand the text or support it with any examples.	The candidate is unable to relate to the other text studied.	The candidate is unable to recognize the differences in the way authors write.	The candidate is unable to give a personal view of the text studied.	0

SCIENCE (52)
PHYSICS
SCIENCE Paper - 1

CLASS IX

There will be one paper of **two hours** duration carrying 80 marks and Internal Assessment of practical work carrying 20 marks.

The paper will be divided into **two** sections, Section I (40 marks) and Section II (40 marks).

Section I (compulsory) will contain short answer questions on the entire syllabus.

Section II will contain six questions. Candidates will be required to answer any **four** of these **six** questions.

Note: Unless otherwise specified, only SI Units are to be used while teaching and learning, as well as for answering questions.

1. Measurements and Experimentation

- (i) International System of Units, **the required SI units with correct symbols are given at the end of this syllabus.** Other commonly used system of units - fps and cgs.

- (ii) Simple pendulum

Simple pendulum: time period, frequency, graph of length l versus T^2 only; slope of the graph. Formula $T=2\pi\sqrt{l/g}$ [no derivation]. Only simple numerical problems.

2. Motion in One Dimension

Scalar and vector quantities, distance, speed, velocity, acceleration; equations of uniformly accelerated motion without derivations.

Examples of Scalar and vector quantities only, rest and motion in one dimension; distance and displacement; speed and velocity; acceleration and retardation [Non-uniform acceleration excluded].

Equations to be learned: $v = u + at$;

*$S = ut + \frac{1}{2}at^2$; $S = \frac{1}{2}(u+v)t$; $v^2 = u^2 + 2aS$. [Equation for S_n^{th} is **not** included].*

Simple numerical problems.

3. Laws of Motion

- (i) Contact and non-contact forces; cgs & SI units.

Examples of contact forces (frictional force, normal reaction force, tension force as applied through strings and force exerted during collision) and non-contact forces (gravitational, electric and magnetic). General properties of non-contact forces. cgs and SI units of force and their relation with Gravitational units.

- (ii) Newton's First Law of Motion (qualitative discussion) introduction of the idea of inertia, mass and force.

*Newton's first law; statement and qualitative discussion; definitions of inertia and force from first law, examples of inertia as illustration of first law. (Inertial mass **not** included).*

- (iii) Newton's Second Law of Motion (including $F=ma$); weight and mass.

Detailed study of the second law. Linear momentum, $p = mv$; change in momentum $\Delta p = \Delta(mv) = m\Delta v$ for mass remaining constant, rate of change of momentum;

$$\Delta p / \Delta t = m \Delta v / \Delta t = ma \text{ or}$$

$$\left\{ \frac{p_2 - p_1}{t} = \frac{mv - mu}{t} = \frac{m(v - u)}{t} = ma \right\};$$

Simple numerical problems combining

$F = \Delta p / \Delta t = ma$ and equations of motion. Units of force - only cgs and SI.

- (iv) Newton's Third Law of Motion (qualitative discussion only); simple examples.

Statement with qualitative discussion; examples of action - reaction pairs, (F_{BA} and F_{AB}); action and reaction always act on different bodies.

- (v) Gravitation

Universal Law of Gravitation. (Statement and equation) and its importance. Gravity,

acceleration due to gravity, free fall. Weight and mass, Weight as force of gravity comparison of mass and weight; gravitational units of force, (Simple numerical problems), (problems on variation of gravity excluded)

4. Fluids

- (i) Change of pressure with depth (including the formula $p=h\rho g$); Transmission of pressure in liquids; atmospheric pressure.

Thrust and Pressure and their units; pressure exerted by a liquid column $p = h\rho g$; simple daily life examples, (i) broadness of the base of a dam, (ii) Diver's suit etc. some consequences of $p = h\rho g$; transmission of pressure in liquids; Pascal's law; atmospheric pressure; common manifestation and consequences. Variations of pressure with altitude, (qualitative only); applications such as weather forecasting and altimeter. (Simple numerical problems including Pascal's law)

- (ii) Buoyancy, Archimedes' Principle; floatation; relationship with density; relative density; determination of relative density of a solid using water only.

Buoyancy, upthrust (F_B); definition; different cases, $F_B >$, $=$ or $<$ weight W of the body immersed; characteristic properties of upthrust; Archimedes' principle; explanation of cases where bodies with density $\rho >$, $=$ or $<$ the density ρ' of the fluid in which it is immersed.

Relative Density (RD) and Archimedes' principle, determination of RD of a solid denser than water using water and RD of liquid. Floatation: principle of floatation; relation between the density of a floating body, density of the liquid in which it is floating and the fraction of volume of the body immersed; ($\rho_1/\rho_2 = V_2/V_1$); apparent weight of floating object; application to ship, submarine, iceberg, balloons, etc.

Simple numerical problems involving Archimedes' principle, buoyancy and floatation.

5. Heat and Energy

- (i) Concepts of heat and temperature.

*Heat as energy, SI unit – joule,
 $1 \text{ cal} = 4.186 \text{ J}$ exactly.*

- (ii) Anomalous expansion of water

Graphs showing variation of volume and density of water with temperature in the 0 to 10°C range. Hope's experiment and consequences of Anomalous expansion.

- (iii) Global warming and Green House effect.

Scientific definitions of the above.

6. Light

- (i) Reflection of light; images formed by a pair of parallel and perpendicular plane mirrors;

Laws of reflection; experimental verification; characteristics of images formed in a pair of mirrors, (a) parallel and (b) perpendicular to each other; uses of plane mirrors.

- (ii) Spherical mirrors; characteristics of image formed by these mirrors. Uses of concave and convex mirrors. (Only simple direct ray diagrams are required).

Brief introduction to spherical mirrors - concave and convex mirrors, centre and radius of curvature, pole and principal axis, focus and focal length; location of images from ray diagram for various positions of a small linear object on the principal axis of concave and convex mirrors; characteristics of images.

Uses of spherical mirrors.

Scale drawing or graphical representation of ray diagrams not required.

7. Sound

- (i) Nature of Sound waves. Requirement of a medium for sound waves to travel; propagation and speed in different media; comparison with speed of light.

Sound propagation, terms – frequency (f), wavelength (λ), velocity (V), relation $V = f\lambda$. (Simple numerical problems) effect of different factors on the speed of sound; comparison of speed of sound with speed of light; consequences of the large difference in these speeds in air; thunder and lightning.

- (ii) Infrasonic, sonic, ultrasonic frequencies and their applications.

Elementary ideas and simple applications only. Difference between ultrasonic and supersonic.

8. Electricity and Magnetism

- (i) Simple electric circuit using an electric cell and a bulb to introduce the idea of current (including its relationship to charge); potential difference; insulators and conductors; closed and open circuits; direction of current (electron flow and conventional)

Current Electricity: brief introduction of sources of direct current - cells, accumulators (construction, working and equations excluded); Electric current as the rate of flow of electric charge (direction of current - conventional and electronic), symbols used in circuit diagrams. Detection of current by Galvanometer or ammeter (functioning of the meters not to be introduced). Idea of electric circuit by using cell, key, resistance wire/resistance box/rheostat, qualitatively.; elementary idea about work done in transferring charge through a conductor wire; potential difference $V = W/q$.

(No derivation of formula) simple numerical problems.

Social initiatives: Improving efficiency of existing technologies and introducing new eco-friendly technologies. Creating awareness and building trends of sensitive use of resources and products, e.g. reduced use of electricity.

- (ii) Induced magnetism, Magnetic field of earth. Neutral points in magnetic fields.

Magnetism: magnetism induced by bar magnets on magnetic materials; induction precedes attraction; lines of magnetic field and their properties; evidences of existence of earth's magnetic field, magnetic compass. Uniform magnetic field of earth and non-uniform field of a bar magnet placed along magnetic north-south; neutral point; properties of magnetic field lines.

INTERNAL ASSESSMENT OF PRACTICAL WORK

Candidates will be asked to carry out experiments for which instructions are given. The experiments may be based on topics that are not included in the syllabus but theoretical knowledge will not be required. A candidate will be expected to be able to follow simple instructions, to take suitable readings and to present these readings in a systematic form. He/she may be required to exhibit his/her data graphically. Candidates will be expected to appreciate and use the concepts of least count, significant figures and elementary error handling.

A set of 5 to 7 experiments may be designed as given below or as found most suitable by the teacher. Students should be encouraged to record their observations systematically in a neat tabular form - in columns with column heads including units or in numbered rows as necessary. The final result or conclusion may be recorded for each experiment. Some of the experiments may be demonstrated (with the help of students) if these cannot be given to each student as lab experiments.

1. Determine the least count of the Vernier callipers and measure the length and diameter of a small cylinder (average of three sets) - may be a metal rod of length 2 to 3 cm and diameter 1 to 2 cm.
2. Determine the pitch and least count of the given screw gauge and measure the mean radius of the given wire, taking three sets of readings in perpendicular directions.
3. Measure the length, breadth and thickness of a glass block using a metre rule (each reading correct to a mm), taking the mean of three readings in each case. Calculate the volume of the block in cm^3 and m^3 . Determine the mass (not weight) of the block using any convenient balance in g and kg. Calculate the density of glass in cgs and SI units using mass and volume in the respective units. Obtain the relation between the two density units.
4. Measure the volume of a metal bob (the one used in simple pendulum experiments) from the readings of water level in a measuring cylinder using displacement method. Also calculate the same volume from the radius measured using Vernier callipers. Comment on the accuracies.

5. Obtain five sets of readings of the time taken for 20 oscillations of a simple pendulum of lengths about 70, 80, 90, 100 and 110 cm; calculate the time periods (T) and their squares (T^2) for each length (l). Plot a graph of l vs. T^2 . Draw the best - fit straight - line graph. Also, obtain its slope. Calculate the value of g in the laboratory. It is $4\pi^2 \times \text{slope}$.
6. Take a beaker of water. Place it on the wire gauze on a tripod stand. Suspend two thermometers - one with Celsius and the other with Fahrenheit scale. Record the thermometer readings at 5 to 7 different temperatures. You may start with ice-cold water, then allow it to warm up and then heat it slowly taking temperature (at regular intervals) as high as possible. Plot a graph of T_F vs. T_C . Obtain the slope. Compare with the theoretical value. Read the intercept on T_F axis for $T_C = 0$.
7. Using a plane mirror strip mounted vertically on a board, obtain the reflected rays for three rays incident at different angles. Measure the angles of incidence and angles of reflection. See if these angles are equal.
8. Place three object pins at different distances on a line perpendicular to a plane mirror fixed vertically on a board. Obtain two reflected rays (for each pin) fixing two pins in line with the image. Obtain the positions of the images in each case by extending backwards (using dashed lines), the lines representing reflected rays. Measure the object distances and image distances in the three cases. Tabulate. Are they equal? Generalize the result.
9. Obtain the focal length of a concave mirror (a) by distant object method, focusing its real image on a screen or wall and (b) by one needle method removing parallax or focusing the image of the illuminated wire gauze attached to a ray box. One could also improvise with a candle and a screen. Enter your observations in numbered rows.
10. Connect a suitable dc source (two dry cells or an acid cell), a key and a bulb (may be a small one used in torches) in series. Close the circuit by inserting the plug in the key. Observe the bulb as it lights up. Now open the circuit, connect another identical bulb in between the first bulb and the cell so that the two bulbs are in series. Close the key. Observe the lighted bulbs. How does the light from any one bulb compare with that in the first case when you had only one bulb? Disconnect the second bulb. Reconnect the circuit as in the first experiment. Now connect the second bulb across the first bulb. The two bulbs are connected in parallel. Observe the brightness of any one bulb. Compare with previous results. Draw your own conclusions regarding the current and resistance in the three cases.
11. Plot the magnetic field lines of earth (without any magnet nearby) using a small compass needle. On another sheet of paper, place a bar magnet with its axis parallel to the magnetic lines of the earth, i.e. along the magnetic meridian or magnetic north south. Plot the magnetic field in the region around the magnet. Identify the regions where the combined magnetic field of the magnet and the earth is (a) strongest, (b) very weak but not zero, and (c) zero. Why is neutral point, so called?
12. Using a spring balance obtain the weight (in N) of a metal ball in air and then completely immersed in water in a measuring cylinder. Note the volume of the ball from the volume of the water displaced. Calculate the upthrust from the first two weights. Also calculate the mass and then weight of the water displaced by the bob $M=V.\rho$, $W=mg$). Use the above result to verify Archimedes principle.

SCIENCE (52)

BIOLOGY

SCIENCE Paper - 3

CLASS IX

*There will be one paper of **two hours** duration of 80 marks and Internal Assessment of Practical Work carrying 20 marks.*

*The paper will be divided into **two** sections, Section I (40 marks) and Section II (40 marks).*

***Section I (compulsory)** will contain short answer questions on the entire syllabus.*

***Section II** will contain **six** questions. Candidates will be required to answer any **four** of these **six** questions.*

1. Basic Biology

- (i) The cell, a unit of life, protoplasm, basic difference between prokaryotic and eukaryotic cell; differences between an animal and a plant cell.
 - *A basic understanding of the cell theory, structure of plant and animal cell with functions of various cell organelles. (Protoplasm, Cytoplasm, Cell Wall, Cell Membrane, Nucleus, Nucleolus, Mitochondria, Endoplasmic Reticulum, Ribosome, Golgi bodies, Plastids, Lysosomes, Centrosome and Vacuole).*
 - *Major differences between a prokaryotic and eukaryotic cell.*
 - *Differences between a plant cell and an animal cell should be mainly discussed with respect to cell wall, centrosome, vacuoles and plastids.*
- (ii) Tissues: Types of plant and animal tissues.
 - *A brief understanding of their location, basic structure and functions with examples.*
 - *A brief understanding of their role in different physiological processes in plants and animals.*

2. Flowering Plants

- (i) Flower: Structure of a bisexual flower, functions of various parts.
 - *A brief introduction to complete and incomplete flowers.*
 - *Essential and non-essential whorls of a bisexual flower; their various parts and functions.*
 - *Inflorescence and placentation (meaning only)*

(Charts or actual specimens may be used to help enhance clarity of concepts.)

- (ii) Pollination: self and cross-pollination.
 - *Explanation, advantages and disadvantages of self and cross-pollination.*
 - *Agents of pollination and the characteristic features of flowers pollinated by various agents such as insects, wind, and water.*
 - *A brief idea as to how nature favours cross pollination.*
- (iii) Fertilisation.
 - *Events taking place between pollination and fertilisation leading to the formation of zygote in the embryo sac.*
 - *A brief explanation of the terms double fertilization and triple fusion.*
 - *Fruit and Seed - definition and significance.*

3. Plant Physiology

- (i) Structure of dicot and monocot seeds, Germination of seeds, types, and conditions for seed germination.
 - *Structure and germination of Bean seed and Maize grain.*

- *Differences between monocot and dicot seeds.*
 - *Differences between hypogeal and epigeal germination.*
 - *Conditions for seed germination - To be explained and supported by experiments.*
- (ii) Respiration in plants: outline of the process, gaseous exchange.
- *A brief outline of the process mentioning the terms Glycolysis, Krebs cycle and their significance.*
 - *A reference to be made to aerobic and anaerobic respiration with chemical equations in each case.*
 - *Experiments on gaseous exchange and on heat production.*

4. Diversity in living organisms

- (i) Economic importance of Bacteria.
- (a) *Useful role of bacteria:*
- *Medicine: antibiotics, serums and vaccines*
 - *Agriculture: nitrogen cycle (role of nitrogen fixing, nitrifying and denitrifying bacteria)*
 - *Industry -curing of tea, tanning of leather.*
- (b) *Harmful role of bacteria - spoilage of food, diseases in plants and animals, bio-weapons.*
- (ii) Economic importance of Fungi.
- A brief idea of the useful role of Fungi in breweries, bakeries, cheese processing, and mushroom cultivation. (Processes of manufacture are not required).*

5. Human Anatomy and Physiology

- (a) Nutrition.
- (i) Classes of food; balanced diet. Malnutrition and deficiency diseases.
- *Functions of carbohydrates, fats, proteins, mineral salts (calcium, iodine, iron and sodium), vitamins and water in proper functioning of the body.*

- *Sources of vitamins, their functions and deficiency diseases.*
- *Meaning and importance of a 'Balanced Diet'.*
- *Role of cellulose in our diet.*
- *Causes, symptoms and prevention of Kwashiorkor and Marasmus.*

- (ii) The structure of a tooth, different types of teeth.
- *Structure of a tooth to be discussed with the help of a diagram.*
 - *Functions of different types of teeth.*
 - *Dental formula of an adult.*
- (iii) Digestive System: Organs, digestive glands and their functions (including enzymes and their functions in digestion, absorption and assimilation of digested food).
- *Organs and glands of the digestive system and their functions with reference to digestion, absorption and assimilation.*
 - *brief idea of peristalsis.*

(b) Skeleton - Movement and Locomotion.

- *Functions of human skeleton*
- *Axial and Appendicular Skeleton*
- *Types of joints with reference to their location:*
 - *immovable joints*
 - *slightly movable joints*
 - *freely movable (hinge joint, ball and socket joint, gliding joint, pivot joint.)*

(c) Structure and functions of skin.

- *Various parts of the skin and their functions.*
- *Special derivatives of the skin with reference to sweat glands, sebaceous glands, hair, nails and mammary glands.*
- *Heat regulation - vasodilation and vasoconstriction.*

- (d) Respiratory System: Organs; mechanism of breathing; tissue respiration, heat production.

- *Structures of the respiratory system.*
- *Differences between anaerobic respiration in plants and in man.*
- *Role of diaphragm and intercostal muscles in breathing to provide a clear idea of the breathing process.*
- *Brief idea of gaseous transport and tissue respiration.*
- *Brief understanding of respiratory volumes.*
- *Effect of altitude on breathing; asphyxiation and hypoxia.*

INTERNAL ASSESSMENT OF PRACTICAL WORK

The practical work is designed to test the ability of the candidates to make accurate observations from specimens of plants and animals-

PLANT LIFE

- (i) The examination of an onion peel under the microscope to study various parts of the cell.
- (ii) A cross-pollinated flower to be examined and identified and the parts to be studied and labelled e.g. Hibiscus.
- (iii) Specimens of germinating seeds with plumule and radicle (the bean seed and maize grain) for examination, identification, drawing and labelling the parts.

ANIMAL LIFE

- (i) The examination of a human cheek cell under the microscope to study various parts of the cell.
- (ii) Identification of sugar, starch, protein and fat through conduct of relevant tests.
- (iii) Examination and identification of specimens belonging to the following groups of animals:
Non-Chordata - Porifera, Coelenterata, Platyhelminthes, Nematelminthes Annelida, Arthropoda. Mollusca and Echinodermata.
Chordata- Pisces, Amphibia, Reptilia, Aves, Mammalia.
Identification of the structure of the following organs through specimens/models and charts: Lung and skin.
- (iv) Experiments to show the mechanism of breathing.
Bell jar experiment should be discussed. Comparison should be made with the human lungs and respiratory tract to show the mechanism of breathing.
- (v) Visit a few establishments in the locality such as motor repair workshops, kilns, pottery making units, fish and vegetable markets, restaurants, dyeing units. Find out the types of wastes and methods prevalent for their disposal. On the basis of the information collected prepare a report, suggest measures to improve the environmental conditions.
- (vi) Visit a water treatment plant, sewage treatment plant or garbage dumping or vermicomposting sites in the locality and study their working.

SCIENCE (52)
CHEMISTRY
SCIENCE Paper - 2

CLASS IX

*There will be one paper of **two hours** duration of 80 marks and Internal Assessment of practical work carrying 20 marks.*

*The paper will be divided into **two** sections, Section I (40 marks) and Section II (40 marks).*

***Section I (compulsory)** will contain short answer questions on the entire syllabus.*

***Section II** will contain **six** questions. Candidates will be required to answer any **four** of these **six** questions.*

***Note:** All chemical reactions should be studied with reference to the reactants, products, conditions, observations and the (balanced) equations.*

1. The Language of Chemistry

- (i) Symbol of an element; valency; formulae of radicals and formulae of compounds. Balancing of simple chemical equations.
- *Symbol – definition; symbols of the elements used often.*
 - *Valency - definition; hydrogen combination and number of valence electrons of the metals and non-metals; mono, di, tri and tetra valent elements.*
 - *Radicals – definition; formulae and valencies.*
 - *Compounds – name and formulae.*
 - *Chemical equation – definition and examples of chemical equations with one reactant and two or three products, two reactants and one product, two reactants and two products and two reactants and three or four products; balancing of equations. (by hit and trial method).*
- (ii) Relative Atomic Masses (atomic weights) and Relative Molecular Masses (molecular weights): either - standard H atom or $1/12^{\text{th}}$ of carbon 12 atom.
- *Definitions*
 - *Calculation of Relative Molecular Mass and percentage composition of a compound.*

2. Chemical changes and reactions

- (i) Types of chemical changes.

- *Direct combination*
- *Decomposition*
- *Displacement;*
- *Double decomposition*

(The above to be taught with suitable chemical equations as examples).

- (ii) Energy changes in a chemical change.

Exothermic and endothermic reactions with examples – evolution/absorption of heat, light and electricity.

3. Water

- (i) Water as a universal solvent.

- *Solutions as 'mixtures' of solids in water; saturated solutions.*
- *Qualitative effect of temperature on solubility (e.g. solutions of calcium sulphate, potassium nitrate and sodium chloride in water).*

- (ii) Hydrated and anhydrous substances.

- (a) Hydrated substances:

Water of Crystallisation – meaning and examples.

- (b) Anhydrous substances:

Meaning and examples only

- (c) Properties:

- *Efflorescence*
- *Deliquescence*
- *Hygroscopy*

(Definition and examples of each of the above).

- (iii) Drying and Dehydrating Agents

Meaning and examples only.

4. Atomic Structure and Chemical bonding

- (i) Structure of an Atom, mass number and atomic number, Isotopes and Octet Rule.

- *Definition of an atom*
- *Constituents of an atom - nucleus (protons, neutrons) with associated electrons; mass number, atomic number.*
- *Electron distribution in the orbits - $2n^2$ rule, Octet rule. Reason for chemical activity of an atom.*
- *Definition and examples of isotopes (hydrogen, carbon, chlorine).*

- (ii) Electrovalent and covalent bonding, structures of various compounds – orbit structure

- (a) Electrovalent Bond

- *Definition*
- *Atomic orbit structure for the formation of Electrovalent compounds (e.g. NaCl, MgCl₂, CaO);*

- (b) Covalent Bond

- *Definition*
- *Atomic orbit structure for the formation of Covalent molecules on the basis of duplet and octet of electrons (examples: hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, water, ammonia, carbon tetrachloride, methane.)*

5. The Periodic Table

Dobereiner's Triads, Newland's law of Octaves, Mendeleev's contributions; Modern Periodic Law, the Modern Periodic Table. (Groups and periods)

- *General idea of Dobereiner's triads, Newland's law of Octaves, Mendeleev's periodic law.*
- *Discovery of Atomic Number and its use as a basis for Modern Periodic law.*
- *Modern Periodic Table (Groups 1 to 18 and periods 1 to 7).*
- *Special reference to Alkali metals (Group 1), Alkaline Earth metals (Group 2) Halogens (Group 17) and Zero Group (Group 18).*

6. Study of the First Element -Hydrogen

Position of the non-metal (Hydrogen) in the periodic table and general group characteristics with reference to valency electrons, burning, ion formation applied to the above-mentioned element.

- (i) Hydrogen from: water, dilute acids and alkalis.

- (a) Hydrogen from water:

- *The action of cold water on sodium potassium and calcium.*
- *The action of hot water on magnesium.*
- *The action of steam on aluminium, zinc, and iron; (reversibility of reaction between iron and steam).*
- *The action of steam on non-metal (carbon).*

Students can be shown the action of sodium and calcium on water in the laboratory. They must be asked to make observations and write equations for the above reactions.

Application of activity series for the above-mentioned reactions.

- (b) Displacement of hydrogen from dilute acids.

The action of dilute sulphuric acid or hydrochloric acid on metals: Mg, Al, Zn and Fe .

(To understand reasons for not using other metals and dilute nitric acid.)

- (c) Displacement of hydrogen from alkalis.

The action of Alkalis ((NaOH, KOH) on Al, Zn and Pb – unique nature of these elements.

- (ii) The preparation and collection of hydrogen by a standard laboratory method other than electrolysis.

In the laboratory preparation, the reason for using zinc, the impurities in the gas, their removal and the precautions in the collection of the gas must be mentioned.

- (iii) Industrial manufacture of hydrogen by Bosch process.

- *Main reactions and conditions.*
- *Separation of CO₂ and CO from hydrogen.*

- (iv) Oxidation and reduction reactions.

Differences in terms of addition and removal of oxygen / hydrogen.

7. Study of Gas Laws

- (i) The behaviour of gases under changes of temperature and pressure; explanation in terms of molecular motion (particles, atoms, molecules); Boyle's Law and Charles' Law; absolute zero; gas equation; simple relevant calculations.
- *The behaviour of gases under changes of temperature and pressure; explanation in terms of molecular motion (particles, atoms, molecules).*
 - *Boyle's Law: statement, mathematical form, simple calculations.*
 - *Charles' Law: statement, mathematical form, simple calculations.*
 - *Absolute zero Kelvin scale of temperature.*
 - *Gas equation $P_1 V_1 / T_1 = P_2 V_2 / T_2$; simple relevant calculations based on gas equation.*
- (ii) Relationship between Kelvin scale and Celsius Scale of temperature; Standard temperature and pressure. *Conversion of temperature from Celsius Scale to Kelvin scale and vice versa. Standard temperature and pressure. (Simple calculations).*

INTERNAL ASSESSMENT OF PRACTICAL WORK

Candidates will be asked to observe the effect of reagents and/or of heat on substances supplied to them. The exercises will be simple and may

include the recognition and identification of certain gases listed below.

Gases: Hydrogen, Oxygen, Carbon dioxide, Chlorine, Hydrogen chloride, Sulphur dioxide, Hydrogen sulphide, Ammonia, Water vapour, Nitrogen dioxide.

Candidates are expected to have completed the following minimum practical work.

Simple experiments on:

1. Action of heat on the following compounds:

- (a) copper carbonate, zinc carbonate
- (b) washing soda, copper sulphate crystals
- (c) zinc nitrate, copper nitrate, lead nitrate
- (d) ammonium chloride, iodine, ammonium dichromate

Make observations, identify the products and make deductions where possible.

2. Action of dilute sulphuric acid on the following substances. (warm if necessary)

- (a) a metal
- (b) a carbonate
- (c) a sulphide
- (d) a sulphite

Make observations, identify the gas evolved and make deductions.

3. Apply the flame test to identify the metal in the unknown substance.

- (a) a sodium salt
- (b) a potassium salt
- (c) a calcium compound

MATHEMATICS (51)

CLASS IX

There will be **one** paper of **two and a half** hours duration carrying 80 marks and Internal Assessment of 20 marks.

The paper will be divided into **two** sections, Section I (40 marks) and Section II (40 marks).

Section I: will consist of **compulsory** short answer questions.

Section II: Candidates will be required to answer **four** out of **seven** questions.

The solution of a question may require the knowledge of more than one branch of the syllabus.

1. Pure Arithmetic

Rational and Irrational Numbers

Rational, irrational numbers as real numbers, their place in the number system. Surds and rationalization of surds. Simplifying an expression by rationalizing the denominator. Representation of rational and irrational numbers on the number line.

Proofs of irrationality of $\sqrt{2}, \sqrt{3}, \sqrt{5}$

2. Commercial Mathematics

Compound Interest

(a) Compound interest as a repeated Simple Interest computation with a growing Principal. Use of this in computing Amount over a period of 2 or 3 years.

(b) Use of formula $A = P\left(1 + \frac{r}{100}\right)^n$. Finding CI from the relation $CI = A - P$.

- Interest compounded half-yearly included.
- Using the formula to find one quantity given different combinations of A, P, r, n, CI and SI; difference between CI and SI type included.

Note: Paying back in equal installments, being given rate of interest and installment amount, **not included**.

3. Algebra

(i) Expansions

Recall of concepts learned in earlier classes.

$$(a \pm b)^2$$

$$(a \pm b)^3$$

$$(x \pm a)(x \pm b)$$

$$(a \pm b \pm c)^2$$

(ii) Factorisation

$$a^2 - b^2$$

$$a^3 \pm b^3$$

$ax^2 + bx + c$, by splitting the middle term.

(iii) Simultaneous Linear Equations in two variables. (With numerical coefficients only)

- Solving algebraically by:
 - Elimination
 - Substitution and
 - Cross Multiplication method
- Solving simple problems by framing appropriate equations.

(iv) Indices/ Exponents

Handling positive, fractional, negative and “zero” indices.

Simplification of expressions involving various exponents

$$a^m \times a^n = a^{m+n}, a^m \div a^n = a^{m-n}, (a^m)^n = a^{mn}$$

etc. Use of laws of exponents.

4. Geometry

(i) Triangles

(a) Congruency: four cases: SSS, SAS, AAS, and RHS. Illustration through cutouts. Simple applications.

(b) Mid-Point Theorem and its converse, equal intercept theorem

(i) *Proof and simple applications of mid-point theorem and its converse.*

(ii) *Equal intercept theorem: proof and simple application.*

(c) **Pythagoras Theorem**

Area based proof and simple applications of Pythagoras Theorem and its converse.

(ii) **Rectilinear Figures**

Proof and use of theorems on parallelogram.

- *Both pairs of opposite sides equal (without proof).*
- *Both pairs of opposite angles equal.*
- *One pair of opposite sides equal and parallel (without proof).*
- *Diagonals bisect each other and bisect the parallelogram.*
- *Rhombus as a special parallelogram whose diagonals meet at right angles.*
- *In a rectangle, diagonals are equal, in a square they are equal and meet at right angles.*

(iii) **Circle:**

(a) **Chord properties**

- *A straight line drawn from the centre of a circle to bisect a chord which is not a diameter is at right angles to the chord.*
- *The perpendicular to a chord from the centre bisects the chord (without proof).*
- *Equal chords are equidistant from the centre.*
- *Chords equidistant from the centre are equal (without proof).*
- *There is one and only one circle that passes through three given points not in a straight line.*

(b) **Arc and chord properties:**

- *If two arcs subtend equal angles at the centre, they are equal, and its converse.*
- *If two chords are equal, they cut off equal arcs, and its converse (without proof).*

Note: Proofs of the theorems given above are to be taught unless specified otherwise.

5. Statistics

Introduction, collection of data, presentation of data, Graphical representation of data, Mean, Median of ungrouped data.

(i) *Understanding and recognition of raw, arrayed and grouped data.*

(ii) *Tabulation of raw data using tally-marks.*

(iii) *Understanding and recognition of discrete and continuous variables.*

(iv) *Mean, median of ungrouped data.*

(v) *Class intervals, class boundaries and limits, frequency, frequency table, class size for grouped data.*

(vi) *Grouped frequency distributions: the need to and how to convert discontinuous intervals to continuous intervals.*

(vii) *Drawing a frequency polygon.*

6. Mensuration

Area and perimeter of a triangle, Area and circumference of circle. Surface area and volume of Cube and Cuboids.

(a) *Area and perimeter of triangle (including Heron's formula).*

(b) *Circle: Area and Circumference. Direct application problems including Inner and Outer area.*

Areas of sectors of circles other than quarter-circle and semicircle are not included.

(c) *Surface area and volume of 3-D solids: cube and cuboid including problems of type involving:*

- *Different internal and external dimensions of the solid.*
- *Cost.*
- *Concept of volume being equal to area of cross-section x height.*
- *Open/closed cubes/cuboids.*

7. Trigonometry

- (a) *Trigonometric Ratios: sine, cosine, tangent of an angle and their reciprocals.*
- (b) *Trigonometric ratios of standard angles - 0, 30, 45, 60, 90 degrees. Evaluation of an expression involving these ratios.*
- (c) *Simple 2-D problems involving one right-angled triangle.*
- (d) *Concept of trigonometric ratios of complementary angles and their direct application:*

$$\sin A = \cos (90 - A), \cos A = \sin (90 - A)$$

$$\tan A = \cot (90 - A), \cot A = \tan (90 - A)$$

$$\sec A = \operatorname{cosec} (90 - A), \operatorname{cosec} A = \sec (90 - A)$$

8. Coordinate Geometry

Cartesian System, plotting of points in the plane for given coordinates, solving simultaneous linear equations in 2 variables graphically and finding the distance between two points using distance formula.

(a) *Dependent and independent variables.*

(b) *Ordered pairs, coordinates of points and plotting them in the Cartesian plane.*

(c) *Solution of Simultaneous Linear Equations graphically.*

(d) *Distance formula.*

INTERNAL ASSESSMENT

A minimum of two assignments are to be done during the year as prescribed by the teacher.

Suggested Assignments

- Conduct a survey of a group of students and represent it graphically - height, weight, number of family members, pocket money, etc.
- Planning delivery routes for a postman/milkman.
- Running a tuck shop/canteen.
- Study ways of raising a loan to buy a car or house, e.g. bank loan or purchase a refrigerator or a television set through hire purchase.
- Cutting a circle into equal sections of a small central angle to find the area of a circle by using the formula $A = \pi r^2$.
- To use flat cutouts to form cube, cuboids and pyramids to obtain formulae for volume and total surface area.
- Draw a circle of radius r on a $\frac{1}{2}$ cm graph paper, and then on a 2 mm graph paper. Estimate the area enclosed in each case by actually counting the squares. Now try out with circles of different radii. Establish the pattern, if any, between the two observed values and the theoretical value (area = πr^2). Any modifications?

HISTORY, CIVICS AND GEOGRAPHY (50)

HISTORY AND CIVICS

H.C.G. - Paper - 1

[Candidates offering History, Civics and Geography (Thailand) are not eligible to offer History, Civics and Geography]

CLASS IX

There will be **one** paper of **two** hours duration carrying 80 marks and an Internal Assessment of 20 marks.

The paper will be divided into **two** parts, Part I and Part II.

Part I (30 marks) will contain short answer questions set from the entire syllabus.

Candidates will be required to answer **all** questions.

Part II (50 marks) will consist of Section A and Section B. Candidates will be required to answer **two** out of **three** questions from Section A and **three** out of **five** questions from Section B. The sections will correspond to the sections indicated in the syllabus.

SECTION A: CIVICS

An elementary study is required of this section without verbatim study of the Constitutional Articles in detail.

1. Our Constitution

Definition of Constitution - date of adoption, date of enforcement and its significance. Features: Single Citizenship, Universal Adult Franchise, Fundamental Rights (names only) and Fundamental Duties, Directive Principles of State Policy (meaning), Welfare State (meaning only).

2. Elections

Meaning; Composition of Election Commission (in brief); Direct and Indirect election; General election; Mid-term election and By-election.

3. Local Self Government

- (i) Rural: Three-tier system of Panchayati Raj – Gram Panchayat, Panchayat Samiti, Zila Parishad – functions (any four each).
- (ii) Urban: Municipal Committees and Municipal Corporations – functions (any four each).

SECTION B: HISTORY

1. The Harappan Civilisation

Sources: Great Bath, Citadel, seals, bearded man, dancing girl, dockyard, script.

Urban planning. Decline of the Harappan civilization.

2. The Vedic Period

Sources: Vedas and Epics (brief mention);

Brief comparative study of Early and Later Vedic society.

3. Jainism and Buddhism

Causes for the rise of Jainism and Buddhism in the 6th century B.C. Doctrines.

4. The Mauryan Empire

Sources: Arthashastra, Indika, Ashokan Edicts, Sanchi Stupa.

Administration (Chandragupta Maurya and Ashoka); Ashoka's Dhamma.

5. The Sangam Age

Meaning of Sangam; Sources: Tirukkural (in brief).

6. The Age of the Guptas

Sources: Account of Fa-hien; Allahabad Pillar Inscription.

Contribution to the fields of Education (Nalanda University), Science (Aryabhata) and Culture (works of Kalidasa, Deogarh temple).

7. Medieval India

(a) The Cholas

Sources: Inscriptions; Brihadishwara Temple.

Administration (Rajaraja I, Rajendra I).

(b) The Delhi Sultanate

Qutab Minar.

Political history and Administration (Alauddin Khilji and Muhammad Bin Tughlaq).

(c) The Mughal Empire

Sources: Ain-i-Akbari, Taj Mahal, Jama Masjid and Red Fort.

Political history and administration (Akbar)

8. The Modern Age in Europe

(a) Renaissance

Definition; causes (new trade routes, invention of the printing press) and impact on art, literature and science (Leonardo Da Vinci, William Shakespeare and Copernicus).

(b) Reformation

Meaning of Reformation; dissatisfaction with the practices of the Catholic Church, Counter Reformation.(meaning only).

(c) Industrial Revolution

Definition of the term. Socialism and Capitalism - meaning only.

INTERNAL ASSESSMENT

Any **one** project/assignment related to the syllabus.

Suggested Assignments

- ‘The Indian constitution protects the rights of children, women, minorities and weaker sections.’ Elaborate on the basis of a case study.
- ‘Fundamental Duties complement Fundamental Rights.’ Illustrate with the help of a Power Point Presentation.
- Highlight the civic issues of your locality and what suggestions would you offer to address them.
- Visit a museum or local site of historical importance and discuss its significance.
- Discuss the art and architectural features of any of these monuments: Buddhist Caves, Ajanta; Iron Pillar, Mehrauli; Gol Gumbaz, Bijapur; Mattancherry Synagogue, Cochin; Kamakhya Temple, Guwahati; St. Thomas Basilica, Chennai; Tower of Silence, Mumbai.
- Make a pictorial presentation of inventions and innovations as a result of the Industrial Revolution.
- Make a comparative study of the Harappan and the Mesopotamian Civilisations.

HISTORY, CIVICS AND GEOGRAPHY (50)

GEOGRAPHY

H.C.G. - Paper - 2

Candidates offering History, Civics and Geography (Thailand) are not eligible to offer History, Civics and Geography.

CLASS IX

*There will be **one** paper of **two hours** duration carrying 80 marks and an Internal Assessment of 20 marks.*

The question paper will consist of Part I and Part II.

Part I (compulsory) will consist of **two** questions. *Question 1 will consist of short answer questions from the entire syllabus and Question 2 will consist of a question based on **World Map**.*

Part II. *Candidates will be required to choose **any five** questions.*

Candidates will be expected to make the fullest use of sketches, diagrams, graphs and charts in their answers.

Questions may require answers involving the interpretation of photographs of geographical interest.

PRINCIPLES OF GEOGRAPHY

1. Our World

- (i) Geographic grid - Latitudes & Longitudes
 - (a) *Concept of latitudes: main latitudes, their location with degrees, parallels of latitude and their uses.*
 - (b) *Concept of longitudes - Prime Meridian, time (local, standard and time zones, Greenwich Mean Time (GMT) and International Date Line (IDL). Eastern and Western hemisphere.*

(ii) Rotation and Revolution

Rotation – direction, speed and its effects (occurrence of day and night, the sun rising in the east and setting in the west, Coriolis effect)

Revolution of the earth and its inclined axis – effects: the variation in the length of the day and night and seasonal changes with Equinoxes and Solstices.

2. Structure of the Earth

- (i) Earth's Structure
 - Core, mantle, crust – meaning, extent and their composition.*
- (ii) Rocks - difference between minerals and rocks, types of rocks: igneous, sedimentary, metamorphic, their characteristics and formation.
- (iii) Volcanoes
 - Meaning, Types – active, dormant and extinct.*
 - Effects – constructive and destructive.*
 - Important volcanic zones of the world.*
- (iv) Earthquakes
 - Meaning, causes and measurement.*
 - Effects: destructive and constructive.*
 - Earthquake zones of the World*
- (v) Weathering
 - Meaning, types and effects of weathering.*
 - Types: Physical Weathering – block and granular disintegration, exfoliation;*
 - Chemical weathering - oxidation, carbonation, hydration and solution;*
 - Biological Weathering – caused by humans, plants and animals.*

3. Hydrosphere

Meaning of hydrosphere.

Tides - formation and pattern.

Ocean Currents – their effects (specifically of Gulf Stream, North Atlantic Drift, Labrador Current, Kuro Shio and Oya Shio.)

4. Atmosphere

(i) Composition and structure of the atmosphere. *Troposphere, Stratosphere, Ionosphere and Exosphere; Ozone in the Stratosphere, its depletion. Global warming and its impact.*

(ii) Insolation

- *Meaning of insolation and terrestrial radiation.*
- *Factors affecting temperature: latitude, altitude, distance from the sea, slope of land, winds and ocean currents.*

(iii) Atmospheric Pressure and Winds.

- *Meaning and factors that affect atmospheric pressure.*
- *Major pressure belts of the world.*
- *Factors affecting direction and velocity of wind – pressure gradient, Coriolis Effect.*
- *Permanent winds – Trades, Westerlies and Polar Easterlies.*
- *Periodic winds - Land and Sea breezes, Monsoons.*
- *Local winds - Loo, Chinook, Foehn and Mistral.*
- *Variable winds - Cyclones and Anticyclones.*

(iv) Humidity

- *Humidity – meaning.*
- *Precipitation - forms (rain, snow, and hail).*
- *Types of rainfall – relief/orographic, convectional, cyclonic/ frontal with examples from the different parts of the world.*

5. Pollution

(a) Types - air, water (fresh and marine), soil, radiation and noise.

(b) Sources:

- *Noise: Traffic, factories, construction sites, loudspeakers, airports.*
- *Air: vehicular, industrial, burning of garbage.*
Water: domestic and industrial waste.
- *Soil: chemical fertilizers, bio medical waste and pesticides.*

- *Radiation: X- rays; radioactive fallout from nuclear plants.*

(c) Effects - on the environment and human health.

(d) Preventive Measures

Carpools, promotion of public transport, no smoking zone, restricted use of fossil fuels, saving energy and encouragement of organic farming.

6. Natural Regions of the World

Location, area, climate, natural vegetation and human adaptation.

Equatorial region, Tropical Deserts, Tropical Monsoon.

7. Map Work

On an outline map of the World, candidates will be required to locate, mark and name the following:

1. *The major **Natural Regions** of the world - Equatorial, Tropical Monsoon, Tropical Deserts.*
2. *The Oceans, Seas, Gulfs and Straits - all Major Oceans, Caribbean Sea, North Sea, Black Sea, Caspian Sea, South China Sea, Mediterranean Sea, Gulf of Carpentaria, Hudson Bay, Persian Gulf, Gulf of Mexico, Gulf of Guinea, Bering Strait, Strait of Gibraltar, Strait of Malacca.*
3. *Rivers – Mississippi, Colorado, Amazon, Paraguay, Nile, Zaire, Niger, Zambezi, Orange, Rhine, Volga, Danube, Murray, Darling, Hwang Ho, Yangtse Kiang, Ob, Indus, Ganga, Mekong, Irrawaddy, Tigris, Euphrates.*
4. *Mountains – Rockies, Andes, Appalachian, Alps, Himalayas, Pyrenees, Scandinavian Highlands, Caucasus, Atlas, Drakensburg, Khinghan, Zagros, Urals, Great Dividing Range.*

5. *Plateaus – Canadian Shield, Tibetan Plateau, Brazilian Highlands, Patagonian Plateau, Iranian Plateau, Mongolian Plateau.*

INTERNAL ASSESSMENT

PRACTICAL WORK/ PROJECT WORK

1. A record file having any **three** of the following exercises will be maintained. (The file will be evaluated out of 10 marks).
 - (a) Uses of important types of maps.
 - (b) Directions and how to identify them - an illustrative diagram.
 - (c) Reading and using statement of scale, graphic scale and scale shown by representative fraction method. (No drawing work, only explaining their meanings).
 - (d) Reading of one town guide map or an atlas map. (Recognising the symbols and colours used, identifying directions and distances).
 - (e) Drawing and recognising forms of important contours viz. valleys, ridges, types of slopes, conical hill, plateau, escarpment and sea cliff.
 - (f) Drawing at least one sketch map to organize information about visiting an important place, a zoo or a monument.
2. Candidates will be required to prepare a project report on any **one** topic. The topics for assignments may be selected from the list of suggested assignments given below. Candidates can also take up an assignment of their choice under any of the four broad areas given below. (The project will be evaluated out of 10 marks).

Suggested list of Assignments:

- (a) **Weather records:** Maintaining and interpreting weather records as found in the newspaper for at least one season.
- (b) **Collection of data from secondary sources:** {Using Modern techniques *i.e.*, Global Positioning System (GPS), Remote Sensing, Aerial Photography and Satellite imageries}: Preparing a Power Point presentation on current issues like – use of earth resources/ development activities/dangers of development and ecological disasters like droughts, earthquakes, volcanoes, floods, landslides cyclones and tornadoes in the world.
- (c) **Physical Features:** Collection of data from primary and secondary sources or taking photographs and preparing notional sketches of features found in the vicinity or areas visited during the year as a part of school activity.
- (d) Find out the sources of pollution of water bodies in the locality and determine the quality of water.
- (e) Collect information on global environmental issues and problems and communicate your findings through appropriate modes (posters, charts, collages, cartoons, handouts, essays, street plays and PowerPoint presentation).
- (f) **Area Studies:** Choosing any aspect from World Studies and preparing a Power Point presentation or a write up on it.
- (g) **Meteorological Instruments and their uses:** Six's maximum and minimum thermometer, mercury barometer, aneroid barometer, wind vane, anemometer, rain gauge and hygrometer.

COMPUTER APPLICATIONS (86)

CLASS IX

There will be **one** written paper of **two hours** duration carrying 100 marks and Internal Assessment of 100 marks.

The paper will be divided into two sections A and B.

Section A (Compulsory – 40 marks) will consist of compulsory short answer questions covering the entire syllabus.

Section B (60 marks) will consist of questions which will require detailed answers. There will be a choice of questions in this section.

THEORY – 100 Marks

1. Introduction to Object Oriented Programming concepts

- (i) Principles of Object Oriented Programming, (Difference between Procedure Oriented and Object oriented).

All the four principles of Object Oriented Programming should be defined and explained using real life examples (Data abstraction, Inheritance, Polymorphism, Encapsulation).

- (ii) Introduction to JAVA - Types of java programs – Applets and Applications, Java Compilation process, Java Source code, Byte code, Object code, Java Virtual Machine (JVM), Features of JAVA.

Definition of Java applets and Java applications with examples, steps involved in compilation process, definitions of source code, byte code, object code, JVM, features of JAVA - Simple, Robust, secured, object oriented, platform independent, etc.

2. Elementary Concept of Objects and Classes

Modelling entities and their behaviour by objects, a class as a specification for objects and as an object factory, computation as message passing/method calls between objects (many examples should be done to illustrate this). Objects encapsulate state (attributes) and have behaviour (methods). Class as a user defined data type.

A class may be regarded as a blueprint to create objects. It may be viewed as a factory that produces similar objects. A class may also be considered as a new data type created by the user, that has its own functionality.

3. Values and data types

Character set, ASCII code, Unicode, Escape sequences, Tokens, Constants and Variables, Data types, type conversions.

Escape sequences [\n, \t, \\\, \", \'], Tokens and its types [keywords, identifiers, literals, punctuators, operators], primitive types and non-primitive types with examples, Introduce the primitive types with size in bits and bytes, Implicit type conversion and Explicit type conversion.

4. Operators in Java

Forms of operators, Types of operators, Counters, Accumulators, Hierarchy of operators, 'new' operator, dot (.) operator.

Forms of operators (Unary, Binary, Ternary), types of operators (Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Short hand operators), Discuss precedence and associativity of operators, prefix and postfix, Creation of dynamic memory by using new operator, invoking members of class using dot operator, Introduce System.out.println() and System.out.print() – for simple output.

(Bitwise and shift operators are not included).

5. Input in Java

Initialization, Parameter, introduction to packages, Input streams (Scanner Class), types of errors, types of comments

Initialization – Data before execution, Parameters – at the time of execution, input stream – data entry during execution – using methods of Scanner class [nextShort(), nextInt(), nextLong(), nextFloat (), nextDouble(), next(), nextLine(), next () .charAt(0)]

Discuss different types of errors occurring during execution and compilation of the program (syntax errors, runtime errors and logical errors). Single line comment (//) and multiline comment (/ ... */)*

6. Mathematical Library Methods

Introduction to package java.lang [default], methods of Math class.

pow(x,y), sqrt(x), cbrt(x), ceil(x), floor(x), round (x), abs(a), max(a, b), min(a,b), random().

Java expressions – using all the operators and methods of Math class.

7. Conditional constructs in Java

Application of if, if else, if else if ladder, switch-case, default, break.

if, if else, if else if, Nested if, switch case, break statement, fall through condition in switch case, Menu driven programs, System.exit(0) - to terminate the program.

8. Iterative constructs in Java

Definition, Types of looping statements, entry controlled loops [for, while], variations in looping statements, and Jump statements.

Syntax of entry controlled loops, break and continue, simple programs illustrating for & while loops, inter conversion between for – while, finite and infinite, delay, multiple counter variables (initializations and updations). Demonstrate break and continue statements with the help of loops.

Loops are fundamental to computation and their need should be shown by examples.

INTERNAL ASSESSMENT - 100 Marks

This segment of the syllabus is totally practical oriented. The accent is on acquiring basic programming skills quickly and efficiently.

Programming Assignments (Class IX)

Students are expected to do a minimum of 15 assignments during the whole year to reinforce the concepts studied in the class.

Suggested list of Assignments:

The laboratory assignments will form the bulk of the course. Good assignments should have problems which require design, implementation and testing. They should also embody one or more concepts that have been discussed in the theory class. A significant proportion of the time has to be spent in the laboratory. Computing can only be learnt by doing.

The teacher-in-charge should maintain a record of all the assignments done as a part of practical work throughout the year and give it due credit at the time of cumulative evaluation at the end of the year.

Some sample problems are given below as examples. The problems are of varying levels of difficulty:

- (i) Programs using Assignment statements.
Example: Calculation of Area / Volume / Conversion of temperature / Swapping of values etc.
- (ii) Programs based on– Input through parameters.
Example: Implementation of standard formula etc.
- (iii) Programs based on – Input through Scanner class.
Example: Implementation of standard formula etc.
- (iv) Programs based on Mathematical methods.
Example: larger/smaller of two numbers, cube root, square root, absolute value, power, etc.
- (v) Programs based on if, if else, if else if ladder, nested if etc.
 - (a) if programs
 - Larger / smaller of two numbers
 - To check divisibility of a number, etc.
 - (b) if - else programs
 - Odd or even number
 - Eligibility to vote
 - Upper case or lower case

- Positive or negative number
- Vowel or Consonant
- Buzz number etc.

(c) if-else-if programs

- Programs based on discount/interest/ bonus/ taxes/ commission.
- Programs based on slab system.
- Programs based on Nested if.

(vi) Programs on switch case.

- (a) Day of a week
- (b) Name of the month
- (c) Names of the seasons
- (d) Calculator
- (e) Vowel or consonant etc.

(vii) Programs based on Looping Statement

- (a) Programs based on for looping statement.
- (b) Programs based on printing simple series, summation of simple series, product of simple series.
- (c) Prime number, perfect number, composite number, Fibonacci series. Lowest Common Multiple (LCM), Highest Common Factor (HCF) etc.
- (d) To find the biggest and smallest number from n number of entered numbers.
- (e) Program based on while loop like Armstrong number, Spy number, Niven number, Palindrome number, etc.

(viii) Menu Driven programs.

Important: This list is indicative only. Teachers and students should use their imagination to create innovative and original assignments.

EVALUATION

Proposed Guidelines for Marking

The teacher should use the criteria below to judge the internal work done. Basically, four criteria are being suggested: class design, coding and documentation, variable description and execution or output. The actual grading will be done by the teacher based on his/her judgment. However, one possible way: divide the outcome for each criterion into one of 4 groups:

excellent, good, fair/acceptable, poor/unacceptable, then use numeric values for each grade and add to get the total.

Class design:

Has a suitable class (or classes) been used?

Are all attributes with the right kinds of types present?

Is encapsulation properly done?

Is the interface properly designed?

Coding and Documentation:

Is the coding done properly? (choice of names, no unconditional jumps, proper organization of conditions, proper choice of loops, error handling code layout). Is the documentation complete and readable? (class documentation, variable documentation, method documentation, constraints, known bugs – if any).

Variable and Description

Format for variable description:

Name of the variable	Data Type	Purpose/Description

Evaluation of practical work (Assignments) will be done as follows:

Subject Teacher (Internal Examiner): 100 Marks

Criteria (Total-100 marks)	Class design (20 marks)	Variable description (20 marks)	Coding and Documentation (20 marks)	Execution OR Output (40 marks)
Excellent	20	20	20	40
Good	16	16	16	32
Fair	12	12	12	24
Poor	8	8	8	16

ART (60)

Note: The Syllabus for this subject has not been changed.

Aims:

1. To acquire a knowledge of artistic terms, facts, concepts, theories and principles in drawing and painting, i.e. imagination, creativity, expression, aesthetic sense, organisation, observation and interest.
2. To develop an interest in the world of art.
3. To develop an artistic attitude and values through the study of art.
4. To acquire skills in observations, handling tools and drawing illustrations.

CLASSES IX AND X

PART 1: EXTERNAL EXAMINATION

There will be **four** papers, candidates will be required to offer any **two** papers:

Paper 1: (3 hours) Drawing and / or Painting from Still Life - 100 Marks

Paper 2: (3 hours) Drawing and / or Painting from Nature - 100 Marks

Paper 3: (3 hours) Original Imaginative Composition in Colour - 100 Marks

Paper 4: (3 hours) Applied Art - 100 Marks

PAPER 1 (3 hours) Drawing and / or Painting from Still Life

A group of objects which will be artificial or natural and may include such things as cut flowers, fruits, vegetables, a growing plant, as well as domestic or other artificial objects: the group may be drawn or painted. The work can be carried out, if the candidate wishes, in relation to the surroundings or the part of the room in which the group is placed. If the group is painted, the background must be included.

PAPER 2 (3 hours) Drawing and / or Painting from Nature

This paper is divided into two separate sections. Candidates may offer either A or B. In both sections, the subject may be interpreted freely, either in a decorative or in a realistic manner.

- A. Study of the structure of natural forms: such as a spray or branch, which may include flowers,

foliage or fruit, fossils, bones, etc. Candidates are expected to reveal their appreciation of natural growth or structure by means of drawing or painting.

- B. A subject will be set for drawing or painting out of doors. There should be evidence of a direct study from nature.

PAPER 3 (3 hours) Original Imaginative Composition in Colour

A paper containing a list of alternative subjects will be given to candidates one week before the examination. The actual composition will be executed in the examination room after a period of not less than 7 days from the distribution of the paper to the candidates; sketches or other notes must not be taken into the examination room. Since this is a test of original work, it would be inappropriate for any form of guidance to be given to candidates other than that printed on the question paper. A variety of themes will be set; these may be given in the form of titles indicating the subject or of specified subjects for inclusion in composition, or in any other form that will stimulate the imagination. Candidates should base their work, if possible, on scenes which they have themselves observed. Any style or technique including that which is traditional in the candidate's own area may be used.

PAPER 4 (3 hours) Applied Art

Candidates will be required to answer any *one* question. The object of this paper is to test the ability of candidates in craftwork where the material is restricted to flat paper, ink and/or colour. Questions will be set requiring the design and execution of the following:

- the page of a book, book cover, or end paper;
- a notice or pictorial poster;
- a card such as Christmas card or invitation card, or emblem;
- a patterned paper for a specific purpose.

Several but not all of these *alternative* subjects will be set, and candidates will be required to select any one of them. There will be an opportunity to make full use of the calligrapher's art withdrawn and painted, pen-made or brush-written lettering.

Notes

- (a) Any medium may be used provided that it is suitable for the subject. Painted work must be carried out in a quick-drying medium and must be completely dry before it is dispatched. When acrylic paint is used for examination work, it must be mixed with water. All paints used must be of adequate quality; if coloured crayons or chalk are used, they must have a range and quality comparable with that of paints and must be carefully fixed at the examination centre before the work is sent to the Examiner. Monochrome may be used where permitted by the regulations for each Paper but will not be accepted as satisfying the requirement in respect of colour for Paper 3.
- (b) Candidates must use their judgement with regard to (i) the size of a drawing or painting (ii) the proportion of height to width within the space available. In all cases credit will be given to good composition.
- (c) In each of Papers 1 to 3, the test is of free drawing or painting. Therefore, any mechanical means for the execution of the drawing or painting (such as measuring or ruling) are not allowed. Instruments

and tracing papers are allowed for Paper 4, but candidates are advised to restrict their use as far as possible.

- (d) Where question papers or printed instructions provide for alternative groups, etc., the Supervisor in consultation with an Art Teacher will decide which of these alternatives is to form the subject of the examination, after taking account of local convenience, etc. At centres for candidates from more than one school, both of the alternative subjects in Paper 2 (Plant Drawing) must be provided if they are required by schools or candidates.
- (e) Suitable alternative subjects will be provided for the different areas, so far as this may appear desirable. Account will be taken of different climatic conditions in the selection of flower specimens, etc.
- (f) The paper supplied for use in the examination room will be about 35cm x 25 cm. Schools or candidates wishing to work on a large scale, *not* larger than Half-Imperial or Royal (65 cm x 50 cm) or on a different type of tone or paper, will be at liberty to provide their own. Work which is carried out on stiff boards, or which is mounted cannot be accepted. The paper used by candidates must not be less than 35 cm x 25 cm and the work submitted must fill or approximately fill the page.
- (g) **All drawing must be packed flat and not rolled.** Half-Imperial and Royal sheets should be folded across the middle, when drawings are too large to enclose in the envelopes provided, it is essential that the information required on the front of the envelope be given and that the envelope itself be packed in the same parcel with the drawings.
- (h) Examiners are caused great inconvenience by candidates failing to write their examination number either clearly or correctly, thus making identification difficult. Schools are asked to co-operate by impressing upon candidates that they must write their names on drawings and paintings on the front (top right-hand corner) and also on the back of their assignments.

They must not write anything else on the front of the picture. Failure to observe this instruction may result in loss of marks.

Standing Instructions for Supervisors

PAPERS 1 and 2:

The printed 'Instructions' for these papers, which are sent to schools well in advance of the examination, will be limited, as far as possible, to the subjects of the tests. They are for the use of the Supervisors only, in consultation with the Art teacher.

It is important that early attention should be given to the provision of the subjects required. In both Papers 1 and 2, alternative assignment must be set if required by candidates.

The group or subject should be arranged so that each candidate obtains an uninterrupted view; for Paper 1 and 2, candidates should not be more than 4 m from the group. Candidates may form a semicircle but not a complete circle round the groups; more than one session may be arranged if there is a large number of candidates. The examination must be held in good light but care must be taken that the sunlight does not fall upon the group or subject while work is in progress. If the group or subject is painted, the background must be included.

The surface on which the group of objects for Paper 1 and the group for painting only in Paper 2 is arranged must be below the level of the candidate's eye-level.

Drawing and / or Painting from Nature:

Alternative A. Study of the structure of natural forms:

It is desirable that each candidate be given a separate specimen and be permitted to handle and arrange them.

If the specimens named in the Instruction are not available, Supervisors may, with the assistance of the Art teacher, substitute other specimens as similar as possible to those which have been set. The name of the specimen used must be stated on the back of the drawing in small block letters.

Sprays, when these are set, must be reasonably large and full and in good condition: they should be displayed in a vase or bottle and be clearly visible against a plain background. The container must not be drawn.

Or

Alternative B. Direct study of nature:

A subject is to be set for drawing or painting out of doors. Evidence of direct study in the outdoors must be discernible.

Original Imaginative Composition in Colour:

Copies of the Paper are to be given to the candidates at least a week before the paper is taken in the examination room. Candidates should be instructed to bring their copies of the questions paper with them at the time fixed for this examination.

Applied Art:

At centres where necessary arrangements can be made, candidates may cut and print from a block in the examination room. Folded and cutout paper may be used in making designs. A collage may be used.

PART 2:

(To be assessed internally by the School - 100 marks).

Practical Work in Art

(A) Course Work

- (1) Candidates will be required to practice sketching, painting, drawing, etc., in preparation for the examination. They will also undertake practical work on any of the topics suggested below. The practical work of the candidates will be assessed by the teacher as course work. The teacher is free to assess the course work either on the basis of continuous assessment or on the basis of periodical tests.
- (2) Suggested topics for practical work:
 - (i) Pottery work.
 - (ii) Sculpture; any medium.
 - (iii) Carving in any available material: e.g. wood, plaster, stone.
 - (iv) Panel or relief in clay or plaster.
 - (v) Block-printing, batik, tie and dye, etc., on any material.
 - (vi) Printing from original wood or lino block.

- (vii) Creative Photography.
- (viii) Cartoon and portrait drawing.
- (ix) Animation.

(B) Finished Work

In addition to the course work the candidates will have to submit four pieces of finished Artwork for assessment by the External Examiner. The topics on which these pieces of Artwork may be based can be taken from the syllabus or from any of the topics listed in (A) (2) above or from any other aspect of Art.

(C) Assessment

The teacher and the External Examiner will assess the *Artwork* of the candidates on impression by placing the work of the candidates in groups, giving the following aspects due consideration:

- Imaginative expression.
- Quality of pattern, line and materials.
- Skill in the use of tools and materials.
- Use of colour.

Other aspects may also be considered depending on the nature of the practical work.

(D) Award of Marks (100 Marks)

Subject Teacher (Internal Examiner) 50 marks

External Examiner 50 marks

The total marks obtained out of 100 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

INTERNAL ASSESSMENT IN ART - GUIDELINES FOR MARKING WITH GRADES

Criteria	Preparation	Procedure/ Testing	Observation	Inference/ Results	Presentation
Grade I (4 marks)	Size, perspective, placement and left-over spaces utilized well.	Shapes, likeness, flow of drawing and flow of line.	Usage of light and darkness, colour scheme, texture-innovation	Perfect mastery over the colour, brush handling and the instruments used.	Inspired, technically sound and good to eyes.
Grade II (3 marks)	Any one aspect is wrong.	Any one aspect is wrong.	All the above aspects are without innovation.	Good handling of above aspects.	All above aspects are without inspiration.
Grade III (2 marks)	Any two aspects are wrong.	Any two aspects are wrong.	All the above aspects are without proper texture.	Poor handling of some aspects.	Good to the eyes but with technical errors.
Grade IV (1 mark)	Any three aspects are wrong.	Any three aspects are wrong.	Only one aspect is proper	Poor handling of most aspects.	Not so presentable and with technical errors.
Grade V (0 marks)	All the aspects are wrong.	All the aspects are wrong.	All the aspects are wrong.	Poor in all aspects.	Unappealing in all aspects.

ICSE (CLASS X) FURTHER REDUCED SYLLABUS FOR THE EXAMINATION YEAR 2021

Subjects in which further reduction in Syllabus has been made in September 2020

S.NO.	SUBJECT
1.	English
2.	Second Languages (Hindi & Bengali)
3.	History & Civics
4.	Geography
5.	Mathematics
6.	Physics
7.	Chemistry
8.	Biology
9.	Commercial Studies
10.	Economics
11.	Computer Applications
12.	Economic Applications
13.	Commercial Applications

Subjects in which reduction in Syllabus had been made in July 2020

S.NO.	SUBJECT
1.	Second Languages (Ao-Naga, Assamese, Garo, Gujarati, Kannada, Khasi, Malayalam, Marathi, Nepali, Odia, Punjabi, Sanskrit, Tamil, Telugu, Urdu)
2.	Environmental Science
3.	Home Science
4.	Cookery
5.	Fashion Designing
6.	Physical Education

7.	Hospitality Management
8.	Yoga
9.	Environmental Applications
10.	Technical Drawing Applications
11.	Mass Media & Communication
12.	Performing Arts (Hindustani Music, Carnatic Music, Western Music, Indian Dance, Drama)

Subjects in which NO reduction in Syllabus has been made

S.NO.	SUBJECT
1.	Second Languages (Dzongkha, Lepcha, Manipuri, Mizo, Tangkhul and Tenyidie)
2.	Modern Foreign Languages (Group I)
	French
	German
	Spanish
3.	History & Civics (Thailand)
4.	Geography (Thailand)
5.	Modern Foreign Language (Group II)
6.	Classical Language
7.	Art
8.	Modern Foreign Languages (Group III)

ENGLISH (01)

CLASS X

There will be **two** papers:

Paper 1: English Language;

Paper 2: Literature in English.

Each of these papers will be of **two hours** duration.

Paper 1: English Language (80 Marks)

Internal Assessment (20 Marks)

Paper 2: Literature in English (80 Marks)

Internal Assessment (20 Marks)

PAPER 1 - ENGLISH LANGUAGE

(Two hours) - 80 Marks

Five questions will be set, all of which will be compulsory.

Question 1: Candidates will be required to write a composition of about **300– 350** words from a choice of subjects which will test their ability to: Organise, describe, narrate, report, explain, persuade or argue, present ideas coherently with accuracy and precision, compare and contrast ideas and arrive at conclusions, present relevant arguments and use correct style and format.

The subjects will be varied and may be suggested by language or by other stimuli such as pictures. The subjects will be so chosen so as to allow the candidates to draw on first-hand experience or to stimulate their imagination.

With one subject, a number of suggestions about the content of the composition will be given, but the use of the suggestions will be optional and a candidate will be free to treat the subject in any way that he/she chooses.

The organisation of subject matter, syntax, punctuation, correctness of grammatical constructions and spelling will be expected to be appropriate to the mode of treatment required by the subject.

Question 2: Candidates will have to write a letter from a choice of two subjects requiring either a formal or an informal mode of treatment. Suggestions regarding the content of the letter may be given. The layout of the letter with address, introduction, conclusion, etc., will form part of the assessment. Special attention must be paid to the format of the letter with emphasis on vocabulary appropriate to the context.

Question 3: Candidates will be given a specific situation and will be required to:

- (a) Write the text for a notice based on given directions.
- (b) Write an e-mail on the same content as the notice.

Question 4: An unseen prose passage of about **450** words will be given. Uncommon items of vocabulary, or structure will be avoided. One question will be set to test vocabulary. Candidates will be required to show an understanding of the words/phrases in the context in which they have been used.

A number of questions requiring short answers will also be asked on the passage. These questions will test the candidates' ability to comprehend the explicit content and organisation of the passage and to infer information, intention and attitude from it.

The last question will consist of a summary that will test the candidates' ability to distinguish main ideas from supporting details and to extract salient points to re-write them in the form of a summary. Candidates will be given clear indications of what they are to summarise and of the length of the summary.

Question 5: There will be a number of short answer questions to test the candidates' knowledge of **functional** grammar, structure and use of the language.

All the items in this question will be compulsory. They will consist of correct use of prepositions, verbs and transformation of sentences.

PAPER 2 - LITERATURE IN ENGLISH

(Two hours) - 80 Marks

Candidates will be required to answer five questions from the prescribed textbooks, which include Drama, Prose (Short Stories) and Poetry.

Drama and Prose (Short Stories)

Questions set will be central to the text. Candidates will be required to show that they have understood the passage and are able to clearly give their interpretation of the questions set, which should be in their own words and relevant to the text.

Excerpts may be given from the drama and prose texts leading to questions on the specific book.

Poetry

A poem, or passages from poems, will be given and questions will be set to test the candidates' response to the poem. The questions will focus on the content, understanding and the personal response of candidates to the poem as a whole.

Syllabus to be covered in Class X for the ICSE Examination - Literature in English (English Paper – 2)*

- 1. THE MERCHANT OF VENICE**
(Shakespeare's **unabridged** play by
A.W. Verity): *Only upto Act 4 to be studied.*

**TREASURE TROVE - A collection of ICSE
Poems and Short Stories** (Evergreen Publications)

2. POETRY: All poems to be studied.

- (i) *The Heart of the Tree* – Henry Cuyler Bunner
- (ii) *The Cold Within* – James Patrick Kinney
- (iii) *The Bangle Sellers* – Sarojini Naidu
- (iv) *After Blenheim* – Robert Southey
- (v) *Television* – Roald Dahl
- (vi) *Daffodils* – William Wordsworth
- (vii) *The Patriot* – Robert Browning
- (viii) *Nine Gold Medals* – David Roth

3. PROSE (short stories): All short stories to be studied.

- (i) *Chief Seattle's Speech*
- (ii) *Old Man at the Bridge* – Ernest Miller Hemingway
- (iii) *A Horse and Two Goats* – R.K. Narayan
- (iv) *Hearts and Hands* – O. Henry

- (v) *A Face in the Dark* – Ruskin Bond
- (vi) *An Angel in Disguise* – T.S. Arthur
- (vii) *The Little Match Girl* – Hans Christian Andersen
- (viii) *My Greatest Olympic Prize* – Jesse Owens

*** Please note that the Class X - ICSE Examination paper will be set on the entire syllabus prescribed for the subject.**

Note: For list of prescribed text-books see Appendix.

INTERNAL ASSESSMENT

Paper 1 - English Language

- 1. Schools will prepare, conduct and record assessments of the **Listening and Speaking Skills** of candidates as follows:**

Two assessments to be done in the course of the year.

2. Pattern of Assessment

a) Listening Skills

A passage of about 300 words is read aloud by the examiner *twice*, the first time at normal reading speed (about 110 words a minute) and the next time at a slower speed. Candidates may make brief notes during the readings. They then answer an objective type test based on the passage, on the paper provided.

The recommended number of candidates at a sitting is 30.

b) Speaking Skills

Each candidate is required to make an oral presentation for about two minutes, which will be followed by a discussion on the subject with the examiners, for about three minutes.

Subjects for presentation may include narrating an experience, providing a description, giving directions how to make or operate something, expressing an opinion, giving a report, relating an anecdote or commenting on a current event.

A candidate may refer to brief notes in the course of the presentation but reading or excessive dependence on notes will be penalized.

It is recommended that candidates be given an hour for preparation of their subject for presentation and that they be given a choice of subject, on a common paper.

EVALUATION

The assessment will be conducted jointly by the subject teacher and the external examiner who will each assess the candidate. (The External Examiner may be a teacher nominated by the Head of the School who could be from the faculty **but not teaching the subject in the section/class**. For example, a teacher of English of Class VIII may be deputed to be an External Examiner for Class X).

Award of Marks (20 Marks)

Listening Skills: 10 marks

Speaking Skills: 10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the School.

The Head of the School will be responsible for the online entry of marks on the Council's CAREERS portal by the due date. Schools are required to maintain a record of all assessments conducted in **Listening and Speaking Skills**. These include copies of the assessment tests, topics for presentation and marks awarded. The record will be maintained for a period of 2 months after the ICSE (10) examinations of the candidates concerned.

Paper 2 - Literature in English

Schools will set, assess and record written assignments by the candidates as given below:

Two or three assignments of reasonable length (not exceeding 1500 words in total).

SUGGESTED ASSIGNMENTS

Assignments should be based on the prescribed textbooks on the following lines:

- (i) Character/thematic analysis;
- (ii) Socio-economic, cultural, historical relevance / background;
- (iii) Summary / paraphrase.
- (iv) Appreciation of literary qualities.
- (v) Identifying with a character. Putting oneself in the place of a character in given circumstances and explaining one's actions.
- (vi) Imagine alternative outcomes or endings in a literary piece and the effect on all concerned.

EVALUATION

The assignments/projects are to be evaluated by the subject teacher and by an external examiner. (The External Examiner may be a teacher nominated by the Head of the school, who could be from the faculty, **but not teaching the subject in the section/class**. For example, a teacher of English of Class VIII may be deputed to be an External Examiner for Class X, English projects.)

The Internal Examiner and the External Examiner will assess the assignments independently.

Award of Marks (20 Marks)

Subject Teacher (Internal Examiner) 10 marks

External Examiner 10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

INTERNAL ASSESSMENT IN ENGLISH LANGUAGE-GUIDELINES FOR MARKING WITH GRADES - AURAL ASSIGNMENT (CLASSES IX & X)

Grade	Understanding/ Comprehension Main Idea, Central Theme	Recall	Vocabulary	Context/ Correlation to Other Areas	Marks
I	The candidate accurately understands the central idea of the passage as well as the relevant points in the selected passage/ talk.	The candidate recalls all the important points made (written/ verbal).	The candidate uses appropriate and correct vocabulary while recalling the points made.	The candidate clearly understands the context and can widely correlate the passage to the other areas.	3
II	The candidate gives ideas fairly close to the central / main idea of the passage as well as understands some of the relevant points heard in the selected passage/ talk.	The candidate recalls some of the important points made (written/ verbal).	The candidate uses correct but simple vocabulary while recalling the points made.	The candidate can moderately understand the context of the passage and can moderately correlate the passage to the other areas.	2
III	The candidate cannot fully comprehend the passage and gives only a few ideas related to the central theme of the passage.	The candidate recalls very few of the important points made (written/verbal).	The candidate makes various errors in vocabulary while recalling the points made.	The candidate can only faintly understand the context of the passage and relate it to the other areas.	1
IV	The candidate is neither able to understand the central/main idea of the passage; nor able to understand relevant points heard in the passage/talk.	The candidate is unable to recall the important points made (written/verbal)	The candidate uses incorrect vocabulary while recalling the points made.	The candidate is unable to understand the context of the passage and is unable to correlate the passage to the other areas.	0

INTERNAL ASSESSMENT IN ENGLISH LANGUAGE - GUIDELINES FOR MARKING WITH GRADES - ORAL ASSIGNMENT (CLASSES IX & X)

Grade	Fluency of Language	Subject Matter	Organization	Vocabulary/ Delivery	Understanding	Gesture	Marks
I	Speaks with fluency and has full operational command over the language.	Matter is relevant, rich in content and original.	Content is well sequenced and well organized.	Uses appropriate vocabulary and pronounces words correctly.	While speaking, the candidate emphasizes the important points.	Uses natural and spontaneous gestures that are not out of place.	3
II	The candidate speaks with fairly good fluency and has reasonable operational command of the language.	The subject matter is mostly relevant, consisting of a few original ideas.	The content is satisfactorily sequenced and well organized.	The candidate pronounces most words correctly and uses simple vocabulary.	While speaking, the candidate emphasizes most important points.	Uses some natural gestures.	2
III	The candidate speaks with poor fluency and does not communicate except for the most basic information.	The subject matter is irrelevant and lacks originality.	The subject content is very poor and lacks organisational structure.	The candidate pronounces many words incorrectly and uses inappropriate vocabulary.	While speaking, the candidate emphasizes some important points.	Uses very few natural gestures.	1
IV	The candidate cannot communicate even the most basic information.	The subject matter is negligible.	The subject content comprises of mere words with no structured sentences.	The candidate is unable to correctly pronounce most words and has a limited vocabulary.	While speaking, the candidate is unable to emphasize important points.	Uses no natural gestures.	0

INTERNAL ASSESSMENT IN LITERATURE IN ENGLISH -GUIDELINES FOR MARKING WITH GRADES (CLASSES IX & X)

Grade	Understanding of Text (Narrative)	Examples from Text	Understanding of text- Interpretation and Evaluation	Appreciation of Language, Characterization	Critical Appreciation - Personal Response	Marks
I	The candidate demonstrates expertise in giving an appropriate account of the text, with well-chosen reference to narrative and situation.	The account is suitably supported by relevant examples from the text.	The candidate understands the text with due emphasis on interpretation and evaluation.	The candidate appreciates and evaluates significant ways (structure, character, imagery) in which writers have achieved their effects.	The candidate is able to effectively reflect personal response (critical appreciation) to the text.	4
II	The candidate demonstrates a high level of competence in giving an account of the text, with appropriate references to the narrative and situation.	The account is supported by examples from the text.	The candidate understands text with some emphasis on interpretation and evaluation.	The candidate appreciates and evaluates significant ways in which writers have achieved their effects.	The candidate is able to reflect a personal response to the text.	3
III	The candidate demonstrates competence in giving an account of the text with some reference to the narrative and situation.	The candidate understands the text and shows a basic recognition of the theme and can support it by a few examples.	The candidate recognizes some aspects of the text used by authors to present ideas.	The candidate recognizes some of the significant ways in which the writers have used the language.	The candidate is able to communicate a personal response, which shows appreciation.	2
IV	The candidate gives a broad account of the text with reference to the narrative and situation.	The candidate understands the basic meaning of the text.	The candidate relates the text to other texts studied.	The candidate recognizes differences in the way authors write.	The candidate communicates a straightforward personal response to the text.	1
V	The candidate is unable to demonstrate an understanding of the basic events in the text.	The candidate is unable to understand the text or support it with any examples.	The candidate is unable to relate the text to the other texts studied.	The candidate is unable to recognize the differences in the way authors write.	The candidate is unable to give a personal view of the text studied.	0

SECOND LANGUAGE

Aims:

1. To appreciate the language as an effective means of communication.
2. To acquire knowledge of the elements of the language.
3. To develop an interest in the language.
4. To understand the language when spoken at normal conversational speed.
5. To understand the basic structural patterns of the language, vocabulary and constructions.

INDIAN LANGUAGES

CLASSES IX AND X

Papers will be set in the following languages:

Ao-Naga, Assamese, Bengali, Dzongkha, Garo, Gujarati, Hindi, Kannada, Khasi, Lepcha, Malayalam, Manipuri, Marathi, Mizo, Nepali, Odia, Punjabi, Sanskrit, Tamil, Tangkhul, Telugu, Urdu or any other language of an Indian community approved by the Council.

There will be one paper of three hours duration carrying 80 marks and Internal Assessment of 20 marks.

The paper will be divided into two sections, Section A and Section B.

Section A: Language 40 marks

Section B: Prescribed Texts 40 marks

*Candidates will be required to attempt **all** questions from Section A. They must attempt **four** questions from Section B from **ONLY two** of the prescribed textbooks.*

SECTION A: LANGUAGE - 40 Marks

This section will consist of four questions, all of which will be compulsory.

1. **Composition:** Candidates will be required to write one composition, in the language, which may include short explanations, directions, descriptions or narratives. There will be a choice of subjects, which will be varied and may be suggested by language or other stimuli such as pictures and objects. 15 Marks

2. **Letter:** Candidates will be required to write a letter from a choice of two subjects. Suggestions may be given. The layout of the letter with address, introduction, conclusion, etc., will form part of the assessment. ... 7 Marks
3. **Comprehension:** An unseen passage of about 250 words will be given in the language. Questions on the passage will be set for answers in the language, designed to test the candidates' understanding of the content of the passage. ... 10 Marks
4. **Grammar:** This will consist of tests in the use of language vocabulary, syntax and idioms, synthesis in sentence construction, formation of sentences in the language correctly embodying given words or forms. The question will not require any knowledge of grammatical terms. ... 8 Marks

SECTION B: PRESCRIBED TEXTS - 40 Marks

The question paper will consist of structured and short answer questions. Candidates will be required to answer four questions from **ONLY two** of the prescribed textbooks. All questions will be set in the language and candidates will be required to answer in the language. The questions set will be designed to test the candidates' understanding of the subject matter of the prescribed books.

Note: Further reduction has been made in the list of prescribed textbooks for Hindi and Bengali. For list of Prescribed Textbooks, see Appendix-I.1.

The Class X – ICSE examination paper will be set on the entire syllabus prescribed for the subject. The Class IX internal examination is to be conducted on the portion of this syllabus that is covered during the academic year. ***The Council has not prescribed bifurcation of the syllabus prescribed for this subject.***

INTERNAL ASSESSMENT

Language and Literature:

Class IX: Two or three assignments of reasonable length/duration of which two should be written assignments – one from the language and one from the literature component of the syllabus.

Class X: Two or three assignments of reasonable length/duration of which two should be written assignments – one from the language and one from the literature component of the syllabus.

SUGGESTED ASSIGNMENTS

Language:

Class IX: Creative Writing: Students are to write short compositions (approximately 300 to 400 words each), the stimuli being:

- (i) a piece of recorded music;
- (ii) a recorded series of sounds;
- (iii) a picture/photograph;
- (iv) an opening sentence or phrase;
- (v) a newspaper/magazine clipping or report;

One piece of factual writing which should be informative or argumentative; one piece of expressive writing which is descriptive and imaginative; preparation of film/book review.

Aural: Listening to a conversation/talk/reading of a short passage and then writing down the relevant or main points in the specified number of words and answering the given questions.

Class X: Oral: Prepared speech/ declamation; impromptu speech/ debate/ discussion; report/interview; elocution; role-play/general conversation on selected topics.

Creative Writing: Students are to write short compositions (approximately 300 to 400 words each), the stimuli being:

- (i) a piece of recorded music;
- (ii) a recorded series of sounds;
- (iii) a picture/photograph;
- (iv) an opening sentence or phrase;
- (v) a newspaper/magazine clipping or report;

One piece of factual writing which should be informative or argumentative; one piece of expressive writing which is descriptive and imaginative; preparation of film/book review.

Literature (Prescribed Texts):

Classes IX and X

Assignments should be based on the prescribed textbooks on the following lines:

- (i) Character/thematic analysis.
- (ii) Socio-economic, cultural, historical relevance / background.
- (iii) Summary / paraphrase.

EVALUATION

The assignments/project work are to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Head of the school, who could be from the faculty, **but not teaching the subject in the section/class**. For example, a teacher of the language of Class VIII may be deputed to be an External Examiner for Class X projects in the language.)

The Internal Examiner and the External Examiner will assess the assignments independently.

Award of marks (20 Marks)

Subject Teacher (Internal Examiner)	10 marks
External Examiner	10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

**INTERNAL ASSESSMENT IN INDIAN LANGUAGES - GUIDELINES FOR MARKING WITH GRADES - CREATIVE WRITING
(CLASSES IX & X)**

Grade	Content/Analysis of Idea, Thought/ Feeling.	Expression/ Effective Expression of Idea	Structure/ Organisation of Material	Vocabulary/ Use of Words, Phrases	Originality/ Imaginative/ Innovative	Marks
I	The candidate analyses the ideas, feelings and experiences effectively. Reasoning is logical and effective.	The candidate expresses the ideas, thoughts and feelings effectively.	The work is very well structured with a sense of introduction, body, middle and conclusion, paragraphing and appropriate sentence construction.	The use of vocabulary exhibits a high level of competence in handling language.	The work is imaginative, interesting and engrossing.	4
II	The candidate analyses the ideas, feelings and experiences with well-defined explanations, reasoning is logical and persuasive.	The candidate expresses the ideas, thoughts and feelings well and with clarity.	The work is very well structured with some sense of conclusion and of paragraph lengths.	The vocabulary exhibits competence of word usage; correctness of grammar and spelling.	The candidate's work is quite interesting and engrossing.	3
III	The candidate analyses the ideas, feelings and experiences with a fair degree of detail and explanation. Reasoning is fairly logical and persuasive.	The candidate expresses the ideas, thoughts and feelings fairly well and with a fair degree of clarity.	The work is fairly well structured; candidate follows simple paragraphing.	The candidate uses straightforward vocabulary and fairly good pattern of spellings.	The candidate demonstrates the ability to sustain the interest of the reader.	2
IV	The candidate attempts to analyze ideas, feelings and experiences with simple explanation and detail. Reasoning and arguments are not very convincing.	The candidate expresses the ideas, thoughts and feelings intelligibly and in simple language.	The work shows some understanding of paragraphing and structure.	The candidate's vocabulary is limited and the spelling, punctuation and grammar is sometimes poor.	The candidate is, to some extent, able to sustain the interest of the reader.	1
V	The candidate attempts a basic analysis of ideas, feelings and experiences with few simple explanations and few details. Is unable to present proper arguments.	The candidate is unable to express the ideas, thoughts and feelings, uses simple language and the work is not very intelligible.	The candidate does not display an understanding of structure and paragraphing.	There is consistent weakness in spelling, punctuation and grammar.	The candidate is unable to sustain the interest of the reader.	0

INTERNAL ASSESSMENT IN INDIAN LANGUAGES - GUIDELINES FOR MARKING WITH GRADES
AURAL ASSIGNMENT (CLASS IX)

Grade	Understanding/ Comprehension Main Idea, Central Theme	Recall	Vocabulary	Context/ Correlation to Other Areas	Marks
I	The candidate accurately understands the central idea of the passage as well as the relevant points in the selected passage/ talk.	The candidate recalls all the important points made (written/ verbal).	The candidate uses appropriate and correct vocabulary while recalling the points made.	The candidate clearly understands the context and can widely correlate the passage to the other areas.	3
II	The candidate gives ideas fairly close to the central / main idea of the passage as well as understand some of the relevant points heard in the selected passage/ talk.	The candidate recalls some of the important points made (written/ verbal).	The candidate uses correct but simple vocabulary while recalling the points made.	The candidate can moderately understand the context of the passage and can moderately correlate the passage to the other areas.	2
III	The candidate cannot fully comprehend the passage and gives only a few ideas related to the central theme of the passage.	The candidate recalls very few of the important points made (written/verbal).	The candidate makes various errors in vocabulary while recalling the points made.	The candidate can only faintly understand the context of the passage and relate it to the other areas.	1
IV	The candidate is neither able to understand the central/main idea of the passage; nor able to understand relevant points heard in the passage/talk.	The candidate is unable to recall the important points made (written/verbal)	The candidate uses incorrect vocabulary while recalling the points made.	The candidate is unable to understand the context of the passage and is unable to correlate the passage to the other areas.	0

**INTERNAL ASSESSMENT IN INDIAN LANGUAGES - GUIDELINES FOR MARKING WITH GRADES
ORAL ASSIGNMENT (CLASS X)**

Grade	Fluency of Language	Subject Matter	Organization	Vocabulary/ Delivery	Understanding	Gesture	Marks
I	Speaks with fluency and has full operational command over the language.	Matter is relevant, rich in content and original.	Content is well sequenced and well organized.	Uses appropriate vocabulary and pronounces words correctly.	While speaking, the candidate emphasizes the important points.	Uses natural and spontaneous gestures that are not out of place.	3
II	The candidate speaks with fairly good fluency and has reasonable operational command of the language.	The subject matter is mostly relevant, consisting of a few original ideas.	The content is satisfactorily sequenced and well organized.	The candidate pronounces most words correctly and uses simple vocabulary.	While speaking the candidate emphasizes most important points.	Uses some natural gestures.	2
III	The candidate speaks with poor fluency and does not communicate except for the most basic information.	The subject matter is irrelevant and lacks originality.	The subject content is very poor and lacks organisational structure.	The candidate pronounces many words incorrectly and uses inappropriate vocabulary.	While speaking, the candidate emphasizes some important points.	Uses very few natural gestures.	1
IV	The candidate cannot communicate even the most basic information.	The subject matter is negligible.	The subject content comprises of mere words with no structured sentences.	The candidate is unable to correctly pronounce most words and has a limited vocabulary.	While speaking, the candidate is unable to emphasize important points.	Uses no natural gestures.	0

**INTERNAL ASSESSMENT IN INDIAN LANGUAGES (LITERATURE - PRESCRIBED TEXTS) - GUIDELINES FOR MARKING
WITH GRADES (CLASSES IX & X)**

Grade	Understanding of Text (Narrative)	Examples from Text	Understanding of text- Interpretation and Evaluation	Appreciation of Language, Characterization	Critical Appreciation -Personal Response	Marks
I	The candidate demonstrates expertise in giving an appropriate account of the text, with well-chosen reference to narrative and situation.	The account is suitably supported by relevant examples from the text.	The candidate understands the text with due emphasis on interpretation and evaluation.	The candidate appreciates and evaluates significant ways (structure, character, imagery) in which writers have achieved their effects.	The candidate is able to effectively reflect personal response (critical appreciation) to the text.	4
II	The candidate demonstrates a high level of competence in giving an account of the text, with appropriate references to the narrative and situation.	The account is supported by examples from the text.	The candidate understands the text with some emphasis on interpretation and evaluation.	The candidate appreciates and evaluates significant ways in which writers have achieved their effects.	The candidate is able to reflect a personal response to the text.	3
III	The candidate demonstrates competence in giving an account of the text with some reference to the narrative and situation.	The candidate understands the text and shows a basic recognition of the theme and can support it by a very few examples.	The candidate recognizes some aspects of the text used by authors to present ideas.	The candidate recognizes some of the significant ways in which the writers have used the language.	The candidate is able to communicate a personal response which shows appreciation.	2
IV	The candidate gives broad account of the text with reference to the narrative and situation.	The candidate understands the basic meaning of the text.	The candidate relates the text to other texts studied.	The candidate recognizes differences in the way authors write.	The candidate communicates straight forward personal response to the text.	1
V	The candidate is unable to demonstrate an understanding of the basic events in the text.	The candidate is unable to understand the text or support it with any examples.	The candidate is unable to relate to the other text studied.	The candidate is unable to recognize the differences in the way authors write.	The candidate is unable to give a personal view of the text studied.	0

HISTORY, CIVICS AND GEOGRAPHY (50)

HISTORY AND CIVICS

H.C.G. - Paper - 1

CLASS X

There will be **one** paper of **two** hours duration carrying 80 marks and an Internal Assessment of 20 marks.

The paper will be divided into **two** parts, Part I and Part II.

Part I (30 marks) will contain short answer questions set from the entire syllabus.

Candidates will be required to answer **all** questions.

Part II (50marks) will consist of Section A and Section B. Candidates will be required to answer **two** out of **three** questions from Section A and **three** out of **five** questions from Section B. The sections will correspond to the sections indicated in the syllabus.

SECTION A: CIVICS

1. The Union Legislature

Meaning of the federal setup in India.

(i) Lok Sabha - term, composition, qualifications for membership. Parliamentary procedures: a brief idea of sessions, quorum, question hour, adjournment and no-confidence motion. Speaker – election.

(ii) Rajya Sabha – composition, qualifications for membership, election, term, Presiding Officer.

Powers and functions of Union Parliament (control over executive). Exclusive powers of the two Houses.

2. The Union Executive

(a) The President.

Qualifications for election, composition of Electoral College, reason for indirect election, term of office, procedure for impeachment.

Powers (executive, legislative, discretionary and emergency).

(b) Prime Minister and Council of Ministers.

Appointment, formation of Council of Ministers, tenure; Position and powers of the Prime Minister. Collective and individual responsibility of the members of the Cabinet.

Distinction between the Council of Ministers and the Cabinet.

3. The Judiciary

The Supreme Court:

Composition, qualifications of judges, appointment; Jurisdiction and functions: Original, Appellate, Advisory, Revisory, Judicial Review and Court of Record. Enforcement of Fundamental Rights and Writs.

SECTION B: HISTORY

1. The Indian National Movement (1857 – 1917)

(a) The First War of Independence, 1857.

Only the Causes (political, socio-religious, economic and military) will be tested. [The events, however, need to be mentioned in order to maintain continuity and for a more comprehensive understanding.]

(b) Factors leading to the growth of Nationalism.

Socio-religious reform movements (brief mention of contribution of Raja Rammohan Roy and Jyotiba Phule) and role of the Press.

Foundation of the Indian National Congress: The Indian National Association (Surendranath Banerjee) and the East India Association (Dadabhai Naoroji) as precursors. Immediate objectives of the Indian National Congress - the first two sessions and their Presidents should be mentioned.

- (c) First Phase of the Indian National Movement (1885-1907).

Objectives and methods of struggle of the Early Nationalists. Any two contributions of Dadabhai Naoroji, Surendranath Banerjee and Gopal Krishna Gokhale.

Second Phase of the Indian National Movement (1905-1916) - Brief mention of the causes of the Partition of Bengal and its perspective by the Nationalists. Objectives and methods of struggle of the Radicals. Any two contributions of Bal Gangadhar Tilak, Bipin Chandra Pal and Lala Lajpat Rai.

The Muslim League: objectives of the Muslim League.

2. Mass Phase of the National Movement (1915-1947)

- (a) Mahatma Gandhi - *Non-Cooperation Movement : causes (Khilafat Movement, Rowlatt Act, Jallianwala Bagh Tragedy), programme and suspension – Chauri Chaura incident and impact of the Movement; the Civil Disobedience Movement: causes (reaction to the Simon Commission, Declaration of Poorna Swaraj at the Lahore Session of 1929), Dandi March, Gandhi-Irwin Pact and the Second Round Table Conference; the Quit India Movement: causes (failure of the Cripps Mission, Japanese threat), Quit India Resolution and the significance of the Movement.*
- (b) Forward Bloc (*objectives*) and INA (*objectives and contribution of Subhas Chandra Bose*).
- (c) Independence and Partition of India
The Mountbatten Plan (clauses and its acceptance); and the Indian Independence Act of 1947 (clauses only).

3. The Contemporary World

- (a) The First World War
Causes (Nationalism and Imperialism, division of Europe and Sarajevo crisis) and Results (Treaty of Versailles).
- (b) The Second World War
Causes (Dissatisfaction with the Treaty of Versailles, Rise of Fascism and Nazism, Japanese invasion of China, Failure of

League of Nations and Hitler's invasion of Poland).

(c) United Nations

- (i) The objectives of the U.N.

Organs of the United Nations: General Assembly, the Security Council, and the International Court of Justice

Names only.

- (ii) Major agencies of the United Nations: *UNICEF, WHO and UNESCO.*

Only names and expansion of the abbreviations.

INTERNAL ASSESSMENT

Any one project/assignment related to the syllabus.

Suggested Assignments

- Compare the Parliamentary and Presidential forms of Government with reference to India and the U.S.A.
- Conduct a mock Court and record the proceedings.
- Present a life sketch and contributions of any one of the following Presidents of India:
- Dr. Rajendra Prasad, Dr. S. Radhakrishnan and Dr. A.P.J. Abdul Kalam (or any other).
- Present a book review of any one of the following works: Dadabai Naoroji's 'Poverty and un-British rule in India', Gandhi's 'The Story of my Experiments with Truth', Nehru's 'Discovery of India', Bhagat Singh's 'Why I am an Atheist', Vijayalakshmi Pandit's 'The Scope of Happiness: A Personal Memoir', Abdul Kalam's 'Wings of Fire'.
- Discuss the relevance of any one of the following films to understand the history of 20th Century Europe: The Book Thief, Schindler's List, Escape to Victory, The Boy in Striped Pyjamas, Life is Beautiful, The Sound of Music, Gandhi (Richard Attenborough), Sardar (Ketan Mehta), Netaji Subhas Chandra Bose - The Forgotten Hero (Shyam Benegal).
- Highlight the work and achievements of any one Nobel Laureate - Malala Yousafzai or Kailash Satyarthi.
- Make a power point presentation on India's

Independence and Partition.

- Make a presentation on the influence of Gandhian principles on Martin Luther King / Nelson Mandela.
- Prepare a report on the contributions of any one of the following agencies of the United Nations – UNESCO/WHO/UNICEF/ILO/UNDP/FAO.

EVALUATION

The assignments/project work is to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Head of the School, who could be from the faculty, **but not teaching the subject in the section/class**. For example, a teacher of History of Class VIII may be deputed to be an External Examiner for Class X, History projects.)

The Internal Examiner and the External Examiner will assess the assignments independently.

Award of marks (20 Marks)

Subject Teacher (Internal Examiner): 10 marks

External Examiner: 10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the School.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

INTERNAL ASSESSMENT IN HISTORY & CIVICS - GUIDELINES FOR MARKING WITH GRADES

Grade	Preparation/ Research	Information	Concepts	Thinking Skills	Presentation	Marks
I	<ul style="list-style-type: none"> Follows instructions with understanding. Masters research techniques easily. Reference work is orderly. 	<ul style="list-style-type: none"> A good deal of relevant matter. Uses wide range of sources. 	<ul style="list-style-type: none"> Good understanding of historical concepts - sequence/ reconstruction- causes and consequences- continuity and change Empathy. 	<ul style="list-style-type: none"> Different interpretations of evidence. Can draw Inferences/ deductions/ conclusions. 	<ul style="list-style-type: none"> Matter presented is clear and is in coherent form (sub-headings, sections, chapters etc.) Work is neat and tidy and not over elaborate. 	4
II	<ul style="list-style-type: none"> Follows instructions but needs a little help in research techniques. Reference notes quite orderly. 	<ul style="list-style-type: none"> Selects matter relevant to context. Limited use of references/ sources. 	<ul style="list-style-type: none"> Understanding of concepts is adequate. 	<ul style="list-style-type: none"> Limited / Single interpretation of evidence with some examples. Some inferences/ conclusions are drawn. 	<ul style="list-style-type: none"> Matter is presented in coherent form but not organized into sections etc. Presentation neat and tidy but not elaborate. 	3
III	<ul style="list-style-type: none"> Follows instructions but needs constant guidance. Reference notes at times disorderly. 	<ul style="list-style-type: none"> Relevant matter but limited reference work. Matter is sketchy. 	<ul style="list-style-type: none"> Displays limited use of concepts. 	<ul style="list-style-type: none"> Few examples /single example to support reasoning. 	<ul style="list-style-type: none"> Work is presented in an orderly way, but not organized into sections. Over use of 'cosmetics' to hide lack of substance. Work is quite neatly presented. 	2
IV	<ul style="list-style-type: none"> Struggles with research methods and needs constant guidance. Reference notes copied without reference to keywords. 	<ul style="list-style-type: none"> Hardly any reference material. Use of irrelevant matter. Matter is sketchy. 	<ul style="list-style-type: none"> Minimal competency in concepts. A few of the required concepts. 	<ul style="list-style-type: none"> Finds it difficult to make conclusions/ deductions/ inferences. No examples to support reasoning. 	<ul style="list-style-type: none"> Matter presented in a confused way at times (no sub-headings, chapters, etc.) Tendency to copy from reference books. Use of "cosmetics" to hide lack of substance. 	1
V	<ul style="list-style-type: none"> Cannot follow instructions. Works 'blindly' without reference to keywords. 	<ul style="list-style-type: none"> No reference work/copied from other textbooks/ sketchy matter. 	<ul style="list-style-type: none"> Unable to demonstrate concepts. 	<ul style="list-style-type: none"> Unable to make inferences/ deductions or come to any conclusions. 	<ul style="list-style-type: none"> Matter presented in an incoherent/ disorganized way. Copied from textbooks "blindly". Use of "cosmetics" to hide lack of substance. Untidy work. 	0

HISTORY, CIVICS AND GEOGRAPHY (50)

GEOGRAPHY

H.C.G. - Paper - 2

CLASS X

There will be **one** paper of **two** hours duration carrying 80 marks and Internal Assessment of 20 marks.

The Paper will consist of **two** parts, Part I and Part II.

Part I (compulsory) will consist of **two** questions. Question 1 will be based on **Topographical Map**. Question 2 will be based on outline **Map of India**.

Part II: Candidates will be expected to answer any **five** questions.

Candidates will be expected to make the fullest use of sketches, diagrams, graphs and charts in their answers.

Questions set may require answers involving the interpretation of photographs of geographical interest.

PART – I

MAP WORK

1. Interpretation of Topographical Maps

- Locating features with the help of a four-figure grid reference.
- Definition of contour and contour interval. Identification of landforms marked by contours (steep slope, gentle slope), triangulated height, spot height, benchmark, relative height/depth.
- Interpretation of colour tints used on a topographical survey of India map.
- Identification and definition of types of scale given on the map.
Measuring direct/shortest distances and calculating area using the scale given therein.
- Marking directions between different locations, using eight cardinal points.
- Identify: Site of prominent villages and/or towns, types of land use / land cover and means of communication with the help of the index given at the bottom of the sheet.
- Identification of drainage (direction of flow and pattern) and settlement patterns.
- Identification of natural and man-made features.

2. Map of India

On an outline map of India, candidates will be required to locate, mark and name the following:

Mountains, Peaks and Plateaus: Himalayas, Karakoram, Aravali, Vindhya, Satpura, Western and Eastern Ghats, Nilgiris, Mount Godwin Austin (K2). Deccan Plateau, Chota Nagpur Plateau.

Plains: Gangetic Plains and Coastal plains – (Konkan, Kanara, Malabar, Coromandel, Northern Circars).

Desert: Thar (The Great Indian Desert)

Rivers: Indus, Jhelum, Satluj, Ganga, Yamuna, Ghaghra, Gomti, Chambal, Betwa, Brahmaputra, Narmada, Tapi, Mahanadi, Godavari, Krishna, Cauveri, Tungabhadra.

Water Bodies: Gulf of Kutch, Gulf of Khambhat, Gulf of Mannar, Chilka Lake.

Passes: Karakoram Pass.

Latitude and Longitudes: Standard Meridian (82° 30'E).

Direction of Winds: South West Monsoons (Arabian Sea and Bay of Bengal Branches), North East Monsoons.

Distribution of Minerals: Oil - Mumbai High (Offshore Oil Field), Coal – Jharia.

Soil Distribution – Alluvial and Black Soil.

Cities - Delhi, Mumbai, Kolkata, Chennai, and Allahabad.

Population - Distribution of Population (Dense and sparse).

PART - II

GEOGRAPHY OF INDIA

3. Location, Extent and Physical features

- *Position and Extent of India. (through Map only)*
- *The physical features of India – mountains, plateaus, plains and rivers. (through Map only)*

4. Climate

Distribution of Temperature, Rainfall, winds in Summer and Winter and factors affecting the climate of the area. Monsoon and its mechanism. Seasons – March to May – Summer; June to September – Monsoon; October to November - Retreating Monsoon. December to February – Winter.

5. Soil Resources

- *Types of soil (alluvial, black, red and laterite) distribution, composition and characteristics such as colour, texture, minerals and crops associated.*
- *Soil Erosion – causes, prevention and conservation.*

6. Natural Vegetation

- *Importance of forests.*
- *Types of vegetation (tropical evergreen, tropical deciduous, tropical desert, littoral and mountain), distribution and correlation with their environment.*
- *Forest conservation.*

7. Water Resources

- *Sources (Surface water and ground water).*
- *Need for conservation and conservation practices (Rainwater harvesting and its importance).*
- *Irrigation: Importance and methods.*

8. Mineral and Energy Resources

- *Iron ore, Manganese, Copper – uses and their distribution.*
- *Conventional Sources: Coal, Petroleum, (distribution, advantages and disadvantages).*
- *Non-conventional Sources: Solar, wind, nuclear and biogas (generation and advantages).*

9. Agriculture

- *Indian Agriculture – importance, problems and reforms.*
- *Agricultural seasons (rabi, kharif, zayad).*
- *Climatic conditions, soil requirements, methods of cultivation, processing and distribution of the following crops:*
 - *Rice, wheat and pulses.*
 - *Sugarcane.*
 - *Cotton and tea.*

10. Manufacturing Industries

Importance and classification

- *Agro based Industry – Sugar and Textile (Cotton).*
- *Mineral based Industry – Iron & Steel (TISCO, Rourkela), Petro Chemical and Electronics.*

11. Transport

Importance and Modes – Roadways, Railways, Airways and Waterways – Advantages and disadvantages.

12. Waste Management

- *Need for waste management.*
- *Methods of safe disposal - segregation, dumping and composting.*
- *Need and methods for reducing, reusing and recycling waste.*

INTERNAL ASSESSMENT

PRACTICAL / PROJECT WORK

Candidates will be required to prepare a project report on any **one** topic. The topics for assignments may be selected from the list of suggested assignments given below. Candidates can also take up an assignment of their choice under any of the broad areas given below.

Suggested list of assignments:

1. Local Geography:
 - (a) Land use pattern in different regions of India– a comparative analysis.
 - (b) The survey of a local market on the types of shops and services offered.
2. Environment:
Wildlife conservation efforts in India.
3. Current Geographical Issues:
Development of tourism in India.
4. Transport in India:
Development of Road, Rail, Water and Air routes.
5. List different type of industries in the States and collect information about the types of raw materials used, modes of their procurement and disposal of wastes generated. Classify these industries as polluting or environment friendly and suggest possible ways of reducing pollution caused by these units.

6. Need for industrialization in India, the latest trends and its impact on economy of India.
7. Visit a water treatment plant, sewage treatment plant or garbage dumping or vermicomposting sites in the locality and study their working.

EVALUATION

The assignments/project work is to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Head of the school, who could be from the faculty, **but not teaching the subject in the section/class**. For example, a teacher of Geography of Class VIII may be deputed to be an External Examiner for Class X, Geography projects.)

The Internal Examiner and the External Examiner will assess the assignments independently.

Award of Marks (20 Marks)

Subject Teacher (Internal Examiner)	10 marks
External Examiner	10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

INTERNAL ASSESSMENT IN GEOGRAPHY - GUIDELINES FOR MARKING WITH GRADES

Criteria	Preparation	Procedure/ Testing	Observation	Inference/Results	Presentation
Grade I (4 marks)	Gives complete theoretical information using relevant geographical terms	States the objectives and defines the aspects to be studied.	Studies text and source material and makes a list.	States theoretical information in a coherent and concise manner using geographical terminology. Uses a variety of techniques. Shows resourcefulness. Supports investigation with relevant evidence.	Neatly and correctly stated statement of intent and conclusion matches with objectives.
Grade II (3 marks)	Provides adequate information using appropriate terms.	States objectives but not the limitations of the study.	Makes a limited list of source material only from secondary sources.	Uses sound methodology-using methods suggested. Makes a valid statement about the data collected. Attempts to develop explanations using available information.	Limited use of reference material and a presentation, which is routine.
Grade III (2 marks)	States objectives using some geographical terms but mostly in descriptive terms.	Only lists the aspects to be studied.	References are minimal.	Uses methodology in which selective techniques are applied correctly. Makes descriptive statement. Analysis is limited. Relates and describes systematically the data collected. Tries to relate conclusion to original aim.	Simple and neat with correct placement of references, acknowledgements, contents, maps and diagrams.
Grade IV (1 mark)	States intent without using relevant geographical terms but explaining them correctly.	Shows evidence of what to look for and how to record the same.	Uses methodology with some techniques but is unable to systematically record data and collect information.	Makes few relevant statements. Does analyse data that is not presented or tends to copy analysis available from other sources. Makes superficial conclusions. Link between the original aim and conclusion is not clear.	Neat but lacking in correct placement of table of contents, maps, diagrams and pictures.
Grade V (0 marks)	Does not make any use of geographical terms.	Has not collected any relevant data and has not presented sources correctly.	Does not use any logical technique and does not follow the methodology suggested.	Does not analyse data. Does not use the suggested methods. Makes conclusions but does not relate them to the original aim.	Presents the report without reference.

MATHEMATICS (51)

CLASS X

There will be **one** paper of **two and a half** hours duration carrying 80 marks and Internal Assessment of 20 marks.

The paper will be divided into **two** sections, Section I (40 marks), Section II (40 marks).

Section I: Will consist of compulsory short answer questions.

Section II: Candidates will be required to answer **four** out of **seven** questions.

1. Commercial Mathematics

(i) Goods and Services Tax (GST)

Computation of tax including problems involving discounts, list-price, profit, loss, basic/cost price including inverse cases. Candidates are also expected to find price paid by the consumer after paying State Goods and Service Tax (SGST) and Central Goods and Service Tax (CGST) - the different rates as in vogue on different types of items will be provided. Problems based on corresponding inverse cases are also included.

(ii) Banking

Recurring Deposit Accounts: computation of interest and maturity value using the formula:

$$I = P \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$MV = P \times n + I$$

2. Algebra

(i) Linear Inequations

Linear Inequations in one unknown for $x \in N, W, Z, R$. Solving

- Algebraically and writing the solution in set notation form.
- Representation of solution on the number line.

(ii) Quadratic Equations in one variable

(a) Nature of roots

- Two distinct real roots if $b^2 - 4ac > 0$
- Two equal real roots if $b^2 - 4ac = 0$
- No real roots if $b^2 - 4ac < 0$

(b) Solving Quadratic equations by:

- Factorisation
- Using Formula.

(c) Solving simple quadratic equation problems.

(iii) Ratio and Proportion

(a) Proportion, Continued proportion, mean proportion

(b) Componendo, dividendo, alternendo, invertendo properties and their combinations.

(iv) Factorisation of polynomials:

(a) Factor Theorem.

(b) Remainder Theorem.

(c) Factorising a polynomial completely after obtaining one factor by factor theorem.

Note: $f(x)$ not to exceed degree 3.

(v) Matrices

(a) Order of a matrix. Row and column matrices.

(b) Compatibility for addition and multiplication.

(c) Null and Identity matrices.

(d) Addition and subtraction of 2×2 matrices.

(e) Multiplication of a 2×2 matrix by

- a non-zero rational number
- a matrix.

(vi) Arithmetic Progression

- *Finding their General term.*
- *Finding Sum of their first 'n' terms.*

(vii) Co-ordinate Geometry

(a) Reflection

(i) *Reflection of a point in a line:*

$x=0, y=0, x=a, y=a$, the origin.

(ii) *Reflection of a point in the origin.*

(iii) *Invariant points.*

(b) Co-ordinates expressed as (x, y) , Section formula, Midpoint formula, Concept of slope, equation of a line, Various forms of straight lines.

(i) *Section and Mid-point formula (Internal section only, co-ordinates of the centroid of a triangle included).*

(ii) *Equation of a line:*

- *Slope –intercept form $y = mx + c$*
- *Two- point form $(y-y_1) = m(x-x_1)$*

Geometric understanding of 'm' as slope/ gradient/ $\tan \theta$ where θ is the angle the line makes with the positive direction of the x- axis.

Geometric understanding of 'c' as the y-intercept/the ordinate of the point where the line intercepts the y axis/ the point on the line where $x=0$.

Simple applications of all the above.

3. Geometry

(a) Similarity

Similarity, conditions of similar triangles.

- (i) *Comparison with congruency, keyword being proportionality.*
- (ii) *Three conditions: SSS, SAS, AA. Simple applications (proof not included).*
- (iii) *Applications of Basic Proportionality Theorem.*
- (iv) *Areas of similar triangles are proportional to the squares of corresponding sides.*

(b) Circles

(i) Angle Properties

- *The angle that an arc of a circle subtends at the centre is double that which it subtends at any point on the remaining part of the circle (without proof).*
- *Angles in the same segment of a circle are equal (without proof).*
- *Angle in a semi-circle is a right angle (without proof).*

(ii) Cyclic Properties:

- *Opposite angles of a cyclic quadrilateral are supplementary (without proof).*
- *The exterior angle of a cyclic quadrilateral is equal to the opposite interior angle (without proof).*

(iii) Tangent and Secant Properties:

- *The tangent at any point of a circle and the radius through the point are perpendicular to each other (without proof).*
- *From any point outside a circle, two tangents can be drawn, and they are equal in length (without proof).*
- *If a line touches a circle and from the point of contact, a chord is drawn, the angles between the tangent and the chord are respectively equal to the angles in the corresponding alternate segments (without proof).*

Note: Only numerical applications of all the above.

4. Mensuration

Area and volume of solids – Cylinder, and Cone.

Three-dimensional solids - right circular cylinder, right circular cone: Area (total surface and curved surface) and Volume. Direct application problems including cost, Inner and Outer volume and melting and recasting method to find the volume or surface area of a new solid. Combination of solids included.

Note: Problems on Frustum are not included.

5. Trigonometry

(a) Using Identities to solve/prove simple algebraic trigonometric expressions

$$\sin^2 A + \cos^2 A = 1$$

$$1 + \tan^2 A = \sec^2 A$$

$$1 + \cot^2 A = \operatorname{cosec}^2 A; 0 \leq A \leq 90^\circ$$

(b) Heights and distances: Solving 2-D problems involving angles of elevation and depression using trigonometric tables.

Note: Cases involving more than two right angled triangles excluded.

6. Statistics

Statistics – basic concepts, Mean, Median, Mode. Histograms and Ogive.

(a) Computation of:

■ Measures of Central Tendency: Mean, median, mode for raw and arrayed data. Mean*, median class and modal class for grouped data. (both continuous and discontinuous).

* Mean by any one of the following methods:

■ Direct: $\frac{\sum fx}{\sum f}$

■ Short-cut: $A + \frac{\sum fd}{\sum f}$ where $d = x - A$

■ Step-Deviation: $A + \frac{\sum ft}{\sum f} \times i$ where $t = \frac{x-A}{i}$

(b) Graphical Representation. Histograms and Less than Ogive.

■ Finding the mode from the histogram, the upper quartile, lower Quartile and median etc. from the ogive.

■ Calculation of inter Quartile range.

7. Probability

- Random experiments
- Sample space
- Events
- Definition of probability
- Simple problems on single events

Note: SI units, signs, symbols and abbreviations

(1) Agreed conventions

- Units may be written in full or using the agreed symbols, but no other abbreviation may be used.
- The letter 's' is never added to symbols to indicate the plural form.
- A full stop is not written after symbols for units unless it occurs at the end of a sentence.
- When unit symbols are combined as a quotient, e.g. metre per second, it is recommended that it should be written as m/s, or as m s^{-1} .
- Three decimal signs are in common international use: the full point, the mid-point and the comma. Since the full point is sometimes used for multiplication and the comma for spacing digits in large numbers, it is recommended that the mid-point be used for decimals.

(2) Names and symbols

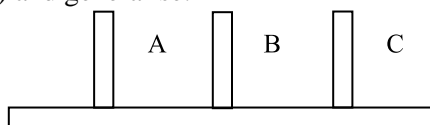
In general			
Implies that	\Rightarrow	is logically equivalent to	\Leftrightarrow
Identically equal to	\equiv	is approximately equal to	\gg
In set language			
Belongs to	\in	does not belong to	\notin
Is equivalent to	\leftrightarrow	is not equivalent	\nleftrightarrow
Union	\cup	to intersection	\cap
Universal set	ξ	is contained in	\subset
Natural (counting)	\mathbb{N}	the empty set	\emptyset
Numbers		whole numbers	\mathbb{W}
Integers	\mathbb{Z}	real numbers	\mathbb{R}
In measures			
Kilometre	km	Metre	m
Centimetre	cm	Millimetre	mm
Kilogram	kg	Gram	g
Litre	L	Centilitre	cL
square kilometre	km^2	Square meter	m^2
square centimetre	cm^2	Hectare	ha
cubic metre	m^3	Cubic centimetre	cm^3
kilometres per hour	km/h	Metres per second	m/s

INTERNAL ASSESSMENT

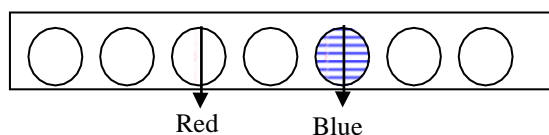
The minimum number of assignments:
Two assignments as prescribed by the teacher.

Suggested Assignments

- Comparative newspaper coverage of different items.
- Survey of various types of Bank accounts, rates of interest offered.
- Planning a home budget.
- Conduct a survey in your locality to study the mode of conveyance / Price of various essential commodities / favourite sports. Represent the data using a bar graph / histogram and estimate the mode.
- To use a newspaper to study and report on shares and dividends.
- Set up a dropper with ink in it vertical at a height say 20 cm above a horizontally placed sheet of plain paper. Release one ink drop; observe the pattern, if any, on the paper. Vary the vertical distance and repeat. Discover any pattern of relationship between the vertical height and the ink drop observed.
- You are provided (or you construct a model as shown) - three vertical sticks (size of a pencil) stuck to a horizontal board. You should also have discs of varying sizes with holes (like a doughnut). Start with one disc; place it on (in) stick A. Transfer it to another stick (B or C); this is one move (m). Now try with two discs placed in A such that the large disc is below, and the smaller disc is above (number of discs = $n=2$ now). Now transfer them one at a time in B or C to obtain similar situation (larger disc below). How many moves? Try with more discs ($n = 1, 2, 3$, etc.) and generalise.



- The board has some holes to hold marbles, red on one side and blue on the other. Start with one pair. Interchange the positions by making one move at a time. A marble can jump over another to fill the hole behind. The move (m) equal 3. Try with 2 ($n=2$) and more. Find the relationship between n and m .



- Take a square sheet of paper of side 10 cm. Four small squares are to be cut from the corners of the square sheet and then the paper folded at the cuts to form an open box. What should be the size of the squares cut so that the volume of the open box is maximum?
- Take an open box, four sets of marbles (ensuring that marbles in each set are of the same size) and some water. By placing the marbles and water in the box, attempt to answer the question: do larger marbles or smaller marbles occupy more volume in a given space?
- An eccentric artist says that the best paintings have the same area as their perimeter (numerically). Let us not argue whether such sizes increase the viewer's appreciation, but only try and find what sides (in integers only) a rectangle must have if its area and perimeter are to be equal (Note: there are only two such rectangles).
- Find by construction the centre of a circle, using only a 60-30 set square and a pencil.
- Various types of "cryptarithm".

EVALUATION

The assignments/project work are to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Head of the school, who could be from the faculty, **but not teaching the subject in the section/class**. For example, a teacher of Mathematics of Class VIII may be deputed to be an External Examiner for Class X, Mathematics projects.)

The Internal Examiner and the External Examiner will assess the assignments independently.

Award of marks (20 Marks)

Subject Teacher (Internal Examiner) : 10 marks

External Examiner : 10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

Criteria	Preparation	Concepts	Computation	Presentation	Understanding	Marks
Grade I	Exhibits and selects a well-defined problem. Appropriate use of techniques.	Admirable use of mathematical concepts and methods and exhibits competency in using extensive range of mathematical techniques.	Careful and accurate work with appropriate computation, construction and measurement with correct units.	Presents well stated conclusions; uses effective mathematical language, symbols, conventions, tables, diagrams, graphs, etc.	Shows strong personal contribution; demonstrate knowledge and understanding of assignment and can apply the same in different situations.	4 marks for each criterion
Grade II	Exhibits and selects routine approach. Fairly good techniques.	Appropriate use of mathematical concepts and methods and shows adequate competency in using limited range of techniques.	Commits negligible errors in computation, construction and measurement.	Some statements of conclusions; uses appropriate math language, symbols, conventions, tables, diagrams, graphs, etc.	Neat with average amount of help; assignment shows learning of mathematics with a limited ability to use it.	3 marks for each criterion
Grade III	Exhibits and selects trivial problems. Satisfactory techniques.	Uses appropriate mathematical concepts and shows competency in using limited range of techniques.	Commits a few errors in computation, construction and measurement.	Assignment is presentable though it is disorganized in some places.	Lack of ability to conclude without help; shows some learning of mathematics with a limited ability to use it.	2 marks for each criterion
Grade IV	Exhibits and selects an insignificant problem. Uses some unsuitable techniques.	Uses inappropriate mathematical concepts for the assignment.	Commits many mistakes in computation, construction and measurement.	Presentation made is somewhat disorganized and untidy.	Lack of ability to conclude even with considerable help; assignment contributes to mathematical learning to a certain extent.	1 mark for each criterion
Grade V	Exhibits and selects a completely irrelevant problem. Uses unsuitable techniques.	Not able to use mathematical concepts.	Inaccurate computation, construction and measurement.	Presentation made is completely disorganized, untidy and poor.	Assignment does not contribute to mathematical learning and lacks practical applicability.	0 mark

SCIENCE (52)

PHYSICS

SCIENCE Paper - 1

CLASS X

*There will be one paper of **two hours** duration carrying 80 marks and Internal Assessment of practical work carrying 20 marks.*

*The paper will be divided into **two** sections, Section I (40 marks) and Section II (40 marks).*

Section I (compulsory) will contain short answer questions on the entire syllabus.

Section II will contain six questions. Candidates will be required to answer any **four** of these **six** questions.

Note: Unless otherwise specified, only SI Units are to be used while teaching and learning, as well as for answering questions.

1. Force, Work, Power and Energy

- (i) Turning forces concept; moment of a force; forces in equilibrium; centre of gravity; [discussions using simple examples and simple numerical problems].

Elementary introduction of translational and rotational motions; moment (turning effect) of a force, also called torque and its cgs and SI units; common examples - door, steering wheel, bicycle pedal, etc.; clockwise and anti-clockwise moments; conditions for a body to be in equilibrium (translational and rotational); principle of moment and its verification using a metre rule suspended by two spring balances with slotted weights hanging from it; simple numerical problems; Centre of gravity (qualitative only) with examples of some regular bodies and irregular lamina.

- (ii) Uniform circular motion.

As an example of constant speed, though acceleration (force) is present. Differences between centrifugal and centripetal force.

- (iii) Work, energy, power and their relation with force.

Definition of work. $W = FS \cos\theta$; special cases of $\theta = 0^\circ, 90^\circ$. $W = mgh$. Definition of

energy, energy as work done. Various units of work and energy and their relation with SI units. [erg, calorie, kW h and eV]. Definition of Power, $P = W/t$; SI and cgs units; other units, kilowatt (kW), megawatt (MW) and gigawatt (GW); and horsepower (1hp=746W) [Simple numerical problems on work, power and energy].

- (iv) Different types of energy (e.g. chemical energy, Mechanical energy, heat energy, electrical energy, nuclear energy, sound energy, light energy).

Mechanical energy: potential energy $U = mgh$ (derivation included) gravitational PE, examples; kinetic energy $K = \frac{1}{2}mv^2$ (derivation included); forms of kinetic energy: translational, rotational and vibrational - only simple examples. [Numerical problems on K and U only in case of translational motion]; qualitative discussions of electrical, chemical, heat, nuclear, light and sound energy, conversion from one form to another; common examples.

- (v) Machines as force multipliers; load, effort, mechanical advantage, velocity ratio and efficiency; pulley systems showing the utility of each type of machine.

Functions and uses of simple machines: Terms-effort E, load L, mechanical advantage $MA = L/E$, velocity ratio $VR = V_E/V_L = d_E/d_L$, input (W_i), output (W_o), efficiency (η), relation between η and MA, VR (derivation included); for all practical machines $\eta < 1$; $MA < VR$.

Pulley system: single fixed, single movable, block and tackle (using single tackle).; MA, VR and η in each case.

- (vi) Principle of Conservation of energy.

Statement of the principle of conservation of energy; theoretical verification that $U + K = \text{constant}$ for a freely falling body. Application of this law to simple pendulum (qualitative only); [simple numerical problems].

2. Light

- (i) Refraction of light through a glass block and a triangular prism - qualitative treatment of simple applications such as real and apparent depth of objects in water and apparent bending of sticks in water. Applications of refraction of light.

Partial reflection and refraction due to change in medium. Laws of refraction; the effect on speed (V), wavelength (λ) and frequency (f) due to refraction of light; conditions for a light ray to pass undeviated. Values of speed of light (c) in vacuum, air, water and glass; refractive index $\mu = c/V$, $V = f\lambda$. Values of μ for common substances such as water, glass and diamond; experimental verification; refraction through glass block; lateral displacement; refraction through a glass prism, simple applications: real and apparent depth of objects in water; apparent bending of a stick under water. (Simple numerical problems and approximate ray diagrams required).

- (ii) Total internal reflection: Critical angle; examples in triangular glass prisms; comparison with reflection from a plane mirror (qualitative only). Applications of total internal reflection.

Transmission of light from a denser medium (glass/water) to a rarer medium (air) at different angles of incidence; critical angle

(C) $\mu = 1/\sin C$. Essential conditions for total internal reflection. Total internal reflection in a triangular glass prism; ray diagram, different cases - angles of prism ($60^\circ, 60^\circ, 60^\circ$), ($60^\circ, 30^\circ, 90^\circ$), ($45^\circ, 45^\circ, 90^\circ$); use of right angle prism to obtain $\delta = 90^\circ$ and 180° (ray diagram); comparison of total internal reflection from a prism and reflection from a plane mirror.

- (iii) Lenses (converging and diverging) including characteristics of the images formed (using ray diagrams only); magnifying glass; location of images using ray diagrams and thereby determining magnification.

Types of lenses (converging and diverging), convex and concave, action of a lens as a set of prisms; technical terms; centre of curvature, radii of curvature, principal axis, foci, focal plane and focal length; detailed study of refraction of light in spherical

lenses through ray diagrams; formation of images - principal rays or construction rays; location of images from ray diagram for various positions of a small linear object on the principal axis; characteristics of images. Sign convention and direct numerical problems using the lens formula are included (derivation of formula not required).

Scale drawing or graphical representation of ray diagrams not required.

Power of a lens (concave and convex); Only definition and basic understanding based on the curvature or thickness of lens. Applications of lenses.

- (iv) Using a triangular prism to produce a visible spectrum from white light; Electromagnetic spectrum.

Deviation produced by a triangular prism; dependence on colour (wavelength) of light; dispersion and spectrum; electromagnetic spectrum: broad classification (names only arranged in order of increasing wavelength); properties common to all electromagnetic radiations; properties and uses of infrared and ultraviolet radiation.

3. Sound

- (i) Reflection of Sound Waves; echoes: their use; simple numerical problems on echoes.

Production of echoes, condition for formation of echoes; simple numerical problems; use of echoes by bats, dolphins, fishermen, medical field. SONAR.

- (ii) Natural vibrations, Damped vibrations, Forced vibrations and Resonance - a special case of forced vibrations. *Meaning and simple applications of natural, damped, forced vibrations and resonance.*

- (iii) Loudness, pitch and quality of sound.

Meaning of the terms and the factors affecting them (no examples).

4. Electricity and Magnetism

- (i) Ohm's Law; concepts of emf, potential difference, resistance; resistances in series and parallel, internal resistance.

Concepts of pd (V), current (I), resistance (R) and charge (Q). Ohm's law: statement, $V=IR$; SI units; graph of V vs I and resistance from slope; ohmic and non-ohmic

resistors, factors affecting resistance (including specific resistance) and internal resistance; super conductors, electromotive force (emf); combination of resistances in series and parallel. Simple numerical problems using the above relations. [Simple network of resistors involving not more than four external resistors in a circuit].

(ii) Electrical power and energy.

Electrical energy; examples of heater, motor, lamp, loudspeaker, etc. Electrical power; measurement of electrical energy, $W = QV = VIt$ from the definition of pd. Combining with ohm's law $W = VIt = I^2 R t = (V^2/R)t$ and electrical power $P = (W/t) = VI = I^2 R = V^2/R$. Units: SI and commercial; Power rating of common appliances, household consumption of electric energy; calculation of total energy consumed by electrical appliances; $W = Pt$ (kilowatt \times hour = kW h), (simple numerical problems).

(iii) Household circuits – main circuit; switches; fuses; earthing; safety precautions; three-pin plugs; colour coding of wires.

Main circuit (3 wires-live, neutral, earth) with fuse / MCB, main switch and its advantages, need for earthing, fuse, 3-pin plug and socket; Conventional location of live, neutral and earth points in 3 pin plugs and sockets. Safety precautions, colour coding of wires.

5. Heat

(i) Calorimetry: meaning, specific heat capacity; principle of method of mixtures; Numerical Problems on specific heat capacity using heat loss and gain and the method of mixtures.

Heat and its units (calorie, joule), temperature and its units ($^{\circ}\text{C}$, K); thermal (heat) capacity $C' = Q/\Delta T$... (SI unit of C'): Specific heat Capacity $C = Q/m\Delta T$ (SI unit of C) Mutual relation between Heat Capacity and Specific Heat capacity, values of C for some

common substances (ice, water and copper). Principle of method of mixtures including mathematical statement. Natural phenomenon involving specific heat. Consequences of high specific heat of water. [Simple numerical problems].

(ii) Latent heat; loss and gain of heat involving change of state for fusion only.

Change of phase (state); heating curve for water; latent heat; specific latent heat of fusion (SI unit). Common physical phenomena involving latent heat of fusion.

6. Modern Physics

Radioactivity and changes in the nucleus; background radiation and safety precautions.

Brief introduction (qualitative only) of the nucleus, nuclear structure, atomic number (Z), mass number (A). Radioactivity as spontaneous disintegration. α , β and γ - their nature and properties; changes within the nucleus. One example each of α and β decay with equations showing changes in Z and A . Uses of radioactivity - radio isotopes. Harmful effects. Safety precautions. Background radiation.

Radiation: X-rays; radioactive fallout from nuclear plants and other sources.

Nuclear Energy: working on safe disposal of waste. Safety measures to be strictly reinforced.

A NOTE ON SI UNITS

SI units (Système International d'Unités) were adopted internationally in 1968.

Fundamental units

The system has seven fundamental (or basic) units, one for each of the fundamental quantities.

Fundamental quantity	Unit	
	Name	Symbol
Mass	kilogram	kg
Length	metre	m
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Derived units

These are obtained from the fundamental units by multiplication or division; no numerical factors are involved. Some derived units with complex names are:

Derived quantity	Unit	
	Name	Symbol
Volume*	cubic metre	m ³
Density	kilogram per cubic metre	kg m ⁻³
Velocity	metre per second	m s ⁻¹
Acceleration	metre per second squared	m s ⁻²
Momentum	kilogram metre per second	kg m s ⁻¹

Some derived units are given special names due to their complexity when expressed in terms of the fundamental units, as below:

Derived quantity	Unit	
	Name	Symbol
Force	newton	N
Pressure	pascal	Pa
Energy, Work	joule	J
Power	watt	W
Frequency	hertz	Hz
Electric charge	coulomb	C
Electric resistance	ohm	Ω
Electromotive force	volt	V

When the unit is named after a person, the *symbol* has a capital letter.

Standard prefixes

Decimal multiples and submultiples are attached to units when appropriate, as below:

Multiple	Prefix	Symbol
10 ⁹	giga	G
10 ⁶	mega	M
10 ³	kilo	k
10 ⁻¹	deci	d
10 ⁻²	centi	c
10 ⁻³	milli	m
10 ⁻⁶	micro	μ
10 ⁻⁹	nano	n
10 ⁻¹²	pico	p
10 ⁻¹⁵	femto	f

INTERNAL ASSESSMENT OF PRACTICAL WORK

Candidates will be asked to carry out experiments for which instructions will be given. The experiments may be based on topics that are not included in the syllabus, but theoretical knowledge will not be required. A candidate will be expected to be able to follow simple instructions, to take suitable readings and to present these readings in a systematic form. He/she may be required to exhibit his/her data graphically. Candidates will be expected to appreciate and use the concepts of least count, significant figures and elementary error handling.

Note: Teachers may design their own set of experiments, preferably related to the theory syllabus. A comprehensive list is suggested below.

1. Lever - There are many possibilities with a meter rule as a lever with a load (known or unknown) suspended from a point near one end (say left), the lever itself pivoted on a knife edge, use slotted weights suspended from the other (right) side for effort.

Determine the mass of a metre rule using a spring balance or by balancing it on a knife edge at some point away from the middle and a 50g weight on the other side. Next pivot (F) the metre rule at the 40cm, 50cm and 60cm mark, each time suspending a load L or the left end and effort E near the right end. Adjust E and or its position so that the rule is balanced. Tabulate the position of L, F and E and the magnitudes of L and E and the distances of load arm and effort arm. Calculate $MA=L/E$ and $VR = \text{effort arm/load arm}$. It will be found that $MA < VR$ in one case, $MA=VR$ in another and $MA > VR$ in the third case. Try to explain why this is so. Also try to calculate the real load and real effort in these cases.

2. Determine the VR and MA of a given pulley system.
3. Trace the course of different rays of light refracting through a rectangular glass slab at different angles of incidence, measure the angles of incidence, refraction and emergence. Also measure the lateral displacement.
4. Determine the focal length of a convex lens by (a) the distant object method and (b) using a needle and a plane mirror.
5. Determine the focal length of a convex lens by using two pins and formula $f = uv/(u+v)$.

6. For a triangular prism, trace the course of rays passing through it, measure angles i_1 , i_2 , A and δ . Repeat for four different angles of incidence (say $i_1=40^\circ$, 50° , 60° and 70°). Verify $i_1 + i_2 = A + \delta$ and $A = r_1 + r_2$.
7. For a ray of light incident normally ($i_1=0$) on one face of a prism, trace course of the ray. Measure the angle δ . Explain briefly. Do this for prisms with $A=60^\circ$, 45° and 90° .
8. Calculate the sp. heat of the material of the given calorimeter, from the temperature readings and masses of cold water, warm water and its mixture taken in the calorimeter.
9. Determination of sp. heat of a metal by method of mixtures.
10. Determination of specific latent heat of ice.
11. Using as simple electric circuit, verify Ohm's law. Draw a graph and obtain the slope.
12. Set up model of household wiring including ring main circuit. Study the function of switches and fuses.

Note: Teachers may feel free to alter or add to the above list. The students may perform about 3 to 5 experiments.

EVALUATION

The practical work/project work are to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Head of the school, who could be from the faculty, **but not teaching the subject in the relevant section/class**. For example, a teacher of Physics of Class VIII may be deputed to be an External Examiner for Class X, Physics projects.)

The Internal Examiner and the External Examiner will assess the practical work/project work independently.

Award of marks (20 Marks)

Subject Teacher (Internal Examiner)	10 marks
External Examiner	10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

SCIENCE (52)
CHEMISTRY
SCIENCE Paper - 2
CLASS X

There will be one paper of **two hours** duration of 80 marks and Internal Assessment of practical work carrying 20 marks.

The paper will be divided into **two** sections, Section I (40 marks) and Section II (40 marks).

Section I (compulsory) will contain short answer questions on the entire syllabus.

Section II will contain **six** questions. Candidates will be required to answer any **four** of these **six** questions.

Note: All chemical process/reactions should be studied with reference to the reactants, products, conditions, observation, the (balanced) equations and diagrams.

1. Periodic Properties and variations of Properties – Physical and Chemical.

- (i) Periodic properties and their variations in groups and periods.

Definitions and trends of the following periodic properties in groups and periods should be studied:

- atomic size
- metallic character
- non-metallic character
- ionisation potential
- electron affinity
- electronegativity

- (ii) Periodicity on the basis of atomic number for elements.

- The study of modern periodic table up to period 3 (students to be exposed to the complete modern periodic table but no questions will be asked on elements beyond period 3 – Argon);
- Periodicity and other related properties to be explained on the basis of nuclear charge and shells (not orbitals).

(Special reference to the alkali metals and halogen groups).

2. Chemical Bonding

Electrovalent, covalent and co-ordinate bonding, structures of various compounds, Electron dot structure.

- (a) Electrovalent bonding:

- Electron dot structure of Electrovalent compounds NaCl, MgCl₂, CaO.
- Characteristic properties of electrovalent compounds – state of existence, melting and boiling points, conductivity (heat and electricity), dissociation in solution and in molten state to be linked with electrolysis.

- (b) Covalent Bonding:

- Electron dot structure of covalent molecules on the basis of duplet and octet of electrons (example: hydrogen, chlorine, nitrogen, ammonia, carbon tetrachloride, methane).
- Polar Covalent compounds – based on difference in electronegativity:
Examples – HCl and H₂O including structures.
- Characteristic properties of Covalent compounds – state of existence, melting and boiling points, conductivity (heat and electricity), ionisation in solution.

Comparison of Electrovalent and Covalent compounds.

- (c) Coordinate Bonding:

- Definition
- The lone pair effect of the oxygen atom of the water molecule and the nitrogen atom of the ammonia molecule to explain the formation of H₃O⁺ and OH⁻ ions in water and NH₄⁺ ion.

The meaning of lone pair; the formation of hydronium ion and ammonium ion must be explained with help of electron dot diagrams.

3. Study of Acids, Bases and Salts

- (i) Simple definitions in terms of the molecules and their characteristic properties.
- (ii) Ions present in mineral acids, alkalis and salts and their solutions; use of litmus and pH paper to test for acidity and alkalinity.
 - *Examples with equation for the ionisation/dissociation of ions of acids, bases and salts.*
 - *Acids form hydronium ions (only positive ions) which turn blue litmus red, alkalis form hydroxyl ions (only negative ions) with water which turns red litmus blue.*
 - *Salts are formed by partial or complete replacement of the hydrogen ion of an acid by a metal. (To be explained with suitable examples).*
 - *Introduction to pH scale to test for acidity, neutrality and alkalinity by using pH paper or Universal indicator.*
- (iii) Definition of salt; types of salts.

Types of salts: normal salts, acid salt, basic salt, definition and examples.

4. Analytical Chemistry

- (i) Action of Ammonium Hydroxide and Sodium Hydroxide on solution of salts: colour of salt and its solution; formation and colour of hydroxide precipitated for solutions of salts of Ca, Fe, Cu, Zn and Pb; special action of ammonium hydroxide on solutions of copper salt and sodium hydroxide on ammonium salts.

On solution of salts:

- *Colour of salt and its solution.*
- *Action on addition of Sodium Hydroxide to solution of Ca, Fe, Cu, Zn, and Pb salts drop by drop in excess. Formation and colour of hydroxide precipitated to be highlighted with the help of equations.*
- *Action on addition of Ammonium Hydroxide to solution of Ca, Fe, Cu, Zn, and Pb salts drop by drop in excess. Formation and colour of hydroxide precipitated to be highlighted with the help of equations.*
- *Special action of Ammonium Hydroxide on solutions of copper salts and sodium hydroxide on ammonium salts.*

- (ii) Action of alkalis (NaOH , KOH) on certain metals, their oxides and hydroxides.

The metal aluminium, its oxide and hydroxide, which react with caustic alkalis (NaOH , KOH), showing the amphoteric nature of this substance.

5. Mole Concept and Stoichiometry

Vapour Density and its relation to relative molecular mass.

- *Molecular mass = $2 \times$ vapour density (formal proof not required)*
- *Deduction of simple (empirical) and molecular formula from:*
 - (a) *the percentage composition of a compound.*
 - (b) *the masses of combining elements.*

6. Electrolysis

- (i) Electrolytes and non-electrolytes.
Definitions and examples.
- (ii) Substances containing molecules only, ions only, both molecules and ions.
 - *Substances containing molecules only ions only, both molecules and ions.*
 - *Examples: relating their composition with their behaviour as **strong and weak electrolytes as well as non-electrolytes.***
- (iii) Definition and explanation of electrolysis, electrolyte, electrode, anode, cathode, anion, cation, oxidation and reduction (on the basis of loss and gain of electrons).
- (iv) An elementary study of the migration of ions, with reference to the factors influencing selective discharge of ions (reference should be made to the activity series as indicating the tendency of metals, e.g. Na, Mg, Fe, Cu, to form ions) illustrated by the electrolysis of:
 - *Molten lead bromide*
 - *acidified water with platinum electrodes*
 - *Aqueous copper (II) sulphate with copper electrodes; electron transfer at the electrodes.*

The above electrolytic processes can be studied in terms of electrolyte used, electrodes used, ionization reaction, anode reaction, cathode reaction, use of selective discharge theory, wherever applicable.

(v) Applications of electrolysis:

- *Electroplating with nickel and silver, choice of electrolyte for electroplating.*
- *Electro refining of copper.*

Reasons and conditions for electroplating; names of the electrolytes and the electrodes used should be given. Equations for the reactions at the electrodes should be given for electroplating, refining of copper.

7. Metallurgy

(i) Occurrence of metals in nature.

- *Mineral and ore - meaning only.*
- *Common ores of aluminium.*

(ii) Extraction of Aluminium.

(a) *Chemical method for purifying bauxite by using NaOH – Baeyer's Process.*

(b) *Electrolytic extraction – Hall Heroult's process:*

Structure of electrolytic cell - the various components as part of the electrolyte, electrodes and electrode reactions.

Description of the changes occurring, purpose of the substances used and the main reactions with their equations.

8. Study of Compounds

A. Hydrogen Chloride

Hydrogen chloride: preparation of hydrogen chloride from sodium chloride; refer to the density and solubility of hydrogen chloride (fountain experiment); reaction with ammonia; acidic properties of its solution.

- *Preparation of hydrogen chloride from sodium chloride; the laboratory method of preparation can be learnt in terms of reactants, product, condition, equation, diagram or setting of the apparatus, procedure, observation, precaution, collection of the gas and identification.*
- *Simple experiment to show the density of the gas (Hydrogen Chloride) – heavier than air.*
- *Solubility of hydrogen chloride (fountain experiment); setting of the apparatus, procedure, observation, inference.*

- *Method of preparation of hydrochloric acid by dissolving the gas in water- the special arrangement and the mechanism by which the back suction is avoided should be learnt.*
- *Reaction with ammonia*
- *Acidic properties of its solution - reaction with metals, their oxides, hydroxides and carbonates to give their chlorides; decomposition of carbonates, hydrogen carbonates, sulphides, sulphites.*
- *Precipitation reactions with silver nitrate solution and lead nitrate solution.*

B. Ammonia

Ammonia: its laboratory preparation and collection from ammonium chloride; ammonia from ammonium salts. Manufacture by Haber's Process; density and solubility of ammonia (fountain experiment); aqueous solution of ammonia; its reactions with hydrogen chloride and with hot copper (II) oxide and chlorine; the burning of ammonia in oxygen.

- *Laboratory preparation from ammonium chloride and collection; (the preparation to be studied in terms of, setting of the apparatus and diagram, procedure, observation, collection and identification)*
- *Ammonia from ammonium salts using alkalis.*

The reactions to be studied in terms of reactants, products, conditions and equations.

- *Manufacture by Haber's Process.*
- *Density and solubility of ammonia (fountain experiment).*
- *The burning of ammonia in oxygen.*
- *The catalytic oxidation of ammonia (with conditions and reaction)*
- *Its reactions with hydrogen chloride and with hot copper (II) oxide and chlorine (both chlorine in excess and ammonia in excess).*

All these reactions may be studied in terms of reactants, products, conditions, equations, and observations.

- *Aqueous solution of ammonia - reaction with sulphuric acid, nitric acid, hydrochloric acid and solutions of iron (III) chloride, iron(II) sulphate, lead nitrate, zinc nitrate and copper sulphate.*

C. Nitric Acid

Nitric Acid: one laboratory method of preparation of nitric acid from potassium nitrate or sodium nitrate. Large scale preparation. Nitric acid as an oxidizing agent.

- *Laboratory preparation of nitric acid from potassium nitrate or sodium nitrate; the laboratory method to be studied in terms of reactants, products, conditions, equations, setting up of apparatus, diagram, precautions, collection and identification.*
- *Manufacture of Nitric acid by Ostwald's process (Only equations with conditions where applicable).*
- *As an oxidising agent: its reaction with copper, carbon, sulphur.*

D. Sulphuric Acid

Sulphuric Acid: its behaviour as an acid when dilute, as an oxidizing agent when concentrated - oxidation of carbon and sulphur; as a dehydrating agent - dehydration of sugar and copper (II) sulphate crystals; its non-volatile nature.

- *Its behaviour as an acid when dilute - reaction with metal, metal oxide, metal hydroxide, metal carbonate, metal bicarbonate, metal sulphite, metal sulphide.*
- *Concentrated sulphuric acid as an oxidizing agent - the oxidation of carbon and sulphur.*
- *Concentrated sulphuric acid as a dehydrating agent- (a) the dehydration of sugar (b) Copper (II) sulphate crystals.*
- *Non-volatile nature of sulphuric acid - reaction with sodium or potassium chloride and sodium or potassium nitrate.*

9. Organic Chemistry

(i) Introduction to Organic compounds.

- *Unique nature of Carbon atom – tetra valency, catenation.*
- *Formation of single, double and triple bonds, straight chain, branched chain, cyclic compounds (only benzene).*

(ii) Structure and Isomerism.

- *Structure of compounds with single, double and triple bonds.*
- *Structural formulae of hydrocarbons. Structural formula must be given for: alkanes, alkenes, alkynes up to 5 carbon atoms.*
- *Isomerism – structural (chain, position).*

(iii) Homologous series – characteristics with examples.

Alkane, alkene, alkyne series and their gradation in properties and the relationship with the molecular mass or molecular formula.

(iv) Simple nomenclature.

Simple nomenclature - of the hydrocarbons with simple functional groups – (double bond, triple bond, alcoholic, aldehydic, carboxylic group) longest chain rule and smallest number for functional groups rule – trivial and IUPAC names (compounds with only one functional group).

(v) Hydrocarbons: alkanes, alkenes, alkynes.

- *Alkanes - general formula; methane (greenhouse gas) and ethane, Complete combustion of methane and ethane, reaction of methane and ethane with chlorine through substitution.*
- *Alkenes – (unsaturated hydrocarbons with a double bond); ethene as an example.*
- *Alkynes – (unsaturated hydrocarbons with a triple bond); ethyne as an example of alkyne.*

Only main properties, particularly addition products with hydrogen and halogen namely Cl_2 , Br_2 and I_2 pertaining to alkenes and alkynes.

INTERNAL ASSESSMENT OF PRACTICAL WORK

Candidates will be asked to observe the effect of reagents and/or of heat on substances supplied to them. The exercises will be simple and may include the recognition and identification of certain gases and ions listed below. The examiners will not, however, be restricted in their choice to substances containing the listed ions.

Gases: Hydrogen, Oxygen, Carbon dioxide, Chlorine, Hydrogen chloride, Sulphur dioxide, Hydrogen sulphide, Ammonia, Water vapour, Nitrogen dioxide.

Ions: Calcium, Copper, Iron, Lead, Zinc and Ammonium, Carbonate, Chloride, Nitrate, Sulphide, Sulphite and Sulphate.

Knowledge of a formal scheme of analysis is not required. Semi-micro techniques are acceptable but candidates using such techniques may need to adapt the instructions given to suit the size of the apparatus being used.

Candidates are expected to have completed the following minimum practical work:

1. Action of heat on the following substances:
 (a) Copper carbonate, zinc carbonate
 (b) zinc nitrate, copper nitrate, lead nitrate
 Make observations, identify the products and make deductions where possible (equations not required).
2. Make a solution of the unknown substance: add sodium hydroxide solution or ammonium hydroxide solution, make observations and give your deduction. Warming the mixture may be needed. Choose from substances containing Ca^{2+} , Cu^{2+} , Fe^{2+} , Fe^{3+} , Pb^{2+} , Zn^{2+} , NH_4^+ .
3. Supply a solution of a dilute acid and alkali. Determine which is acidic and which is basic, giving two tests for each.

EVALUATION

The assignments/project work are to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Head of the school, who could be from the faculty, **but not teaching the subject in the section/class**. For example, a teacher of Chemistry of Class VIII may be deputed to be an External Examiner for Class X Chemistry projects.)

The Internal Examiner and the External Examiner will assess the assignments independently.

Award of marks (20 Marks)

Subject Teacher (Internal Examiner)	10 marks
External Examiner	10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

NOTE: According to the recommendation of International Union of Pure and Applied Chemistry (IUPAC), the groups are numbered from 1 to 18 replacing the older notation of groups IA VIIA, VIII, IB VIIB and 0. However, for the examination both notations will be accepted.

Old notation	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	IIIA	IVA	VA	VIA	VIIA	0
New notation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

SCIENCE (52)

BIOLOGY

SCIENCE Paper - 3

CLASS X

There will be one paper of **two hours** duration of 80 marks and Internal Assessment of practical work carrying 20 marks.

The paper will be divided into **two** sections, Section I (40 marks) and Section II (40 marks).

Section I (compulsory) will contain short answer questions on the entire syllabus.

Section II will contain **six** questions. Candidates will be required to answer any **four** of these **six** questions.

1. Basic Biology

(i) Cell Cycle and Cell Division.

Cell cycle – Interphase (G_1 , S, G_2) and Mitotic phase.

Cell Division:

- *Mitosis and its stages.*
- *A basic understanding of Meiosis as a reduction division (stages not required).*
- *A brief idea of homologous chromosomes and crossing over leading to variations.*
- *Significance and major differences between mitotic and meiotic division.*

(ii) Structure of chromosome.

Basic structure of chromosome with elementary understanding of terms such as chromatin, chromatid, gene structure of DNA and centromere.

2. Plant Physiology

- (i) Absorption by roots, imbibition, diffusion and osmosis; osmotic pressure, root pressure; turgidity and flaccidity; plasmolysis and deplasmolysis; the absorption of water and minerals; active and passive transport (in brief); The rise of water up to the xylem; Forces responsible for ascent of sap.

- *Understanding of the processes related to absorption of water by the roots.*
- *Characteristics of roots, which make them suitable for absorbing water.*
- *Structure of a single full-grown root hair.*
- *A general idea of Cohesive, Adhesive forces and transpirational pull.*
- *Experiments to show the conduction of water through the xylem.*

- (ii) Transpiration - process and significance. Ganong's potometer and its limitations. The factors affecting rate of transpiration. Experiments on transpiration. A brief idea of guttation and bleeding.

- *Concept of transpiration and its importance to plants*
- *Experiments related to transpiration:*
 - (a) *Loss in weight of a potted plant or a leafy shoot in a test tube as a result of transpiration.*
 - (b) *Use of cobalt chloride paper to demonstrate unequal rate of transpiration in a dorsiventral leaf.*
- *Mechanism of stomatal transpiration on the basis of potassium ion exchange theory.*
- *Adaptations in plants to reduce transpiration.*
- *A brief idea of guttation and bleeding.*

- (iii) Photosynthesis: the process and its importance to life in general; experiments to show the necessity of light, carbon dioxide, chlorophyll, formation of starch and release of oxygen; carbon cycle.

- *The process and significance of Photosynthesis.*
- *The internal structure of chloroplast to be explained to give an idea of the site of light and dark reactions.*

- *Opening and closing of stomata based on potassium ion exchange theory.*
- *Overall balanced chemical equation to represent photosynthesis.*
- *Introduction of the terms "photochemical" for light phase and "biosynthetic" for dark phases.*
- *Light reaction - activation of chlorophyll followed by photolysis of water, release of O₂, formation of ATP (photophosphorylation) and NADPH.*
- *Dark reaction - only combination of hydrogen released by NADP with CO₂ to form glucose. (detailed equations are not required).*
- *Adaptations in plants for photosynthesis.*
- *Experiments with regard to the factors essential for photosynthesis; emphasis on destarching and the steps involved in starch test.*
- *A diagrammatic representation of "carbon cycle".*

3. Human Anatomy and Physiology

- (i) **Circulatory System:** Blood and lymph, the structure and working of the heart, blood vessels, circulation of blood (only names of the main blood vessels entering and leaving the heart, liver and kidney will be required). Lymphatic system.
 - *Composition of blood (structure and functions of RBC, WBC and platelets).*
 - *Brief idea of tissue fluid and lymph.*
 - *Increase in efficiency of mammalian red blood cells due to absence of certain organelles; reasons for the same.*
 - *A brief idea of blood coagulation.*
 - *Structure and working of the heart along with names of the main blood vessels entering and leaving the heart, the liver and the kidney.*
 - *Concept of systole and diastole; concept of double circulation.*
 - *Brief idea of pulse and blood pressure.*
 - *Blood vessels: artery, vein and capillary to be explained with the help of diagrams to bring out the relationship between their structure and function.*
- (ii) **Excretory System:** A brief introduction to the excretory organs; parts of the urinary system; structure and function of the kidneys; blood vessels associated with kidneys; structure and function of nephron
 - *Brief idea of the lymphatic organs: spleen and tonsils.*
 - *ABO blood group system, Rh factor.*
 - *Significance of the hepatic portal system.*
 - *A brief idea of different excretory organs in the human body.*
 - *External and internal structure of the kidney.*
 - *Parts of the urinary system along with the blood vessels entering and leaving the kidney; functions of various parts of the urinary system (emphasis on diagram with correct labelling). A general idea of the structure of a kidney tubule/nephron.*
 - *A brief idea of ultra-filtration (emphasis on the diagram of malpighian capsule); selective reabsorption and tubular secretion in relation to the composition of blood plasma and urine formed.*
- (iii) **Nervous system:** Structure of Neuron; central, autonomous and peripheral nervous system (in brief); brain and spinal cord; reflex action and how it differs from voluntary action. Sense organs – Eye: Structure, functions, defects and corrective measures: Ear: Parts and functions of the ear.
 - *Parts of a neuron.*
 - *Various parts of the external structure of the brain and its primary parts: Medulla Oblongata, Cerebrum, Cerebellum, Thalamus, Hypothalamus and Pons; their functions.*
 - *Reference to the distribution of white and gray matter in Brain and Spinal cord.*
 - *Voluntary and involuntary actions – meaning with examples.*
 - *Diagrammatic explanation of the reflex arc, showing the pathway from receptor to effector.*
 - *A brief idea of the peripheral and autonomic nervous system in regulating body activities.*

- *Differences between natural and acquired reflex.*
- *External and Internal structure and functions of the Eye and Ear and their various parts.*
- *A brief idea of stereoscopic vision, adaptation and accommodation of eye.*
- *Defects of the eye (myopia, hyperopia hypermetropia, presbyopia, astigmatism and cataract) and corrective measures (diagrams -included for myopia and hyperopia only)*
- *The course of perception of sound in human ear.*
- *Role of ear in maintaining balance of the body.*

(iv) Endocrine System: General study of the following glands: Adrenal, Pancreas, Thyroid and Pituitary. Endocrine and Exocrine glands.

- *Differences between Endocrine and Exocrine glands.*
- *Exact location and shape of the endocrine glands in the human body.*
- *Hormones secreted by the following glands: Pancreas: insulin and glucagon; Thyroid: only thyroxine; Adrenal gland: Cortical hormones and adrenaline; Pituitary: growth hormone, tropic hormones, ADH and oxytocin.*
- *Effects of hypo secretion and hyper secretion of hormones.*
- *A brief idea of Feedback mechanism with reference to TSH.*

INTERNAL ASSESSMENT OF PRACTICAL WORK

The practical work is designed to test the ability of the candidates to make an accurate observation from specimens of plants and animals.

PLANT LIFE

- Observation of permanent slides of stages of mitosis.
- Experiments demonstrating:
 - Diffusion: using potassium permanganate in water.
 - Osmosis: Thistle Funnel experiment and potato osmoscope.
 - Absorption: using a small herbaceous plant.

(iii) Experiments on Transpiration:

- demonstration of the process using a Bell Jar.
- demonstration of unequal transpiration in a dorsiventral leaf using cobalt chloride paper.
- demonstration of uptake of water and the rate of transpiration using Ganong's potometer.

(iv) Experiments on Photosynthesis:

- to show the necessity of light, carbon dioxide and chlorophyll for photosynthesis.
- To show the release of O₂ during photosynthesis using hydrilla / elodea.

ANIMAL LIFE

- Identification of the structures of the urinary system, heart and kidney (internal structure) and brain (external view) through models and charts.
- The identification of different types of blood cells under a microscope.
- Identification of the internal structure of the Ear and Eye (Through models and charts).
- Identification and location of selected endocrine glands: Adrenal, Pancreas, Thyroid and Pituitary glands with the help of a model or chart.

EVALUATION

The practical work/project work are to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Head of the school, who could be from the faculty, **but not teaching the subject in the relevant section/class**. For example, a teacher of Biology of Class VIII may be deputed to be an External Examiner for Class X, Biology projects.)

The Internal Examiner and the External Examiner will assess the practical work/project work independently.

Award of marks (20 Marks)

Subject Teacher (Internal Examiner)	10 marks
External Examiner	10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

INTERNAL ASSESSMENT IN SCIENCE - GUIDELINES FOR MARKING WITH GRADES

Criteria	Preparation	Procedure/ Testing	Observation	Inference/ Results	Presentation
Grade I (4 marks)	Follows instructions (written, oral, diagrammatic) with understanding; modifies if needed. Familiarity with and safe use of apparatus, materials, techniques.	Analyses problem systematically. Recognises a number of variables and attempts to control them to build a logical plan of investigation.	Records data/observations without being given a format. Comments upon, recognises use of instruments, degree of accuracy. Recording is systematic.	Processes data without format. Recognises and comments upon sources of error. Can deal with unexpected results, suggesting modifications.	Presentation is accurate and good. Appropriate techniques are well used.
Grade II (3 marks)	Follows instructions to perform experiment with step-by-step operations. Awareness of safety. Familiarity with apparatus, materials and techniques.	Specifies sequence of operation; gives reasons for any change in procedure. Can deal with two variables, controlling one.	Makes relevant observations. No assistance is needed for recording format that is appropriate.	Processes data appropriately as per a given format. Draws qualitative conclusions consistent with required results.	Presentation is adequate. Appropriate techniques are used.
Grade III (2 marks)	Follows instructions to perform a single operation at a time. Safety awareness. Familiarity with apparatus & materials.	Develops simple experimental strategy. Trial and error modifications made to proceed with the experiment.	Detailed instructions needed to record observations. Format required to record results.	Processes data approximately with a detailed format provided. Draws observations qualitative conclusions as required.	Presentation is reasonable, but disorganised in some places. Overwriting; rough work is untidy.
Grade IV (1 mark)	Follows some instructions to perform a single practical operation. Casual about safety. Manages to use apparatus & materials.	Struggles through the experiment. Follows very obvious experimental strategy.	Format required to record observations/ readings but tends to make mistakes in recording.	Even when detailed format is provided, struggles or makes errors while processing data. Reaches conclusions with help.	Presentation is poor and disorganised but follows an acceptable sequence. Rough work missing or untidy.
Grade V (0 marks)	Not able to follow instructions or proceed with practical work without full assistance. Unaware of safety.	Cannot proceed with the experiment without help from time to time.	Even when format is given, recording is faulty or irrelevant.	Cannot process results, nor draw conclusions, even with considerable help.	Presentation unacceptable; disorganised, untidy/ poor. Rough work missing.

COMPUTER APPLICATIONS (86)

CLASS X

There will be **one** written paper of **two hours** duration carrying 100 marks and Internal Assessment of 100 marks.

The paper will be divided into two sections A and B.

Section A (Compulsory – 40 marks) will consist of compulsory short answer questions covering the entire syllabus.

Section B (60 marks) will consist of questions which will require detailed answers. There will be a choice of questions in this section

THEORY – 100 Marks

1. Revision of Class IX Syllabus

(i) Introduction to Object Oriented Programming concepts, (ii) Elementary Concept of Objects and Classes, (iii) Values and Data types, (iv) Operators in Java, (v) Input in Java, (vi) Mathematical Library Methods, (vii) Conditional constructs in Java, (viii) Iterative constructs in Java, (ix) Nested for loops.

2. Class as the Basis of all Computation

Objects and Classes

Objects encapsulate state and behaviour – numerous examples; member variables; attributes or features. Variables define state; member methods; Operations/methods/messages/ methods define behaviour.

Classes as abstractions for sets of objects; class as an object factory; primitive data types, composite data types. Variable declarations for both types; difference between the two types. Objects as instances of a class.

Consider real life examples for explaining the concept of class and object.

3. User - defined Methods

Need of methods, syntax of methods, forms of methods, method definition, method calling, method overloading, declaration of methods,

Ways to define a method, ways to invoke the methods – call by value [with programs] and call by reference [only definition with an example], Object

creation - invoking the methods with respect to use of multiple methods with different names to implement modular programming, using data members and member methods, Actual parameters and formal parameters, Declaration of methods - static and non-static, method prototype / signature, - Pure and impure methods, - pass by value [with programs] and pass by reference [only definition with an example], Returning values from the methods , use of multiple methods and more than one method with the same name (polymorphism - method overloading).

4. Constructors

Definition of Constructor, characteristics, types of constructors, use of constructors, constructor overloading.

Default constructor, parameterized constructor, constructor overloading., Difference between constructor and method

5. Library classes

Introduction to wrapper classes, methods of wrapper class and their usage with respect to numeric and character data types. Autoboxing and Unboxing in wrapper classes.

Class as a composite type, distinction between primitive data type and composite data type or class types. Class may be considered as a new data type created by the user, that has its own functionality. The distinction between primitive and composite types should be discussed through examples. Show how classes allow user defined types in programs. All primitive types have corresponding class wrappers. Introduce Autoboxing and Unboxing with their definition and simple examples.

The following methods are to be covered:

int parseInt(String s),

long parseLong(String s),

float parseFloat(String s),

double parseDouble(String s),

boolean isDigit(char ch),

boolean isLetter(char ch),

boolean isLetterOrDigit(char ch),
boolean isLowerCase(char ch),
boolean isUpperCase(char ch),
boolean isWhitespace(char ch),
char toLowerCase (char ch)
char toUpperCase(char ch)

6. Arrays

Definition of an array, types of arrays, declaration, initialization and accepting data of single dimensional array, accessing the elements of single dimensional array.

Arrays and their uses, sorting technique - bubble sort; Search technique – linear search, Array as a composite type, length statement to find the size of the array (sorting and searching techniques using single dimensional array only).

7. String Handling

String class, methods of String class;

The following String class methods are to be covered:

String trim ()
String toLowerCase()
String toUpperCase()
int length()
char charAt (int n)
int indexOf(char ch)
int lastIndexOf(char ch)
String concat(String str)
boolean equals (String str)
boolean equalsIgnoreCase(String str)
int compareTo(String str)
int compareToIgnoreCase(String str)
String replace (char oldChar,char newChar) String
substring (int beginIndex)
String substring (int beginIndex, int
endIndex)
boolean startsWith(String str)
boolean endsWith(String str)
String valueOf(all types)
Only Syntax, purpose, working examples with
output.

INTERNAL ASSESSMENT - 100 Marks

This segment of the syllabus is totally practical oriented. The accent is on acquiring basic programming skills quickly and efficiently.

Programming Assignments (Class X)

The students should complete a minimum of **15** laboratory assignments during the whole year to reinforce the concepts studied in class.

Suggested list of Assignments:

The laboratory assignments will form the bulk of the course. Good assignments should have problems which require design, implementation and testing. They should also embody one or more concepts that have been discussed in the theory class. A significant proportion of the time has to be spent in the laboratory. Computing can only be learnt by doing.

The teacher-in-charge should maintain a record of all the assignments done by the student throughout the year and give it due credit at the time of cumulative evaluation at the end of the year.

Some sample problems are given below as examples. The problems are of varying levels of difficulty:

- (i) User defined methods
 - (a) Programs depicting the concept of pure, impure, static, non- static methods.
 - (b) Programs based on overloaded methods.
 - (c) Programs involving data members, member methods invoking the methods with respect to the object created.
- (ii) Constructors
 - (a) Programs based on different types of constructors mentioned in the scope of the syllabus.
 - (b) Programs / outputs based on constructor overloading
- (iii) Library classes
 - (a) Outputs based on all the methods mentioned in the scope of the syllabus.
 - (b) Programs to check whether a given character is an uppercase/ lowercase / digit etc.
- (iv) Arrays
 - (a) Programs based on accessing the elements of an array.
 - (b) Programs based on sort techniques mentioned in

the scope of the syllabus.

- (c) Programs based on search techniques mentioned in the scope of the syllabus.

- (v) String handling

Outputs based on all the string methods mentioned in the scope of the syllabus.

Important: This list is indicative only. Teachers and students should use their imagination to create innovative and original assignments.

EVALUATION

The teacher-in-charge shall evaluate all the assignments done by the student throughout the year [both written and practical work]. He/she shall ensure that most of the components of the syllabus have been used appropriately in the assignments. Assignments should be with appropriate list of variables and comment statements. The student has to mention the output of the programs.

Proposed Guidelines for Marking

The teacher should use the criteria below to judge the internal work done. Basically, four criteria are being suggested: class design, coding and documentation, variable description and execution or output. The actual grading will be done by the teacher based on his/her judgment. However, one possible way: divide the outcome for each criterion into one of 4 groups: excellent, good, fair/acceptable, poor/unacceptable, then use numeric values for each grade and add to get the total.

Class design:

Has a suitable class (or classes) been used?

Are all attributes with the right kinds of types present? Is encapsulation properly done?

Is the interface properly designed?

Coding and documentation:

Is the coding done properly? (Choice of names, no unconditional jumps, proper organization of conditions, proper choice of loops, error handling, code layout) Is the documentation complete and readable? (class documentation, variable documentation, method documentation, constraints, known bugs - if any).

Variable description:

Format for variable description:

Name of the Variable	Data Type	Purpose/description

Execution or Output:

Does the program run on all sample input correctly?

Evaluation of practical work will be done as follows:

Subject Teacher (Internal Examiner)				50 marks
External Examiner				50 marks
Criteria (Total-50 marks)	Class design (10 marks)	Variable description (10 marks)	Coding and Documentation (10 marks)	Execution OR Output (20 marks)
Excellent	10	10	10	20
Good	8	8	8	16
Fair	6	6	6	12
Poor	4	4	4	8

An External Examiner shall be nominated by the Head of the School and may be a teacher from the faculty, but not teaching the subject in the relevant section/class. For example, A teacher of Computer Science of class VIII may be deputed to be the External Examiner for class X.

The total marks obtained out of 100 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

EQUIPMENT

There should be enough computer systems to provide for a teaching schedule where at least three-fourth of a time available is used for programming and assignments/practical work.

The course shall require at least 4 periods of about 40 minutes duration per week. In one week, out of 4 periods the time should be divided as follows:

- 2 periods – Lecture cum demonstration by the Instructor.
- 2 periods – Assignments/Practical work.

The hardware and software platforms should be such that students can comfortably develop and run programs on those machines.

Since hardware and software evolve and change very rapidly the schools shall need to upgrade them as required. Following are the minimal specifications as of now.

RECOMMENDED FACILITIES:

- A lecture cum demonstration room with a MULTIMEDIA PROJECTOR/ an LCD and Overhead Projector (OHP) attached to the computer.

- A white board with white board markers should be available.
- A fully equipped Computer Laboratory that allows one computer per student.
- The computers should have a minimum of 1 GB RAM and at least a P - IV or Equivalent Processor.
- Good Quality printers.
- A scanner, a web cam/a digital camera (Should be provided if possible).

SOFTWARE FOR CLASSES IX & X

Any suitable Operating System can be used.

For teaching fundamental concepts of computing using object oriented approach, Blue J environment (3.2 or higher version) compatible with JDK (5.0 or higher version) as the base or any other editor or IDE, compatible with JDK (5.0 or higher version) as the base may be used. Ensure that the latest versions of software are used.

ISC (CLASS XII) FURTHER REDUCED SYLLABUS FOR THE EXAMINATION YEAR 2021

Subjects in which further reduction in Syllabus has been made in September 2020

S.NO.	SUBJECT
1.	English
2.	History
3.	Sociology
4.	Psychology
5.	Accounts
6.	Mathematics
7.	Physics
8.	Chemistry
9.	Biology
10.	Biotechnology

Subjects in which reduction in Syllabus had been made in July 2020

S.NO.	SUBJECT
1.	Indian Languages (Bengali, Gujarati, Hindi, Kannada, Mizo, Malayalam, Nepali, Odia, Punjabi, Tamil, Telugu and Urdu)
2.	Elective English
3.	Political Science
4.	Geography
5.	Economics
6.	Commerce
7.	Business Studies
8.	Home Science

9.	Fashion Designing
10.	Electricity and Electronics
11.	Computer Science
12.	Geometrical and Mechanical Drawing
13.	Geometrical and Building Drawing
14.	Music (Indian Music-Hindustani)
15.	Physical Education
16.	Environmental Science
17.	Mass Media & Communication
18.	Hospitality Management
19.	Legal Studies

Subjects in which NO reduction in Syllabus has been made

S.NO.	SUBJECT
1.	Indian Languages (Assamese, Dzongkha, Khasi, Manipuri, Marathi and Lepcha)
2.	Modern Foreign Languages (Chinese, French, German, Tibetan, Spanish)
3.	Classical Languages (Arabic, Sanskrit, Persian)
4.	Engineering Science
5.	Music (Indian Music – Carnatic & Western Music)
6.	Art

COMPULSORY SUBJECT

ENGLISH (801)

CLASS XII

The subject English has *two* components, *English Language* and *Literature in English*. Each of these components will consist of a *Theory Paper* of 80 Marks and *Project Work* of 20 Marks.

ENGLISH LANGUAGE

There will be *two* papers in English Language:

Paper I: Theory (3 hours): 80 Marks

Paper II: Project Work: 20 Marks

PAPER I: THEORY - 80 Marks

Question One:

A composition on one of a number of subjects.

... 20 Marks

Question Two:

- (a) Directed writing (article writing, book review, film review, review of cultural programme, speech writing, report writing, personal profile and statement of purpose) based on suggested points.

...15 Marks

- (b) Proposal Writing based on a given situation. The proposal should include (i) An Introduction (ii) Objectives (iii) List of measures to be taken. A concluding statement is desirable.

...10 Marks

Question Three:

Short-answer questions to test grammar, structure and usage.

...15 Marks

Question Four:

Comprehension.

...20 Marks

NOTE: It is recommended that in Paper I, about 45 minutes should be spent on Question one, 55 minutes on Question two, 30 minutes on Question three and 50 minutes on Question four.

Question One

Candidates will be required to select **one** composition topic from a choice of **six** topics. The choice will normally include narrative, descriptive, reflective, argumentative, discursive topics and short story.

The required length of the composition is **400 – 450** words.

The main criteria by which the compositions will be marked are as follows:

- (a) The quality of the language employed, the range and appropriateness of vocabulary and sentence structure, syntax, the correctness of grammatical constructions, punctuation and spelling.
- (b) The degree to which candidates have been successful in organising the content of the composition as a whole and in individual paragraphs.

Question Two

There are *two* parts in this question and *both* parts are compulsory.

- (a) The piece of directed writing will be based on the information and ideas provided. The required length will be about 300 words. The range of subjects may include article writing, book review, film review, review of cultural

programme, speech writing, report writing, personal profile and statement of purpose.

Skills such as selecting, amplifying, describing, presenting reasoned arguments, re-arranging and re-stating may be involved. The candidates' ability in the above skills, including format, will be taken into account as well as their ability to handle language appropriately in the context of the given situation.

- (b) Candidates will be required to write a proposal based on a given situation. The proposal should include an introduction, objectives and a list of measures to be taken. A concluding statement is desirable. The candidates will also be marked on linguistic ability.

Question Three

All the items in this question are compulsory and their number and type / pattern may vary from year to year. They will consist of short-answer, open completion items or any other type, which will test the candidates' knowledge of the essentials of functional English grammar and structure. Only two or three types will be included in any one examination.

Question Four

A passage of about 500 words will be provided.

Questions based on the passage will be as follows:

- Questions that test the candidates' knowledge of vocabulary and ability to understand the content and infer information and meanings from the text.
- A question that elicits the main ideas of all or part of the passage.

In this part of the question, the candidate will be required to frame a summary (keeping to a word limit), in a coherent manner. Marks will be awarded for expression and the candidate's ability to summarise clearly in complete sentences. Marks will be deducted for linguistic errors.

It is recommended that this part be done in the grid form.

Use of abbreviations will not be accepted.

All questions are compulsory.

PAPER II: PROJECT WORK - 20 Marks

In addition to the syllabus prescribed, candidates are also required to be assessed in Project Work.

PROJECT WORK FOR CLASS XII

Project Work in Class XII consists of assessment of candidates in *three* projects, *one each* on **Listening, Speaking and Writing skills**.

Listening and Speaking skills are to be **assessed internally**, by the School, during English course work in Class XII.

Writing Skills are to be **assessed externally** by the Visiting Examiner, appointed locally and approved by the Council.

Details of assignments for Project Work are given below:

Listening Skills (to be internally assessed by the subject teacher)

An unseen passage of about 500 words may be read aloud, twice, the first time at normal reading speed (about 110 words a minute) and the next time at a slower speed. The passage may be taken from any novel, newspaper, magazine article, journal and so on but **not from an ICSE or ISC textbook**. Students may make brief notes during the readings followed by answering objective type questions based on the passage, on the paper provided.

Speaking Skills (to be internally assessed by the subject teacher)

Students are to be assessed through an individual presentation of about three minutes followed by a discussion with the subject teacher, for another two or three minutes on any one of the following topics:

Topics	Examples
1. Narrating an experience.	An incident from my childhood days.
2. Giving a report.	A report of a school event.
3. Expressing an opinion or theme based conversation.	What is your opinion of on-line learning?

Writing Skills (to be externally assessed by the Visiting Examiner)

A piece of written work of about 500 words must be produced on any one of the following topics:

Topics	Examples
1. Description of a process.	Description of how to operate a device, cook a dish or conduct a scientific experiment.
2. A description of a sporting event.	A description of a cricket match.
3. An autobiographical experience.	The day I learnt the lesson of punctuality.
4. A review of a TV serial.	A review – favourable or unfavourable of any TV serial.

EVALUATION

Marks (out of a total of 20) should be distributed as given below:

1.	Internal Evaluation by Teacher*	5 Marks
	• Listening Skills (Aural)	5 Marks
	• Speaking Skills (Oral)	
2.	Evaluation by Visiting Examiner of Writing Skills**	10 Marks
TOTAL		20 Marks

*** Internal Evaluation by the Teacher (10 Marks):**

Assessment Criteria	Description	Marks
Listening Skills (Aural)	Response to questions based on listening comprehension	5
Speaking Skills (Oral)	- Content	1
	- Fluency	1
	- Vocabulary	1
	- Sentence structure	1
	- Confidence	1
TOTAL		10

****Criteria for Evaluation by the Visiting Examiner (10 Marks):**

Assessment Criteria		Description	Marks
1.	Presentation	Overall formatting (headings, sub-headings, paragraphing) within a word limit of 500 words and a separate title page.	2
2.	Originality	No plagiarism	2

3.	Use of appropriate language	Use of suitable terminology, vocabulary and illustrations for the specific task chosen.	2
4.	Structure	Must read as a unified whole.	2
5.	Style	Lucid style, which communicates the message effectively	2
TOTAL			10

LITERATURE IN ENGLISH (PRESCRIBED TEXTS)

There will be **two** papers in Literature in English:

Paper I: Theory (3 hours): 80 Marks

Paper II: Project Work: 20 Marks

PAPER I: THEORY – 80 Marks

Candidates will be required to answer **five** questions as follows:

One textual question (compulsory) on the Shakespeare play together with **four** other questions on **the three** texts.

Question 1 compulsory.... 20 Marks, four other questions, each carrying 15 Marks.

(Note: Candidates are reminded that infringement of the rubric will certainly invite penalty during the marking of answer scripts.)

The textual question, which will be set on the Shakespeare play, will contain **three** short passages and candidates will be required to answer questions set on **two** of the passages. These Questions may require candidates to explain words and phrases, to rewrite passages in modern English, or to relate an extract to the work as a whole.

The rest of the questions on the Shakespeare play and on the other prescribed texts will be set on the episodes, the plot or plots, themes or ideas, characters, relationship and other prominent literary qualities of the texts prescribed.

NOTE: The Class XII - ISC Examination paper will be set on the entire syllabus prescribed for the subject.

Syllabus to be covered in Class XII for the ISC Examination - Literature in English (English Paper – 2)*

- I. Drama: *The Tempest*: William Shakespeare**
(Complete drama)
- II. Echoes: A Collection of ISC Short Stories**
(Evergreen Publications (India) Ltd, New Delhi).
 1. *Salvatore* – W. Somerset Maugham
 2. *Fritz* – Satyajit Ray
 3. *Quality* – John Galsworthy
 4. *The Story of an Hour* – Kate Chopin
 5. *The Chinese Statue* – Jeffrey Archer
 6. *A Gorilla in the Guest Room* – Gerald Durrell
 7. *The Singing Lesson* – Katherine Mansfield
 8. *The Sound Machine* – Roald Dahl
- III. Reverie: A Collection of ISC Poems** (Evergreen Publications (India) Ltd, New Delhi)
 1. *The Darkling Thrush* – Thomas Hardy
 2. *The Dolphins* – Carol Ann Duffy
 3. *The Gift of India* – Sarojini Naidu
 4. *Crossing the Bar* – Alfred, Lord Tennyson
 5. *John Brown* – Bob Dylan
 6. *Desiderata* - Max Ehrmann
 7. *Dover Beach* – Matthew Arnold
 8. *The Spider and the Fly* – Mary Botham Howitt

***For the ISC Examination, the complete syllabus covered in Classes XI and XII will be examined for Literature in English (English Paper – 2).**

PAPER II: PROJECT WORK - 20 Marks

In addition to the syllabus prescribed, candidates are also required to be assessed in Project Work. Project Work consists of assessment of **Writing Skills**. The objective is to produce original, creative and insightful perspectives on the drama/short stories/poems.

PROJECT WORK FOR CLASS XII

Project Work in Class XII consists of assessment of **Writing Skills** which are **to be assessed internally by the subject teacher and externally by the Visiting Examiner** appointed locally and approved by the Council.

Candidates will be required to undertake **one written assignment of 1000-1500 words**, on any one of the following topics:

Topics		Examples
1.	Analysis of the theme of any story or poem from the prescribed texts.	Discuss the attitudes to war presented in the poem <i>John Brown</i> .
2.	Analysis of a character from the play, short stories or poems in the prescribed texts.	Analyse the character of either <i>Caliban</i> from <i>The Tempest</i> , <i>Salvatore</i> from <i>the short story</i> or <i>John Brown</i> from <i>the poem</i> .
3.	Summary or paraphrase of a story or poem.	
4.	An alternate outcome to any of the chosen texts.	Provide an alternate ending to the short story <i>Fritz</i> .
5.	Comparison of two characters from two different texts.	Compare the two woman characters of <i>The Singing Lesson</i> and <i>The Story of an Hour</i> .

The assignment should be structured as given below:

- A. The written assignment must be given a title in the form of a question which should allow the candidate to explore the drama or the chosen short stories/poems in depth.
- B. The written assignment must follow the structure given below:
 - Introduction:
 - Explanation of the question that has been framed
 - Reason for choosing the text
 - Brief explanation of how the candidate intends to interpret the chosen text and literary materials used in the process
 - Main Body – organised and well-structured treatment of the question using appropriate sub-headings.
 - Conclusion – comprehensive summary of the points made in the main body.

Note: The text/texts analysed in the Class XI Project Work must not be repeated in Class XII.

EVALUATION

Marks (out of a total of 20) should be distributed as given below:

1.	Internal Evaluation by Teacher*	10 marks
2.	Evaluation by Visiting Examiner**	10 marks
TOTAL		20 marks

*** Internal Evaluation by the Teacher (10 Marks):**

Assessment Criteria		Candidates should be able to:	Marks
1.	Process	Identify the topic. Plan a detailed written assignment. Produce a written outline.	3
2.	Understanding, Application of Knowledge and Analysis	Use a range of literary aspects such as plot, setting, characters, action, style and ideas in order to present an organized and well-structured complete assignment.	4
3.	Presentation	Prepare the document (overall format: headings, sub-headings, paragraphing) writing within a word limit of 1000-1500 words and provide a separate title page.	3
TOTAL			10

****Criteria for Evaluation by the Visiting Examiner (10 Marks)**

Assessment Criteria		Candidates should be able to:	Marks
1.	Presentation	Prepare the document (overall format: headings, sub-headings, paragraphing) writing within a word limit of 1000-1500 words and provide a separate title page.	4
2.	Understanding, Application of Knowledge and Analysis	Use a range of literary aspects such as plot, setting, characters, action, style and ideas in order to present an organized and well-structured complete assignment.	6
TOTAL			10

Note: No Question Paper for Project Work will be set by the Council.

MATHEMATICS (860)

CLASS XII

There will be **two** papers in the subject:

Paper I : Theory (3 hours)80 marks

Paper II: Project Work20 marks

PAPER I (THEORY) – 80 Marks

The syllabus is divided into **three** sections A, B and C.

Section A is compulsory for all candidates. Candidates will have a choice of attempting questions from **EITHER** Section B **OR** Section C.

There will be one paper of **three** hours duration of 80 marks.

Section A (65 Marks): Candidates will be required to attempt **all** questions. Internal choice will be provided in two questions of two marks, two questions of four marks and two questions of six marks each.

Section B/ Section C (15 Marks): Candidates will be required to attempt **all** questions **EITHER** from Section B or Section C. Internal choice will be provided in one question of two marks and one question of four marks.

DISTRIBUTION OF MARKS FOR THE THEORY PAPER

S.No.	UNIT	TOTAL WEIGHTAGE
SECTION A: 65 MARKS		
1.	Relations and Functions	10 Marks
2.	Algebra	10 Marks
3.	Calculus	32 Marks
4.	Probability	13 Marks
SECTION B: 15 MARKS		
5.	Vectors	5 Marks
6.	Three - Dimensional Geometry	6 Marks
7.	Applications of Integrals	4 Marks
OR		
SECTION C: 15 MARKS		
8.	Application of Calculus	5 Marks
9.	Linear Regression	6 Marks
10.	Linear Programming	4 Marks
TOTAL		80 Marks

SECTION A

1. Relations and Functions

- (i) Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

- *Relations as:*
 - *Relation on a set A*
 - *Identity relation, empty relation, universal relation.*
 - *Types of Relations: reflexive, symmetric, transitive and equivalence relation.*
- *Functions:*
 - *One to one and onto functions.*

(ii) Inverse Trigonometric Functions

Definition, domain, range, principal value branch.

- *Principal values.*
- *$\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$ etc. and their graphs.*
- *$\sin^{-1}x = \cos^{-1}\sqrt{1-x^2} = \tan^{-1}\frac{x}{\sqrt{1-x^2}}$.*
- *$\sin^{-1}x = \operatorname{cosec}^{-1}\frac{1}{x}$; $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$ and similar relations for $\cot^{-1}x$, $\tan^{-1}x$, etc.*

$$\sin^{-1}x \pm \sin^{-1}y = \sin^{-1}\left(x\sqrt{1-y^2} \pm y\sqrt{1-x^2}\right)$$

$$\cos^{-1}x \pm \cos^{-1}y = \cos^{-1}\left(xy \mp \sqrt{1-y^2}\sqrt{1-x^2}\right)$$

$$\text{similarly } \tan^{-1}x + \tan^{-1}y = \tan^{-1}\frac{x+y}{1-xy}, xy < 1$$

$$\tan^{-1}x - \tan^{-1}y = \tan^{-1}\frac{x-y}{1+xy}, xy > -1$$

- *Formulae for $2\sin^{-1}x$, $2\cos^{-1}x$, $2\tan^{-1}x$, $3\tan^{-1}x$ etc. and application of these formulae.*

2. Algebra

Matrices and Determinants

(i) Matrices

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operation on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices. Invertible matrices (here all matrices will have real entries).

(ii) Determinants

Determinant of a square matrix (up to 3 x 3 matrices), properties of determinants, minors, co-factors. Adjoint and inverse of a square matrix. Solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

- Types of matrices ($m \times n$; $m, n \leq 3$), order; Identity matrix, Diagonal matrix.
- Symmetric, Skew symmetric.
- Operation – addition, subtraction, multiplication of a matrix with scalar, multiplication of two matrices (the compatibility).

E.g. $\begin{bmatrix} 1 & 1 \\ 0 & 2 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix} = AB(\text{say})$ but BA is

not possible.

- Singular and non-singular matrices.
- Existence of two non-zero matrices whose product is a zero matrix.
- Inverse (2×2 , 3×3) $A^{-1} = \frac{\text{Adj}A}{|A|}$

- Martin's Rule (i.e. using matrices)

$$a_1x + b_1y + c_1z = d_1$$

$$a_2x + b_2y + c_2z = d_2$$

$$a_3x + b_3y + c_3z = d_3$$

$$A = \begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix} \quad B = \begin{bmatrix} d_1 \\ d_2 \\ d_3 \end{bmatrix} \quad X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$$AX = B \Rightarrow X = A^{-1}B$$

Problems based on above.

- Determinants
 - Order.
 - Minors.
 - Cofactors.
 - Expansion.

3. Calculus

- (i) Differentiation, Derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit functions. Concept of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

- Differentiation
 - Derivatives of trigonometric functions.
 - Derivatives of exponential functions.
 - Derivatives of logarithmic functions.
 - Derivatives of inverse trigonometric functions - differentiation by means of substitution.
 - Derivatives of implicit functions and chain rule.
 - e for composite functions.
 - Derivatives of Parametric functions.
 - Differentiation of a function with respect to another function e.g. differentiation of $\sin x^3$ with respect to x^3 .
 - Logarithmic Differentiation - Finding dy/dx when $y = x^{x^x}$.
 - Successive differentiation up to 2nd order.

NOTE : Derivatives of composite functions using chain rule.

- L' Hospital's theorem.

$$\frac{0}{0} \text{ form, } \frac{\infty}{\infty} \text{ form}$$

(ii) Applications of Derivatives

Applications of derivatives: increasing/decreasing functions, tangents and normals, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-lifesituations).

- Equation of Tangent and Normal
- Increasing and decreasing functions.
- Maxima and minima.
 - Stationary/turning points.
 - Absolute maxima/minima
 - local maxima/minima
 - First derivatives test and second derivatives test

- Application problems based on maxima and minima.

(iii) Integrals

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

- Indefinite integral

- Integration as the inverse of differentiation.
- Anti-derivatives of polynomials and functions $(ax + b)^n$, $\sin x$, $\cos x$, $\sec^2 x$, $\operatorname{cosec}^2 x$ etc.
- Integrals of the type $\sin^2 x$, $\sin^3 x$, $\sin^4 x$, $\cos^2 x$, $\cos^3 x$, $\cos^4 x$.
- Integration of $1/x$, e^x .
- Integration by substitution.
- Integrals of the type $f'(x)[f(x)]^n$, $\frac{f'(x)}{f(x)}$.
- Integration of $\tan x$, $\cot x$, $\sec x$, $\operatorname{cosec} x$.
- Integration by parts.

When degree of $f(x) \geq$ degree of $g(x)$,
e.g.

$$\frac{x^2 + 1}{x^2 + 3x + 2} = 1 - \left(\frac{3x + 1}{x^2 + 3x + 2} \right)$$

- Definite Integral

- Fundamental theorem of calculus (without proof)
- Properties of definite integrals.
- Problems based on the following properties of definite integrals are to be covered.

$$\int_a^b f(x) dx = \int_a^b f(t) dt$$

$$\int_a^b f(x) dx = - \int_b^a f(x) dx$$

$$\int_a^b f(x) dx = \int_a^c f(x) dx + \int_c^b f(x) dx$$

where $a < c < b$

$$\int_a^b f(x) dx = \int_a^b f(a + b - x) dx$$

$$\int_0^a f(x) dx = \int_0^a f(a - x) dx$$

$$\int_0^{2a} f(x) dx = \begin{cases} 2 \int_0^a f(x) dx, & \text{if } f(2a - x) = f(x) \\ 0, & \text{if } f(2a - x) = -f(x) \end{cases}$$

$$\int_{-a}^a f(x) dx = \begin{cases} 2 \int_0^a f(x) dx, & \text{if } f \text{ is an even function} \\ 0, & \text{if } f \text{ is an odd function} \end{cases}$$

(iv) Differential Equations

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type: $\frac{dy}{dx} + py = q$,

where p and q are functions of x or constants. $\frac{dx}{dy} + px = q$, where p and q are

functions of y or constants.

- Differential equations, order and degree.
- Formation of differential equation by eliminating arbitrary constant(s).
- Solution of differential equations.
- Variable separable.
- Homogeneous equations.
- Linear form $\frac{dy}{dx} + Py = Q$ where P and Q are functions of x only. Similarly, for $\frac{dx}{dy}$.

NOTE 1: The second order differential equations are excluded.

4. Probability

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem.

- *Independent and dependent events conditional events.*
- *Laws of Probability, addition theorem, multiplication theorem, conditional probability.*
- *Theorem of Total Probability.*
- *Baye's theorem.*

SECTION B

5. Vectors

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

- *As directed line segments.*
- *Magnitude and direction of a vector.*
- *Types: equal vectors, unit vectors, zero vector.*
- *Position vector.*
- *Components of a vector.*
- *Vectors in two and three dimensions.*
- *\hat{i} , \hat{j} , \hat{k} as unit vectors along the x, y and the z axes; expressing a vector in terms of the unit vectors.*
- *Operations: Sum and Difference of vectors; scalar multiplication of a vector.*
- *Scalar (dot) product of vectors and its geometrical significance.*
- *Cross product - its properties - area of a triangle, area of parallelogram, collinear vectors.*

NOTE: Proofs of geometrical theorems by using Vector algebra are excluded.

6. Three - dimensional Geometry

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, coplanar and skew lines. Cartesian and vector equation of a plane. Distance of a point from a plane.

- *Equation of x-axis, y-axis, z axis and lines parallel to them.*
- *Equation of xy - plane, yz - plane, zx - plane.*
- *Direction cosines, direction ratios.*
- *Angle between two lines in terms of direction cosines /direction ratios.*
- *Condition for lines to be perpendicular/parallel.*
- *Lines*
 - *Cartesian and vector equations of a line through one and two points.*
 - *Coplanar and skew lines.*
 - *Conditions for intersection of two lines.*
 - *Distance of a point from a line.*
- *Planes*
 - *Cartesian and vector equation of a plane.*
 - *Direction ratios of the normal to the plane.*
 - *One point form.*
 - *Normal form.*
 - *Intercept form.*
 - *Distance of a point from a plane.*
 - *Intersection of the line and plane.*

7. Application of Integrals

Application in finding the area bounded by simple curves and coordinate axes. Area enclosed between two curves.

- *Application of definite integrals - area bounded by curves, lines and coordinate axes is required to be covered.*
- *Simple curves: lines, parabolas and polynomial functions.*

SECTION C

8. Application of Calculus

Application of Calculus in Commerce and Economics in the following:

- *Cost function,*
- *average cost,*
- *marginal cost and its interpretation*
- *demand function,*
- *revenue function,*

- marginal revenue function and its interpretation,
- Profit function and breakeven point.
- increasing-decreasing functions.

Self-explanatory

NOTE: Application involving differentiation, increasing and decreasing function to be covered.

9. Linear Regression

- Lines of regression of x on y and y on x.
- Lines of best fit.
- Regression coefficient of x on y and y on x.
- $b_{xy} \times b_{yx} = r^2$, $0 \leq b_{xy} \times b_{yx} \leq 1$
- Identification of regression equations
- Estimation of the value of one variable using the value of other variable from appropriate line of regression.

Self-explanatory

10. Linear Programming

Introduction, related terminology such as constraints, objective function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions(bounded and unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Introduction, definition of related terminology such as constraints, objective function, optimization, advantages of linear programming; limitations of linear programming; application areas of linear programming; different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimum feasible solution.

PAPER II – PROJECT WORK – 20 Marks

Candidates will be expected to have completed **two** projects, one from Section A and one from **either** Section B **or** Section C.

The project work will be assessed by the subject teacher and a Visiting Examiner appointed locally and approved by the Council.

Mark allocation for **each** Project [10 marks]:

Overall format	1 mark
Content	4 marks
Findings	2 marks
Viva-voce based on the Project	3 marks
Total	10 marks

Topics for Project Work:

Section A

1. Explore the principal value of the function $\sin^{-1} x$ (or any other inverse trigonometric function) using a unit circle.
2. Explain the concepts of increasing and decreasing functions, using geometrical significance of dy/dx . Illustrate with proper examples.
3. Explain the conditional probability, the theorem of total probability and the concept of Bayes' theorem with suitable examples.

Section B

4. Using vector algebra, find the area of a parallelogram/triangle. Also, derive the area analytically and verify the same.
5. Find the image of a line with respect to a given plane.
6. Find the area bounded by a parabola and an oblique line.

(Any other pair of curves which are specified in the syllabus may also be taken.)

Section C

7. Draw a rough sketch of Cost (C), Average Cost (AC) and Marginal Cost (MC)

Or

Revenue (R), Average Revenue (AR) and Marginal Revenue (MR).

8. For a given data, find regression equations by the method of least squares.
9. Using any suitable data, find the Optimum cost by formulating a linear programming problem (LPP).

NOTE: No question paper for Project Work will be set by the Council.

SAMPLE TABLE FOR PROJECT WORK

S. No.	Unique Identification Number (Unique ID) of the candidate	<u>PROJECT 1</u>					<u>PROJECT 2</u>					TOTAL MARKS
		A	B	C	D	E	F	G	H	I	J	
		Teacher	Visiting Examiner	Average Marks (A + B ÷ 2)	Viva-Voce by Visiting Examiner	Total Marks (C + D)	Teacher	Visiting Examiner	Average Marks (F + G ÷ 2)	Viva-Voce by Visiting Examiner	Total Marks (H + I)	(E + J)
		7 Marks*	7 Marks*	7 Marks	3 Marks	10 Marks	7 Marks*	7 Marks*	7 Marks	3 Marks	10 Marks	20 Marks
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

*Breakup of 7 Marks to be awarded separately by the Teacher and the Visiting Examiner is as follows:		Name of Teacher: Signature: Date
Overall Format	1 Mark	
Content	4 Marks	Name of Visiting Examiner Signature: Date
Findings	2 Marks	

NOTE: VIVA-VOCE (3 Marks) for each Project is to be conducted only by the Visiting Examiner, and should be based on the Project only

PHYSICS (861)

CLASS XII

There will be two papers in the subject:

Paper I: Theory - 3 hours ... 70 marks

Paper II: Practical - 3 hours ... 15 marks

Project Work ... 10 marks

Practical File ... 5 marks

PAPER I- THEORY: 70 Marks

There will be no overall choice in the paper. Candidates will be required to answer **all** questions. Internal choice will be available in two questions of 2 marks each, two questions of 3 marks each and all the three questions of 5 marks each.

S. NO.	UNIT	TOTAL WEIGHTAGE
1.	Electrostatics	14 Marks
2.	Current Electricity	
3.	Magnetic Effects of Current and Magnetism	16 Marks
4.	Electromagnetic Induction and Alternating Currents	
5.	Electromagnetic Waves	
6.	Optics	20 Marks
7.	Dual Nature of Radiation and Matter	13 Marks
8.	Atoms and Nuclei	
9.	Electronic Devices	7 Marks
TOTAL		70 Marks

PAPER I -THEORY- 70 Marks

Note: (i) Unless otherwise specified, only S. I. Units are to be used while teaching and learning, as well as for answering questions.

(ii) All physical quantities to be defined as and when they are introduced along with their units and dimensions.

(iii) Numerical problems are included from all topics except where they are specifically excluded or where only qualitative treatment is required.

1. Electrostatics

(i) Electric Charges and Fields

Electric charges; conservation and quantisation of charge, Coulomb's law; superposition principle and continuous charge distribution.

Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in uniform electric field.

Electric flux, Gauss's theorem in Electrostatics and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet.

Coulomb's law, S.I. unit of charge; permittivity of free space and of dielectric medium. Frictional electricity, electric charges (two types); repulsion and attraction; simple atomic structure - electrons and ions; conductors and insulators; quantization and conservation of electric charge; Coulomb's law in vector form; (position coordinates r_1 , r_2 not necessary). Comparison with Newton's law of gravitation; Superposition principle ($\vec{F}_1 = \vec{F}_{12} + \vec{F}_{13} + \vec{F}_{14} + \dots$).

(a) Concept of electric field and its intensity; examples of different fields; gravitational, electric and magnetic; Electric field due to a point charge $\vec{E} = \vec{F} / q_0$ (q_0 is a test charge); \vec{E} for a group of charges (superposition principle); a point charge q in an

electric field \vec{E} experiences an electric force $\vec{F}_E = q\vec{E}$. Intensity due to a continuous distribution of charge i.e. linear, surface and volume.

(b) Electric lines of force: A convenient way to visualize the electric field; properties of lines of force; examples of the lines of force due to (i) an isolated point charge (+ve and - ve); (ii) dipole, (iii) two similar charges at a small distance; (iv) uniform field between two oppositely charged parallel plates.

(c) Electric dipole and dipole moment; derivation of the \vec{E} at a point, (1) on the axis (end on position) (2) on the perpendicular bisector (equatorial i.e. broad side on position) of a dipole, also for $r \gg 2l$ (short dipole); dipole in a uniform electric field; net force zero, torque on an electric dipole: $\vec{\tau} = \vec{p} \times \vec{E}$ and its derivation.

(d) Gauss' theorem: the flux of a vector field; $Q = vA$ for velocity vector \vec{v} $\parallel \vec{A}$, \vec{A} is area vector. Similarly, for electric field \vec{E} , electric flux $\phi_E = EA$ for $\vec{E} \parallel \vec{A}$ and $\phi_E = \vec{E} \cdot \vec{A}$ for uniform \vec{E} . For non-uniform field $\phi_E = \int d\phi = \int \vec{E} \cdot d\vec{A}$. Special cases for $\theta = 0^\circ, 90^\circ$ and 180° . Gauss' theorem, statement: $\phi_E = q/\epsilon_0$ or $\phi_E = \oint \vec{E} \cdot d\vec{A} = q/\epsilon_0$ where ϕ_E is for a closed surface; q is the net charge enclosed, ϵ_0 is the permittivity of free space. Essential properties of a Gaussian surface.

Applications: Obtain expression for \vec{E} due to 1. an infinite line of charge, 2. a uniformly charged infinite plane thin sheet.

(ii) Electrostatic Potential, Potential Energy and Capacitance.

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges;

equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel. Capacitance of a parallel plate capacitor, energy stored in a capacitor.

(a) Concept of potential, potential difference and potential energy. Equipotential surface and its properties. Obtain an expression for electric potential at a point due to a point charge; graphical variation of E and V vs r , $V_P = W/q_0$; hence $V_A - V_B = W_{BA}/q_0$ (taking q_0 from B to A) = $(q/4\pi\epsilon_0)(1/r_A - 1/r_B)$; derive this equation; also $V_A = q/4\pi\epsilon_0 \cdot 1/r_A$; for $q > 0$, $V_A > 0$ and for $q < 0$, $V_A < 0$. For a collection of charges V = algebraic sum of the potentials due to each charge; potential due to a dipole on its axial line and equatorial line; also at any point for $r \gg 2l$ (short dipole). Potential energy of a point charge (q) in an electric field \vec{E} , placed at a point P where potential is V , is given by $U = qV$ and $\Delta U = q(V_A - V_B)$. The electrostatic potential energy of a system of two charges = work done $W_{21} = W_{12}$ in assembling the system; U_{12} or $U_{21} = (1/4\pi\epsilon_0) q_1 q_2 / r_{12}$. For a system of 3 charges $U_{123} = U_{12} + U_{13} + U_{23} = \frac{1}{4\pi\epsilon_0} \left(\frac{q_1 q_2}{r_{12}} + \frac{q_1 q_3}{r_{13}} + \frac{q_2 q_3}{r_{23}} \right)$. For a dipole in a uniform electric field, derive an expression of the electric potential energy $U_E = -\vec{p} \cdot \vec{E}$, special cases for $\phi = 0^\circ, 90^\circ$ and 180° .

(b) Capacitance of a conductor $C = Q/V$; obtain the capacitance of a parallel-plate capacitor ($C = \epsilon_0 A/d$) and equivalent capacitance for capacitors in series and parallel combinations. Obtain an expression for energy stored

$$(U = \frac{1}{2} CV^2 = \frac{1}{2} QV = \frac{1}{2} \frac{Q^2}{C}) \text{ and energy density.}$$

(c) Dielectric constant $K = C'/C$; this is also called relative permittivity $K = \epsilon_r = \epsilon/\epsilon_0$; elementary ideas of polarization of matter in a uniform electric field qualitative discussion; induced surface charges weaken the original field; results in reduction in \vec{E} and hence, in pd , (V); for charge remaining the same $Q = CV = C' V' = K \cdot CV$; $V' = V/K$; and $E' = E/K$; if the Capacitor is kept connected with the source of emf, V is kept constant $V = Q/C = Q'/C'$; $Q' = C'V = K \cdot Q$ increases; For a parallel plate capacitor with a dielectric in between, $C' = KC = K \cdot \epsilon_0 \cdot A/d = \epsilon_r \cdot \epsilon_0 \cdot A/d$. Then $C' = \frac{\epsilon_0 A}{(d/\epsilon_r)}$; for a capacitor partially filled dielectric, capacitance, $C' = \epsilon_0 A/(d-t + t/\epsilon_r)$.

2. Current Electricity

Mechanism of flow of current in conductors. Mobility, drift velocity and its relation with electric current; Ohm's law and its proof, resistance and resistivity and their relation to drift velocity of electrons; V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity; temperature dependence of resistance and resistivity.

Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's laws and simple applications, Wheatstone bridge, metre bridge. Potentiometer - principle and its applications to measure potential difference, to compare emf of two cells; to measure internal resistance of a cell.

(a) Free electron theory of conduction; acceleration of free electrons, relaxation time τ ; electric current $I = Q/t$; concept of drift velocity and electron mobility. Ohm's

law, current density $J = I/A$; experimental verification, graphs and slope, ohmic and non-ohmic conductors; obtain the relation $I = v_d e n A$. Derive $\sigma = ne^2 \tau / m$ and $\rho = m / ne^2 \tau$; effect of temperature on resistivity and resistance of conductors and semiconductors and graphs. Resistance $R = V/I$; resistivity ρ , given by $R = \rho l / A$; conductivity and conductance; Ohm's law as $\vec{J} = \sigma \vec{E}$.

- (b) Electrical energy consumed in time t is $E = Pt = VIt$; using Ohm's law $E = \left(\frac{V^2}{R} \right) t = I^2 R t$. Potential difference $V = P / I$; $P = V I$; Electric power consumed $P = VI = V^2 / R = I^2 R$; commercial units; electricity consumption and billing.
- (c) The source of energy of a seat of emf (such as a cell) may be electrical, mechanical, thermal or radiant energy. The emf of a source is defined as the work done per unit charge to force them to go to the higher point of potential (from -ve terminal to +ve terminal inside the cell) so, $\varepsilon = dW / dq$; but $dq = Idt$; $dW = \varepsilon dq = \varepsilon Idt$. Equating total work done to the work done across the external resistor R plus the work done across the internal resistance r ; $\varepsilon Idt = I^2 R dt + I^2 r dt$; $\varepsilon = I (R + r)$; $I = \varepsilon / (R + r)$; also $IR + Ir = \varepsilon$ or $V = \varepsilon - Ir$ where Ir is called the back emf as it acts against the emf ε ; V is the terminal pd. Derivation of formulae for combination for identical cells in series, parallel and mixed grouping. Parallel combination of two cells of unequal emf. Series combination of n cells of unequal emf.
- (d) Statement and explanation of Kirchhoff's laws with simple examples. The first is a conservation law for charge and the 2nd is law of conservation of energy. Note change in potential across a resistor $\Delta V = IR < 0$ when we go 'down' with the current (compare with flow of water down a river), and $\Delta V = IR > 0$ if we go up against the current across the resistor. When we go through a cell, the -ve terminal is at a lower level and the +ve terminal at a higher level, so going from -ve to +ve through the cell, we are going up and

$\Delta V = +\varepsilon$ and going from +ve to -ve terminal through the cell, we are going down, so $\Delta V = -\varepsilon$. Application to simple circuits. Wheatstone bridge; right in the beginning take $I_g = 0$ as we consider a balanced bridge, derivation of $R_1/R_2 = R_3/R_4$ [Kirchhoff's law not necessary]. Metre bridge is a modified form of Wheatstone bridge, its use to measure unknown resistance. Here $R_3 = l_1 \rho$ and $R_4 = l_2 \rho$; $R_3/R_4 = l_1/l_2$. Principle of Potentiometer: fall in potential $\Delta V \propto \Delta l$; auxiliary emf ε_1 is balanced against the fall in potential V_1 across length l_1 . $\varepsilon_1 = V_1 = Kl_1$; $\varepsilon_1/\varepsilon_2 = l_1/l_2$; potentiometer as a voltmeter. Potential gradient and sensitivity of potentiometer. Use of potentiometer: to compare emfs of two cells, to determine internal resistance of a cell.

3. Magnetic Effects of Current and Magnetism

(i) Moving charges and magnetism

Concept of magnetic field, Oersted's experiment. Biot - Savart law and its application. Ampere's Circuital law and its applications to infinitely long straight wire, straight and toroidal solenoids (only qualitative treatment). Force on a moving charge in uniform magnetic and electric fields, Force on a current-carrying conductor in a uniform magnetic field, force between two parallel current-carrying conductors-definition of ampere, torque experienced by a current loop in uniform magnetic field; moving coil galvanometer - its sensitivity. Conversion of galvanometer into an ammeter and a voltmeter.

(ii) Magnetism and Matter:

A current loop as a magnetic dipole, its magnetic dipole moment, magnetic dipole moment of a revolving electron, bar magnet as an equivalent solenoid, magnetic field lines.

- (a) Only historical introduction through Oersted's experiment. [Ampere's swimming rule not included]. Biot-Savart law and its vector form; application; derive the expression for B (i) at the centre of a circular loop carrying current; (ii) at any point on

its axis. Current carrying loop as a magnetic dipole. Ampere's Circuital law: statement and brief explanation. Apply it to obtain \vec{B} near a long wire carrying current and for a solenoid (straight as well as toroidal). Only formula of \vec{B} due to a finitely long conductor.

- (b) Force on a moving charged particle in magnetic field $\vec{F}_B = q(\vec{v} \times \vec{B})$; special cases, modify this equation substituting $d\vec{l}/dt$ for \vec{v} and I for q/dt to yield $\vec{F} = I d\vec{l} \times \vec{B}$ for the force acting on a current carrying conductor placed in a magnetic field. Derive the expression for force between two long and parallel wires carrying current, hence, define ampere (the base SI unit of current) and hence, coulomb; from $Q = It$. Lorentz force.
- (c) Derive the expression for torque on a current carrying loop placed in a uniform \vec{B} , using $\vec{F} = I \vec{l} \times \vec{B}$ and $\vec{\tau} = \vec{r} \times \vec{F}$; $\tau = NIAB \sin \phi$ for N turns $\vec{\tau} = \vec{m} \times \vec{B}$, where the dipole moment $\vec{m} = NI\vec{A}$, unit: $A.m^2$. A current carrying loop is a magnetic dipole; directions of current and \vec{B} and \vec{m} using right hand rule only; no other rule necessary. Mention orbital magnetic moment of an electron in Bohr model of H atom. Concept of radial magnetic field. Moving coil galvanometer; construction, principle, working, theory $I = k\phi$, current and voltage sensitivity. Shunt. Conversion of galvanometer into ammeter and voltmeter of given range.
- (d) Magnetic field represented by the symbol \vec{B} is now defined by the equation $\vec{F} = q_0(\vec{v} \times \vec{B})$; \vec{B} is not to be defined in terms of force acting on a unit pole, etc.; note the distinction of \vec{B} from \vec{E} is that \vec{B} forms closed loops as there are no magnetic

monopoles, whereas \vec{E} lines start from +ve charge and end on -ve charge. Magnetic flux $\phi = \vec{B} \cdot \vec{A} = BA$ for B uniform and $\vec{B} \parallel \vec{A}$; i.e. area held perpendicular to \vec{B} . For $\vec{B} \perp \vec{A}$, $\phi = BA \cos 90^\circ = 0$. $B = \phi/A$ is the flux density [SI unit of flux is weber (Wb)]; but note that this is not correct as a defining equation as \vec{B} is vector and ϕ and ϕ/A are scalars, unit of B is tesla (T) equal to 10^{-4} gauss. For non-uniform \vec{B} field, $\phi = \int d\phi = \int \vec{B} \cdot d\vec{A}$.

4. Electromagnetic Induction and Alternating Currents

(i) Electromagnetic Induction

Faraday's laws, induced emf and current; Lenz's Law, eddy currents. Self-induction and mutual induction. Transformer.

(ii) Alternating Current

Peak value, mean value and RMS value of alternating current/voltage; their relation in sinusoidal case; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; AC generator.

(a) Electromagnetic induction, Magnetic flux, change in flux, rate of change of flux and induced emf, Faraday's laws. Lenz's law, conservation of energy; motional emf $\varepsilon = Blv$, and power $P = (Blv)^2/R$; eddy currents (qualitative);

(b) Self-Induction, coefficient of self-inductance, $\phi = LI$ and $L = \varepsilon / dI/dt$;

henry = volt. Second/ampere, expression for coefficient of self-inductance of a solenoid

$$L = \frac{\mu_0 N^2 A}{l} = \mu_0 n^2 A \times l.$$

Mutual induction and mutual inductance (M), flux linked $\phi_2 = MI_1$;

$$\text{induced emf } \varepsilon_2 = \frac{d\phi_2}{dt} = M \frac{dI_1}{dt}.$$

Definition of M as

$$M = \frac{\epsilon_2}{\frac{dI_1}{dt}} \text{ or } M = \frac{\phi_2}{I_1} \cdot \text{SI unit}$$

henry. Expression for coefficient of mutual inductance of two coaxial solenoids.

$$M = \frac{\mu_0 N_1 N_2 A}{l} = \mu_0 n_1 N_2 A \quad \text{Induced}$$

emf opposes changes, back emf is set up, eddy currents.

Transformer (ideal coupling): principle, working and uses; step up and step down; efficiency and applications including transmission of power, energy losses and their minimisation.

- (c) Sinusoidal variation of V and I with time, for the output from an ac generator; time period, frequency and phase changes; obtain mean values of current and voltage, obtain relation between RMS value of V and I with peak values in sinusoidal cases only.
- (d) Variation of voltage and current in a.c. circuits consisting of only a resistor, only an inductor and only a capacitor (phasor representation), phase lag and phase lead. May apply Kirchhoff's law and obtain simple differential equation (SHM type), $V = V_0 \sin \omega t$, solution $I = I_0 \sin \omega t$, $I_0 \sin (\omega t + \pi/2)$ and $I_0 \sin (\omega t - \pi/2)$ for pure R , C and L circuits respectively. Draw phase (or phasor) diagrams showing voltage and current and phase lag or lead, also showing resistance R , inductive reactance X_L ; ($X_L = \omega L$) and capacitive reactance X_C , ($X_C = 1/\omega C$). Graph of X_L and X_C vs f .
- (e) The LCR series circuit: Use phasor diagram method to obtain expression for I and V , the pd across R , L and C ; and the net phase lag/lead; use the results of 4(e), V lags I by $\pi/2$ in a capacitor, V leads I by $\pi/2$ in an inductor, V and I are in phase in a resistor, I is the same in all three; hence draw phase diagram, combine V_L and V_C (in opposite phase; phasors add like vectors)

to give $V = V_R + V_L + V_C$ (phasor addition) and the max. values are related by $V_m^2 = V_{Rm}^2 + (V_{Lm} - V_{Cm})^2$ when $V_L > V_C$ Substituting $pd = \text{current} \times \text{resistance or reactance}$, we get $Z^2 = R^2 + (X_L - X_C)^2$ and $\tan \phi = (V_{Lm} - V_{Cm})/V_{Rm} = (X_L - X_C)/R$ giving $I = I_m \sin (wt - \phi)$ where $I_m = V_m/Z$ etc. Special cases for RL and RC circuits. [May use Kirchhoff's law and obtain the differential equation] Graph of Z vs f and I vs f .

- (f) Power P associated with LCR circuit = $\frac{1}{2} V_0 I_0 \cos \phi = V_{rms} I_{rms} \cos \phi = I_{rms}^2 R$; power absorbed and power dissipated; electrical resonance; bandwidth of signals and Q factor (no derivation); oscillations in an LC circuit ($\omega_0 = 1/\sqrt{LC}$). Average power consumed averaged over a full cycle $\bar{P} = (1/2) V_0 I_0 \cos \phi$, LC circuit; at resonance with $X_L = X_C$, $Z = Z_{min} = R$, power delivered to circuit by the source is maximum, resonant frequency
- $$f_0 = \frac{1}{2\pi\sqrt{LC}}.$$
- (g) Simple a.c. generators: Principle, description, theory, working and use. Variation in current and voltage with time for a.c. and d.c. Basic differences between a.c. and d.c.

5. Electromagnetic Waves

Electromagnetic waves, their characteristics, their transverse nature (qualitative ideas only). Complete electromagnetic spectrum starting from radio waves to gamma rays: elementary facts of electromagnetic waves and their uses.

Qualitative descriptions only of electromagnetic spectrum; common features of all regions of em spectrum including transverse nature (\vec{E} and \vec{B} perpendicular to c); special features of the common classification (gamma rays, X rays, UV rays, visible light, IR, microwaves, radio and TV waves) in their production (source), detection and other properties; uses; approximate range of λ or f or at least proper order of increasing f or λ .

6. Optics

(i) Ray Optics and Optical Instruments

Ray Optics: Refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, magnification, power of a lens, combination of thin lenses in contact, combination of a lens and a mirror, refraction and dispersion of light through a prism.

Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

- (a) *Refraction through a prism, minimum deviation and derivation of relation between n , A and δ_{\min} . Include explanation of i - δ graph, $i_1 = i_2 = i$ (say) for δ_m ; from symmetry $r_1 = r_2$; refracted ray inside the prism is parallel to the base of the equilateral prism. Thin prism. Dispersion; Angular dispersion; dispersive power, rainbow - ray diagram (no derivation).*
- (b) *Refraction at a single spherical surface; detailed discussion of one case only - convex towards rarer medium, for spherical surface and real image. Derive the relation between n_1 , n_2 , u , v and R . Refraction through thin lenses: derive lens maker's formula and lens formula; derivation of combined focal length of two thin lenses in contact. Combination of lenses and mirrors (silvering of lens excluded) and magnification for lens, derivation for biconvex lens only; extend the results to biconcave lens, Plano convex lens and lens immersed in a liquid; power of a lens $P=1/f$ with SI unit dioptre. For lenses in contact $1/F = 1/f_1 + 1/f_2$ and $P=P_1+P_2$. Lens formula, formation of image with combination of thin lenses and mirrors.*

[Any one sign convention may be used in solving numerical].

- (c) *Ray diagram and derivation of magnifying power of a simple microscope with image at D (least distance of distinct vision) and infinity; Ray diagram and derivation of magnifying power of a compound*

microscope with image at D . Only expression for magnifying power of compound microscope for final image at infinity.

Ray diagrams of refracting telescope with image at infinity as well as at D ; simple explanation; derivation of magnifying power; Ray diagram of reflecting telescope with image at infinity. Advantages, disadvantages and uses.

(ii) Wave Optics

Wave front and Huygen's principle. Proof of laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width(β), coherent sources and sustained interference of light, Fraunhofer diffraction due to a single slit, width of central maximum.

- (a) *Huygen's principle: wavefronts - different types/shapes of wavefronts; proof of laws of reflection and refraction using Huygen's theory. [Refraction through a prism and lens on the basis of Huygen's theory not required].*
- (b) *Interference of light, interference of monochromatic light by double slit. Phase of wave motion; superposition of identical waves at a point, path difference and phase difference; coherent and incoherent sources; interference: constructive and destructive, conditions for sustained interference of light waves [mathematical deduction of interference from the equations of two progressive waves with a phase difference is not required]. Young's double slit experiment: set up, diagram, geometrical deduction of path difference $\Delta x = d \sin \theta$, between waves from the two slits; using $\Delta x = n\lambda$ for bright fringe and $\Delta x = (n+1/2)\lambda$ for dark fringe and $\sin \theta = \tan \theta = y_n/D$ as y and θ are small, obtain $y_n = (D/d)n\lambda$ and fringe width $\beta = (D/d)\lambda$. Graph of distribution of intensity with angular distance.*

- (c) *Single slit Fraunhofer diffraction (elementary explanation only). Diffraction at a single slit: experimental setup, diagram, diffraction pattern, obtain expression for position of minima, $a \sin \theta_n = n\lambda$, where $n = 1, 2, 3, \dots$ and conditions for secondary maxima, $a \sin \theta_n = (n + 1/2)\lambda$; distribution of intensity with angular distance; angular width of central bright fringe.*

7. Dual Nature of Radiation and Matter

Wave particle duality; photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation - particle nature of light. Matter waves - wave nature of particles, de-Broglie relation.

Photo electric effect, quantization of radiation; Einstein's equation $E_{\max} = h\nu - W_0$; threshold frequency; work function; experimental facts of Hertz and Lenard and their conclusions; Einstein used Planck's ideas and extended it to apply for radiation (light); photoelectric effect can be explained only assuming quantum (particle) nature of radiation. Determination of Planck's constant (from the graph of stopping potential V_s versus frequency f of the incident light). Momentum of photon $p = E/c = h\nu/c = h/\lambda$.

De Broglie hypothesis, phenomenon of electron diffraction (qualitative only). Wave nature of radiation is exhibited in interference, diffraction and polarisation; particle nature is exhibited in photoelectric effect. Dual nature of matter: particle nature common in that it possesses momentum p and kinetic energy KE . The wave nature of matter was proposed by Louis de Broglie, $\lambda = h/p = h/mv$.

8. Atoms and Nuclei

(i) Atoms

Alpha-particle scattering experiment; Rutherford's atomic model; Bohr's atomic model, energy levels, hydrogen spectrum.

Rutherford's nuclear model of atom (mathematical theory of scattering excluded), based on Geiger - Marsden experiment on α -scattering; nuclear radius

r in terms of closest approach of α particle to the nucleus, obtained by equating $\Delta K = 1/2 mv^2$ of the α particle to the change in electrostatic potential energy ΔU of the system $[U = \frac{2e \times Ze}{4\pi\epsilon_0 r_0} \quad r_0 \sim 10^{-15} \text{m} = 1 \text{ fermi};$

atomic structure; only general qualitative ideas, including atomic number Z , Neutron number N and mass number A . A brief account of historical background leading to Bohr's theory of hydrogen spectrum; formulae for wavelength in Lyman, Balmer, Paschen, Brackett and Pfund series. Rydberg constant. Bohr's model of H atom, postulates ($Z=1$); expressions for orbital velocity, kinetic energy, potential energy, radius of orbit and total energy of electron. Energy level diagram, calculation of ΔE , frequency and wavelength of different lines of emission spectra; agreement with experimentally observed values. [Use nm and not Å for unit of λ].

(ii) Nuclei

Composition and size of nucleus, Mass-energy relation, mass defect; Nuclear reactions, nuclear fission and nuclear fusion.

(a) *Atomic masses and nuclear density; Isotopes, Isobars and Isotones – definitions with examples of each. Unified atomic mass unit, symbol u , $1u = 1/12$ of the mass of ^{12}C atom $= 1.66 \times 10^{-27} \text{kg}$). Composition of nucleus; mass defect and binding energy, $BE = (\Delta m) c^2$. Graph of $BE/\text{nucleon}$ versus mass number A , special features - less $BE/\text{nucleon}$ for light as well as heavy elements. Middle order more stable [see fission and fusion] Einstein's equation $E = mc^2$. Calculations related to this equation; mass defect/binding energy, mutual annihilation, and pair production as examples.*

(b) *Nuclear reactions, examples of a few nuclear reactions with conservation of mass number and charge, concept of a neutrino.*

(c) Nuclear Energy

Theoretical (qualitative) prediction of exothermic (with release of energy) nuclear reaction, in fusing together two

light nuclei to form a heavier nucleus and in splitting heavy nucleus to form middle order (lower mass number) nuclei. Also calculate the disintegration energy Q for a heavy nucleus ($A=240$) with $BE/A \sim 7.6$ MeV per nucleon split into two equal halves with $A=120$ each and $BE/A \sim 8.5$ MeV/nucleon; $Q \sim 200$ MeV. Nuclear fission: Any one equation of fission reaction. Chain reaction-controlled and uncontrolled; nuclear reactor and nuclear bomb. Main parts of a nuclear reactor including their functions - fuel elements, moderator, control rods, coolant, casing; criticality; utilization of energy output - all qualitative only. Fusion, simple example of $4\ ^1\text{H} \rightarrow\ ^4\text{He}$ and its nuclear reaction equation; requires very high temperature $\sim 10^6$ degrees; difficult to achieve; hydrogen bomb; thermonuclear energy production in the sun and stars. [Details of chain reaction not required].

9. Electronic Devices

- (i) Semiconductor Electronics: Materials, Devices and Simple Circuits. Energy bands in conductors, semiconductors and insulators (qualitative ideas only). Intrinsic and extrinsic semiconductors.
- (ii) Semiconductor diode: I-V characteristics in forward and reverse bias, diode as a rectifier; Special types of junction diodes: LED, photodiode, solar cell.

(a) *Energy bands in solids; energy band diagrams for distinction between conductors, insulators, and semiconductors - intrinsic and extrinsic; electrons and holes in semiconductors.*

Elementary ideas about electrical conduction in metals [crystal structure not included]. Energy levels (as for hydrogen atom), $1s$, $2s$, $2p$, $3s$, etc. of an isolated atom such as that of copper; these split, eventually forming 'bands' of energy levels, as we consider solid copper made up of a large number of isolated atoms,

brought together to form a lattice; definition of energy bands - groups of closely spaced energy levels separated by band gaps called forbidden bands. An idealized representation of the energy bands for a conductor, insulator and semiconductor; characteristics, differences; distinction between conductors, insulators and semiconductors on the basis of energy bands, with examples; qualitative discussion only; energy gaps (eV) in typical substances (carbon, Ge, Si); some electrical properties of semiconductors. Majority and minority charge carriers - electrons and holes; intrinsic and extrinsic, doping, p-type, n-type; donor and acceptor impurities.

- (b) *Junction diode and its symbol; depletion region and potential barrier; forward and reverse biasing, V-I characteristics and numerical; half wave and a full wave rectifier. Simple circuit diagrams and graphs, function of each component in the electric circuits, qualitative only. [Bridge rectifier of 4 diodes not included]; elementary ideas on solar cell, photodiode and light emitting diode (LED) as semi conducting diodes. Importance of LED's as they save energy without causing atmospheric pollution and global warming.*

PAPER II

PRACTICAL WORK- 15 Marks

The experiments for laboratory work and practical examinations are mostly from two groups:
 (i) experiments based on ray optics and
 (ii) experiments based on current electricity.

The main skill required in group (i) is to remove parallax between a needle and the real image of another needle.

In group (ii), understanding circuit diagram and making connections strictly following the given diagram is very important. Polarity of cells and meters, their range, zero error, least count, etc. should be taken care of.

A graph is a convenient and effective way of representing results of measurement. It is an important part of the experiment.

There will be one graph in the Practical question paper.

Candidates are advised to read the question paper carefully and do the work according to the instructions given in the question paper. Generally, they are not expected to write the procedure of the experiment, formulae, precautions, or draw the figures, circuit diagrams, etc.

Observations should be recorded in a tabular form.

Record of observations

- All observations recorded should be consistent with the least count of the instrument used (e.g. focal length of the lens is 10.0 cm or 15.1 cm but **10 cm is a wrong record.**)
- All observations should be recorded with correct units.

NOTE: The concepts of significant figures and error analysis must be reinforced during Practical Work.

Graph work

Students should learn to draw graphs correctly noting all important steps such as:

- Title
- Selection of origin (should be marked by two coordinates, example 0,0 or 5,0, or 0,10 or 30,5; **Kink is not accepted**).
- The axes should be labelled according to the question
- Uniform and convenient scale should be taken, and the units given along each axis (one small division = 0.33, 0.67, 0.66, etc. should not be taken)
- Maximum area of graph paper (**at least 60% of the graph paper along both the axes**) should be used.
- Points should be plotted with great care, marking the points plotted with (should be a circle with a dot) \odot or \otimes . A blob (\bullet) is a misplot.
- The best fit straight line should be drawn. The best fit line does not necessarily have to pass through all the plotted points and the origin.

While drawing the best fit line, **all experimental points must be kept on the line or symmetrically placed on the left and right side of the line.** The line should be continuous, thin, uniform and extended beyond the extreme plots.

- The intercepts must be read carefully. Y intercept i.e. y_0 is that value of y when $x = 0$. Similarly, X intercept i.e. x_0 is that value of x when $y=0$. **When x_0 and y_0 are to be read, origin should be at (0, 0).**

Deductions

- The slope 'S' of the best fit line must be found taking two distant points (**using more than 50% of the line drawn**), which are not the plotted points, using
$$S = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$$
 Slope S must be calculated upto proper decimal place or significant figures as specified in the question paper.
- All calculations should be rounded off upto proper decimal place or significant figures, as specified in the question papers.

NOTE:

Short answer type questions may be set from each experiment to test understanding of theory and logic of steps involved.

Given below is a list of required experiments. Teachers may add to this list, keeping in mind the general pattern of questions asked in the annual examinations.

Students are required to have completed all experiments from the given list (excluding demonstration experiments):

- To find focal length of a convex lens by using u-v method (no parallax method)
Using a convex lens, optical bench / metre scales and two pins, obtain the positions of the images for various positions of the object: $f < u < 2f$, $u \sim 2f$, and $u > 2f$.
Draw the following set of graphs using data from the experiments -
 - v against u. It will be a curve.

(ii) Magnification $\left(m = \frac{v}{u}\right)$ against v which is a straight line and to find focal length by intercept.

(iii) $y = (100/v)$ against $x = (100/u)$ which is a straight line and find f by intercepts.

2. To find f of a convex lens by displacement method.
3. Using a metre bridge, determine the resistance of about 100 cm of (constantan) wire. Measure its length and radius and hence, calculate the specific resistance of the material.
4. Verify Ohm's law for the given unknown resistance (a 60 cm constantan wire), plotting a graph of potential difference versus current. Also calculate the resistance per cm of the wire from the slope of the graph and the length of the wire.

Demonstration Experiments (*The following experiments may be demonstrated by the teacher*):

1. To convert a given galvanometer into (a) an ammeter of range, say 2A and (b) a voltmeter of range 4V.
2. To study I-V characteristics of a semiconductor diode in forward and reverse bias.
3. To study characteristics of a Zener diode and to determine its reverse breakdown voltage.
4. To determine refractive index of a glass slab using a traveling microscope.
5. To observe polarization of light using two polaroids.
6. Identification of diode, LED, transistor, IC, resistor, capacitor from mixed collection of such items.
7. Use of multimeter to (i) identify base of transistor, (ii) distinguish between npn and pnp type transistors, (iii) see the unidirectional flow of current in case of diode and an LED, (iv) check whether a given electronic component (e.g. diode, transistors, IC) is in working order.
8. Charging and discharging of a capacitor.

PROJECT WORK AND PRACTICAL FILE –

15 marks

Project Work – 10 marks

The Project work is to be assessed by a Visiting Examiner appointed locally and approved by the Council.

All candidates will be required to do **one** project involving some physics related topic/s under the guidance and regular supervision of the Physics teacher.

Candidates should undertake any **one** of the following types of projects:

- Theoretical project
- Working Model
- Investigatory project (by performing an experiment under supervision of a teacher)

Candidates are to prepare a technical report formally written including title, abstract, some theoretical discussion, experimental setup, observations with tables of data collected, graph/chart (if any), analysis and discussion of results, deductions, conclusion, etc. The teacher should approve the draft, before it is finalised. The report should be kept simple, but neat and elegant. No extra credit shall be given for typewritten material/decorative cover, etc. Teachers may assign or students may choose **any one** project of their choice.

Suggested Evaluation Criteria for Theory Based Projects:

▪ Title of the Project
▪ Introduction
▪ Contents
▪ Analysis/ material aid (graph, data, structure, pie charts, histograms, diagrams, etc.)
▪ Originality of work (the work should be the candidates' original work,)
▪ Conclusion/comments
The Project report should be of approximately 15-20 pages.

Suggested Evaluation Criteria for Model Based Projects:

▪ Title of the Project
▪ Model construction
▪ Concise Project report
The Project report should be approximately 5-10 pages

Suggested Evaluation Criteria for Investigative Projects:

▪ Title of the Project
▪ Theory/principle involved
▪ Experimental setup
▪ Observations calculations/deduction and graph work
▪ Result/ Conclusions
The Project report should be of approximately 5-10 pages

Practical File – 5 marks

The Visiting Examiner is required to assess the candidates on the basis of the Physics practical file maintained by them during the academic year.

- 1. The concepts of significant figures and error analysis must be reinforced during Practical Work.**
- 2. Topics especially some mathematical parts of differentiation and integration can be taken up as supplements as and when required, while teaching.**

CHEMISTRY (862)

CLASS XII

There will be two papers in the subject:

Paper I: Theory -	3 hours ... 70 marks	Paper II: Practical:	3 hours ... 15 marks
		Project Work	... 10 marks
		Practical File	... 5 marks

PAPER I (THEORY) - 70 Marks

There will be no overall choice in the paper. Candidates will be required to answer **all** questions. Internal choice will be available in two questions of 2 marks each, two questions of 3 marks each and all the three questions of 5 marks each.

S.No.	UNIT	TOTAL WEIGHTAGE
1.	Solid State	Physical Chemistry 25 Marks
2.	Solutions	
3.	Electrochemistry	
4.	Chemical Kinetics	
5.	Surface Chemistry	
6.	General Principles and Processes of Isolation of Elements	Inorganic Chemistry 20 Marks
7.	p -Block Elements	
8.	d -and f -Block Elements	
9.	Coordination Compounds	
10.	Haloalkanes and Haloarenes	Organic Chemistry 25 Marks
11.	Alcohols, Phenols and Ethers	
12.	Aldehydes, Ketones and Carboxylic Acids	
13.	Organic Compounds containing Nitrogen	
14.	Biomolecules	
15.	Polymers	
16.	Chemistry in Everyday Life	
TOTAL		70 Marks

PAPER I –THEORY – 70 Marks

1. Solid State

Solids: their classification based on different binding forces such as: ionic, covalent molecular; amorphous and crystalline solids (difference), metals. Type of unit cell in two dimensional and three dimensional lattices, number of atoms per unit cell (all types). Calculation of density of unit cell, packing in solids, packing efficiency, point defects, electrical and magnetic properties.

Band theory of metals. Conductors, semiconductors (n and p type) and insulators.

- (i) *Crystalline and amorphous solids.*
- (ii) *Definition of crystal lattice, unit cell; types of unit cell (scc, fcc, bcc); calculation of the number of atoms per unit cell; relationship between radius, edge length and nearest neighbour distance. Calculation of density of unit cell, formula of the compound – numericals based on it; packing in 3 – D, packing fraction in scc, fcc, bcc with derivation.*
- (iii) *Characteristics of crystalline solids; ionic (NaCl), metallic (Cu), atomic (diamond and graphite).*
- (iv) *Point defects: Stoichiometric, non-stoichiometric and impurity defects (F- centres).*
- (v) *Electrical properties: Conductors, semiconductors (n & p types) and insulators.*
- (vi) *Magnetic properties: diamagnetic, paramagnetic.*

2. Solutions

Study of concentration of solutions of solids in liquids, liquid in liquid, solubility of gases in liquids, Colligative properties - Raoult's law of relative lowering of vapour pressure elevation of boiling point, depression of freezing point, osmotic pressure. Use of colligative properties in determining molecular masses of solutes.

Normality, molality, molarity, mole fraction, as measures of concentration. Definition of the

above with examples. Simple problems based on the above.

- (i) *Solubility of gases in liquids – Henry's Law, simple numericals based on the above.*
- (ii) *Raoult's Law for volatile solutes and non-volatile solutes, ideal solution, non-ideal solution. Azeotropic mixtures – definition, types.*
- (iii) *Colligative properties – definition and examples, and its use in determination of molecular mass.*
 - (a) *Relative lowering of vapour pressure: Definition and mathematical expression of Raoult's Law. Determination of relative molecular mass by measurement of lowering of vapour pressure.*
 - (b) *Depression in freezing point: molal depression constant (cryoscopic constant) – definition and mathematical expression (derivation included).*
 - (c) *Elevation in boiling point method: molal elevation constant (ebullioscopic constant) definition and mathematical expression (derivation included).*
 - (d) *Osmotic pressure: definition and explanation. Natural and chemical semipermeable membranes, reverse osmosis, isotonic, hypotonic and hypertonic solutions. Comparison between diffusion and osmosis. Application of osmotic pressure in the determination of relative molecular mass.*

van't Hoff- Boyle's Law, van't Hoff – Charles' Law, van't Hoff - Avogadro's law.

Numerical problems based on all the above methods. Experimental details not required.

3. Electrochemistry

Electrolytic and electrochemical cells. Redox reactions in electrochemical cells. Electromotive Force (emf) of a cell, standard electrode potential, Nernst equation and its application to chemical cells. Relation between Gibbs energy change and emf of a cell.

Conductance in electrolytic solutions, specific, equivalent and molar conductivity, variations of conductivity with concentration. Kohlrausch's Law of electrolysis and Faraday's Laws of electrolysis.

- (i) *Electrochemical cells: introduction, redox reactions (principle of oxidation and reduction in a cell).*
- (ii) *Galvanic cells - introduction; representation, principle – oxidation reduction. Mechanism of production of electric current in a galvanic cell.*
- (iii) *Measurement of potential. Single electrode potentials.*
Standard hydrogen electrode - definition, preparation, application and limitations.
Standard electrode potential (E°) - Measurement of standard electrode potential of Zn^{++}/Zn , Cu^{++}/Cu , half cell (using standard hydrogen electrode).
Cell notation – representation.
Factors affecting electrode potential with explanation - main emphasis on the temperature, concentration and nature of the electrode.
- (iv) *Electrochemical series. Its explanation on the basis of standard reduction potential.*
Prediction of the feasibility of a reaction.
- (v) *Nernst equation and correlation with the free energy of the reaction with suitable examples.*
Prediction of spontaneity of a reaction based on the cell emf.
Numericals on standard electrode potential of half-cells, cell emf, relationship between free energy and equilibrium constant, standard electrode potential and free energy.
- (vi) *Comparison of metallic conductance and electrolytic conductance. Relationship between conductance and resistance. Specific resistance and specific conductance.*
Cell constant: Calculation of cell constant. Meaning of equivalent conductance. Meaning of molar conductance. General relationship between specific conductance, molar conductance and equivalent conductance.

Units, numericals.

Molar conductance of a weak electrolyte at a given concentration and at infinite dilution. Kohlrausch's Law – definition, applications and numericals.

- (vii) *Faraday's laws of Electrolysis.*

Faraday's First Law of electrolysis. Statement, mathematical form. Simple problems.

Faraday's Second Law of electrolysis: Statement, mathematical form. Simple problems.

Relation between Faraday, Avogadro's number and charge on an electron. $F = N_{\text{Ae}}$ should be given (no details of Millikan's experiment are required).

4. Chemical Kinetics

Meaning of Chemical Kinetics – slow and fast reactions. Rate of a reaction - average and instantaneous rate (graphical representation). Factors affecting rate of reaction: surface area, nature of reactants, concentration, temperature, catalyst and radiation. Order and molecularity of a reaction, rate law and specific rate constant. Integrated rate equations and half-life (only for first order reactions). Concept of threshold and activation energy, Arrhenius equation.

- (i) *Meaning of chemical kinetics, Scope and importance of Kinetics of the reaction, slow and fast reactions – explanation in terms of bonds.*
- (ii) *Rate of Reaction: definition, representation of rate of reaction in terms of reactants and products, determination of rate of reactions graphically, instantaneous and average rate of reaction. Factors affecting rate of reaction.*
- (iii) *Law of mass Action: statement and meaning of active mass. Explanation with an example – general reactions.*
- (iv) *Effect of concentration of reactants on the rate of a reaction: Qualitative treatment, based on the law of mass Action, statement of rate law, General rate equation – $\text{Rate} = k(\text{concentration of the reactant})^n$, where k is rate constant and n is the order of the reaction, relationship between the rate of*

the reaction with rate constant with respect to various reactants.

- (v) *Order of a reaction: meaning, relation between order and stoichiometric coefficients in balanced equations, order as an experimental quantity, rate equation, mathematical derivation of rate equation for first order reaction, characteristics of first order reaction – rate constant is independent of the initial concentration, units to be derived, definition of half-life period, derivation of expression of half-life period from first order rate equation.*

Problems based on first order rate equation and half-life period.

- (vi) *Molecularity of the reaction: Meaning – physical picture, Relation between order, molecularity and the rate of a reaction, Differences between order and molecularity of a reaction.*
- (vii) *The concept of energy: Exothermic and endothermic reactions, concept of energy barrier, threshold and activation energy, formation of activated complex, effect of catalyst on activation energy and reaction rate.*
- (viii) *Effect of temperature on the rate constant of a reaction: Arrhenius equation – $K = Ae^{-\frac{E_a}{RT}}$, Meaning of the symbols of Arrhenius equation, related graph, evaluation of E_a and A from the graph, meaning of slope of the graph, conversion from exponential to log form of the equation, relationship between the increase in temperature and the number of collisions. Numerical based on Arrhenius equation.*

5. Surface Chemistry

Absorption and Adsorption - physisorption and chemisorption, factors affecting adsorption of gases on solids and liquids. Catalysis; homogenous and heterogenous, activity and selectivity.

Colloidal state distinction between true solutions, colloids and suspension; lyophilic, lyophobic multi-molecular, macromolecular and associated colloids; properties of colloids; Brownian movement, Tyndall effect, coagulation and electrophoresis. Emulsion - types of emulsions.

- (i) *Difference between absorption and adsorption: definition of physisorption and chemisorption and their differences.*

Factors affecting adsorption of gases on solids.

- (ii) *Catalysis: definition, types of catalysts – positive and negative, homogeneous and heterogeneous catalyst based on the state of the reactant and the catalyst, Elementary treatment of intermediate compound formation theory with examples; adsorption Theory, effect of catalyst on the rate of reaction – the change in the energy of activation in the activation energy curve. Characteristics of a catalyst; specificity, activity, surface area of a catalyst. Promoter and poison.*

- (iii) *Colloidal State: Thomas Graham classified the substances as crystalloid and colloid, classification of substances on the basis of the particle size i.e. true solution, sol and suspension, colloidal system is heterogeneous. lyophilic and lyophobic colloid; classification of colloidal solutions as micro, macro and associated colloids.*

Properties of colloidal solutions: Brownian movement, Tyndall effect, coagulation, electrophoresis (movement of dispersed phase), Protection of colloids, Hardy-Schulze rule. Emulsions, surfactants, micelles (only definition and examples).

Application of colloids and emulsions in daily life.

6. General Principles and Processes of Isolation of Elements

Metals: metallurgy, ores, principles and methods of extraction - concentration, oxidation, reduction, electrolytic refining. Occurrence and principles of extraction of copper, zinc, iron and silver.

Definition of minerals, ores and metallurgy; principle ores of iron, copper, zinc and silver.

Methods of concentration of ores: hydraulic washing, magnetic separation, froth floatation method, leaching.

Extraction of metal from concentrated ore – calcination, roasting and thermal reduction.

Metallurgy of iron, copper, zinc and silver.

Refining of metals - distillation, liquation, electrolysis.

7. p-Block Elements

Group-15 Elements

Position in the periodic table, occurrence, electronic configuration, oxidation states, trends in physical and chemical properties. Nitrogen: preparation properties and its uses; compounds of nitrogen: nitric acid – preparation and properties. Phosphorus - compounds of phosphorus: preparation and properties of phosphine.

- (i) *General introduction, electronic configuration, occurrence, oxidation states. Trends in physical properties; chemical properties with hydrogen, oxygen and halogens.*
- (ii) *Nitrogen - Laboratory preparation, decomposition (ammonium dichromate). Properties and uses.*
- (iii) *Nitric Acid - Preparation and manufacture. Properties: reaction with copper (dilute and concentrated HNO_3), carbon and sulphur. Uses.*
- (iv) *Phosphine – preparation from phosphorus and properties: reaction with halo acids.*

Group-16 Elements

Position in the periodic table, occurrence, electronic configuration, oxidation states, trends in physical and chemical properties. Ozone – methods of preparation. Compounds of sulphur: preparation, properties and uses of sulphur-dioxide (industrial process of manufacture).

- (i) *Electronic configuration, oxidation states, occurrence. Trends in physical properties; chemical properties with hydrogen, oxygen and halogens.*
- (ii) *Ozone: manufacture by Siemen's ozoniser, thermal decomposition of ozone, its oxidising nature – reaction with lead sulphide, potassium iodide and mercury, its uses.*

- (iii) *Sulphur dioxide: laboratory and industrial preparation from sulphites and sulphide ores, reaction of sulphur dioxide with NaOH , Cl_2 , KMnO_4 .*

Group-17 Elements

Position in the periodic table, occurrence, electronic configuration, oxidation states, trends in physical and chemical properties; Preparation, properties and uses of chlorine. Interhalogen compounds.

- (i) *General introduction, electronic configuration, oxidation states. Trends in physical properties and chemical properties (hydrogen, oxygen, halogens and metals).*
- (ii) *Chlorine – preparation from MnO_2 and HCl , from NaCl , MnO_2 and conc. H_2SO_4 (only equations), reactions of chlorine with H_2S , NH_3 , cold, dilute NaOH and hot, concentrated NaOH .*
- (iii) *Interhalogen compounds – structure, hybridisation and shapes: XX' , XX'_3 , XX'_5 , XX'_7 .*

Group-18 Elements

Position in the periodic table, occurrence, electronic configuration, trends in physical and chemical properties, inert nature, uses.

- (i) *General introduction, electronic configuration, occurrence, trends in physical; chemical properties, state and low reactivity.*
- (ii) *Formation of xenon compounds with fluorine and oxygen (equations only), hybridisation, shape and structure of compounds.*
- (iii) *Uses of noble gases.*

8. d and f Block Elements

Position in the periodic table, occurrence, electronic configuration and characteristics of transition metals, general trends in properties of the 3d-series of transition metals - metallic character, ionisation enthalpy, oxidation states, ionic radii, colour of ions, catalytic property, magnetic properties, properties of $\text{K}_2\text{Cr}_2\text{O}_7$ and KMnO_4 .

Lanthanoids and actinoids.

(i) *d*-Block: 3d, 4d and 5d series

Study in terms of metallic character, atomic and ionic radii, ionisation enthalpy, oxidation states, variable valency, formation of coloured compounds, formation of complexes, alloy formation.

(ii) *f*-Block: 4f and 5f series

Electronic configuration, atomic and ionic radii, oxidation states, formation of coloured compounds, formation of complexes. Lanthanoid contraction and its consequences. Chemical reactivity – with oxygen, hydrogen, halogen, sulphur, nitrogen, carbon and water.

Actinoids - oxidation states and comparison with lanthanoids.

(iii) Potassium permanganate: structure, shape; its oxidising nature in acidic, basic and neutral medium, use in redox titration.

Oxidising nature in acidic [FeSO_4 , $(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$, KI], basic (KI) and neutral (H_2S) mediums to be done.

(iv) Potassium dichromate: structure, shape; its use in titration. Oxidising nature in acidic, basic and neutral medium, use in redox titration.

9. Coordination Compounds

Concept of complexes, definition of ligands, coordination number, oxidation number. IUPAC nomenclature of mononuclear coordination compounds. Isomerism (structural and stereo). Bonding, Werner's theory, VBT. Colour, magnetic properties and shapes. Importance of coordination compounds (in qualitative analysis, extraction of metals and biological system).

(i) Definition of coordination compounds / complex compounds, differences with a double salt, study of ligands – mono-, bi-, tri-, tetra-, penta-, hexa- and polydentate, chelating ligands, definition of coordination number, its calculation for a complex coordination sphere, study of oxidation state of an element in a complex, its calculation, IUPAC rules of nomenclature of coordination compounds.

(ii) Isomerism – structural, stereo types and examples.

(iii) Valence bond theory of coordination compounds – examples of formation of inner orbital and outer orbital complexes (high and low spin, octahedral, tetrahedral and square planar), prediction of magnetic character.

(iv) Importance and uses.

10. Haloalkanes and Haloarenes.

Haloalkanes: General formula, nomenclature and classification. Nature of C–X bond, physical and chemical properties, mechanism of substitution reactions, optical rotation.

Haloarenes: Basic idea, nature of C–X bond, substitution reactions (directive influence of halogen in monosubstituted compounds only).

Nature of C-X bond

Naming the halogen derivatives of alkanes by using common system and IUPAC system for mono, di and tri-halo derivatives.

Preparation of haloalkanes from:

- Alkane and halogen.
- Alkene and hydrogen halide.
- Alcohols with PX_3 , PCl_5 and SOCl_2 .
- Halide exchange method (Finkelstein and Swarts)
- Silver salt of fatty acids (Hunsdiecker).

Physical properties: State, melting point, boiling point and solubility.

Chemical properties: nucleophilic substitution reactions ($\text{S}_{\text{N}}1$, $\text{S}_{\text{N}}2$ mechanism in terms of primary, secondary and tertiary halides) Reaction with: sodium hydroxide, water, sodium iodide, ammonia, primary amine, secondary amine, potassium cyanide, silver cyanide, potassium nitrite, silver nitrite, silver salt of fatty acid and lithium-aluminium hydride.

Elimination reaction (Saytzeff's rule) / β elimination.

Reaction with metals: sodium and magnesium (Wurtz's reaction, Grignard's reagent preparation).

Chloroform and iodoform: preparation and properties.

Preparation of haloarenes by Sandmeyer's and Gattermann's reaction, by electrophilic substitution.

Physical properties: State, melting point, boiling point and solubility.

Chemical properties:

- *Electrophilic substitution (chlorination nitration and sulphonation).*
- *Nucleophilic substitution (replacement of chlorine with -OH, -NH₂).*
- *Reduction to benzene.*
- *Wurtz-Fittig reaction.*
- *Fittig reaction.*
- *Addition reaction with magnesium (formation of Grignard reagent).*

11. Alcohols, Phenols and Ethers

Alcohols: Classification, general formula, structure and nomenclature. Methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary and tertiary alcohols, uses with special reference to methanol and ethanol.

(i) *Classification into monohydric, dihydric and polyhydric alcohols, general formulae, structure and nomenclature of alcohols. Difference between primary, secondary and tertiary alcohols in terms of structure, physical properties and chemical properties.*

(ii) *Methods of preparation:*

- *Hydration of Alkenes – direct hydration, indirect hydration, hydroboration oxidation.*
- *From Grignard's reagent.*
- *Hydrolysis of alkyl halides.*
- *Reduction of carbonyl compounds.*
- *From primary amines.*

Properties:

- *Acidic nature of alcohols:*
- *Reaction with sodium.*
- *Esterification.*
- *Reaction with hydrogen halides.*
- *Reaction with PCl₃, PCl₅, and SOCl₂.*

- *Reaction with acid chlorides and acid anhydrides*
- *Oxidation.*
- *Dehydration.*

Uses of alcohols.

(iii) *Conversion of one alcohol into another.*

(iv) *Distinction between primary, secondary and tertiary alcohols by Lucas' Test.*

Phenols: Classification and nomenclature.

Methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

Preparation of phenol from diazonium salt, chlorobenzene (Dow's process) and from benzene sulphonic acid.

Manufacture from Cumene.

Physical properties: state and solubility.

Chemical properties:

- *Acidic character of phenol.*
- *Reaction with sodium hydroxide.*
- *Reaction with sodium.*
- *Reaction with zinc.*
- *Reaction with acetyl chloride and acetic anhydride.*
- *Reaction with phosphorus pentachloride.*
- *Bromination, nitration and sulphonation (Electrophilic substitution reactions).*
- *Kolbe's reaction (formation of salicylic acid).*
- *Reimer – Tiemann reaction*
- *Test for phenol – FeCl₃ test, azo dye test.*

Aliphatic Ethers: General formula, structure and nomenclature. Methods of preparation, physical and chemical properties, uses.

Ethers: structure of ethereal group.

Preparation from alcohol (Williamson's synthesis).

Physical properties: state, miscibility.

Chemical properties:

- *Reaction with chlorine.*
- *Oxidation (peroxide formation).*
- *Reaction with HI.*
- *Reaction with PCl₅.*

12. Aldehydes, Ketones and Carboxylic Acids

Aldehydes and Ketones: Nomenclature, structure of methods of preparation of aldehydes and ketones, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes and uses.

Preparation:

- From alcohol.
- From alkenes (ozonolysis).
- From alkynes (hydration).
- From acid chlorides (Rosenmund's reduction, reaction with dialkyl cadmium).
- From calcium salt of carboxylic acids.
- From nitriles (Stephen reaction, Grignard's reagent).
- From esters.

Physical properties – state and boiling point.

Chemical properties:

- Nucleophilic addition reactions with mechanism (ammonia and its derivatives, HCN, NaHSO₃ and Grignard's reagent).
- Oxidation reactions, iodoform reaction.
- Reduction: reduction to alcohol and alkanes (Clemmensen's reduction, Wolff-Kishner reduction, Red phosphorus and HI).
- Base catalysed reactions: Aldol condensation, cross Aldol condensation, Cannizzaro's reaction.

Tests: difference between formaldehyde and acetaldehyde; aldehydes and ketones.

Uses of aldehydes and ketones.

Aromatic aldehyde (Benzaldehyde)

Lab preparation from toluene by oxidation with chromyl chloride.

Physical properties: state and stability.

Chemical properties:

- Oxidation and reduction.
- Nucleophilic addition reaction (hydrogen cyanide and sodium bisulphite).
- Reactions with ammonia and its derivatives (hydroxyl amine, hydrazine and phenyl hydrazine).

- Reaction with phosphorus pentachloride.
- Cannizzaro reaction.
- Benzoin condensation.
- Perkin's reaction.
- Electrophilic substitution - halogenation, nitration and sulphonation.

Test: distinction between aromatic and aliphatic aldehydes.

Uses of benzaldehyde.

Carboxylic Acids: Classification, general formula and structure of carboxylic group. Nomenclature, acidic nature, methods of preparation, physical and chemical properties and uses.

Classification of mono and di carboxylic acids with examples.

Preparation of aliphatic and aromatic carboxylic acid:

- From alcohols, aldehydes.
- From nitriles.
- From Grignard's reagent.

Physical properties: state, boiling point and solubility.

Chemical properties:

- Acidic character: (aliphatic, aromatic carboxylic acids with the effect of substituents on the acidic character – to be dealt with in detail)
- Reaction with active metals, alkalis, carbonates and bicarbonates,
- Formation of acid derivatives.
- Decarboxylation (chemical and Kolbe's electrolytic reaction).
- HVZ reactions.
- Substitution of benzene ring (meta directive effect of carboxylic acid group) nitration and sulphonation.

Tests for acids: formic acid, acetic acid and benzoic acid.

Uses of formic acid, acetic acid and benzoic acid.

13. Organic compounds containing Nitrogen

Aliphatic Amines: General formula and, classification of amines. Structure of the amino group, nomenclature. Methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

- *Amines*

Nomenclature, classification with examples, structure, general formula.

Methods of preparation:

- *From alcohol.*
- *From alkyl halide.*
- *From cyanide.*
- *From amide (Hofmann's degradation).*
- *From nitro compounds.*
- *Gabriel phthalimide Synthesis.*

Physical properties: comparison between primary, secondary and tertiary amines in terms of – state, solubility, boiling point (hydrogen bonding), comparison with alcohols.

Chemical properties:

- *Basic character of amines – comparison between primary, secondary and tertiary alkyl amines/ ammonia/ aniline. Effect of substituents on the basic strength of aniline*
- *Alkylation and acylation with mechanism.*
- *Reaction with nitrous acid.*
- *Carbylamine reaction.*

Distinction between primary, secondary and tertiary amines (Hinsberg's Test).

Aniline

Preparation reduction of nitrobenzene.

Physical properties – state, solubility and boiling point.

Chemical properties:

- *Reaction with HCl and H₂SO₄.*
- *Acetylation, alkylation.*
- *Benzoylation.*

- *Carbylamine reaction.*
- *Diazotisation.*
- *Electrophilic substitution (bromination, nitration and sulphonation).*

Tests for aniline.

Uses of aniline.

Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Preparation from aniline;

Properties: Sandmeyer's reaction, Gattermann reaction, replacement of diazo group by – H, – OH, –NO₂, coupling reaction with phenol and aniline.

14. Biomolecules

Carbohydrates – Definition, Classification (aldoses and ketoses), monosaccharides (glucose and fructose), D-L configuration oligosaccharides (sucrose), polysaccharides (starch, cellulose); Importance of carbohydrates.

Carbohydrates: definition, classification - mono (aldose, ketose), oligo (di, tri, tetra saccharides) and polysaccharides with examples: reducing sugars and non-reducing sugars – examples and uses.

Heating with HI, reaction with hydroxylamine, bromine water and nitric acid.

Test for glucose and fructose (bromine water test with equation).

Disaccharides – structure of sucrose (glycosidic linkage).

Polysaccharides – starch, cellulose, glycogen.

Proteins – structural units of proteins. Basic idea of – amino acids, peptide bond, polypeptides, proteins, denaturation of proteins. Enzymes, hormones - elementary idea only.

Proteins: Amino acids – general structure, classification and zwitter ion formation. Isoelectric point.

Classification of proteins on the basis of molecular shape; denaturation of proteins. (Definitions only. Details and diagrams are not required).

Nucleic Acids - DNA and RNA.

Nucleic acids: basic unit – purine and pyrimidine, DNA – structure (double helical), RNA (No chemical structure required). Differences between DNA and RNA.

15. Chemistry in Everyday life

Chemicals in medicines - analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

In medicine: antipyretics, analgesics, tranquillisers, antiseptics, disinfectants, anti-microbials, anti-fertility drugs, antihistamines, antibiotics, antacids.

Definition, common examples, uses.

Differences between antiseptics and disinfectants.

Structure not required.

Chemicals in food - preservatives, artificial sweetening agents, elementary idea of antioxidants.

Preservatives: role, example (Sodium benzoate).

Artificial sweetening agents: role, examples (aspartame, saccharine, sucralose and alitame).

7

PAPER II

PRACTICAL WORK – 15 Marks

Candidates are required to complete the following experiments:

1. Titrations

Oxidation-reduction titrations: potassium manganate (VII) / ammonium iron (II) sulphate; potassium manganate (VII) / oxalic acid.

The candidate may be required to determine the percentage purity of a compound and the number of molecules of water of crystallization in hydrated salts. In such experiments sufficient working details including recognition of the end point will be given.

Candidates will be required to calculate:

- Molarity
- Concentration in grams L^{-1} / molecular mass

- Number of molecules of water of crystallisation/ percentage purity.

NOTE: Molarity must be calculated upto 4 decimal places at least, in order to avoid error.

OBSERVATION TABLE

S. No.	(A)	(B)	(B – A)
	Initial burette reading (ml)	Final burette reading (ml)	Difference (ml)
1			
2			
3			

- Concordant reading is to be used for titre value. Concordant reading is two consecutive values which are exactly the same. Average will not be accepted as titre value.
- The table is to be completed in ink only. Pencil is not to be used.
- Overwriting will not be accepted in the tabular column.

Observations:

- Pipette size (should be same for all the candidates at the centre).
- Titre value (concordant value).

2. Study of the rate of reaction

The 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 (using different concentrations for either), magnesium and dil. sulphuric acid/ dil. hydrochloric acid (using different concentrations).

- Graph of volume vs. time and its interpretation.
- Relationship between concentration and rate, volume and rate and time and rate.

3. Identification of the following compounds and functional groups based on observations

- Alcoholic group - glycerol
- Aldehyde group- formaldehyde
- Ketonic group – acetone
- Carboxylic group – benzoic acid
- Amino group - aniline

***Please Note: Carbylamine and acrolein tests should not be performed.**

The student should learn to differentiate between colours, solution, ring and precipitate.

4. Characteristic tests of carbohydrates and proteins

- Carbohydrates – glucose
- Proteins – powdered milk

Identification should be of 'Carbohydrate' and 'Protein' not of individual substances.

5. Qualitative analysis

Qualitative analysis: identification of single salt containing one anion and one cation:

Anions: CO_3^{2-} , NO_2^- , S^{2-} , SO_3^{2-} , SO_4^{2-} , NO_3^- , CH_3COO^- , Cl^- , Br^- , I^- , $\text{C}_2\text{O}_4^{2-}$, PO_4^{3-} .

Cations: NH_4^+ , Pb^{2+} , Cu^{2+} , Al^{3+} , Fe^{3+} , Zn^{2+} , Mn^{2+} , Ni^{2+} , Co^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+} , Mg^{2+} .

NOTE:

Chromyl chloride test not to be performed.

For wet test of anions, sodium carbonate extract must be used (except for carbonate).

(Insoluble salts such as lead sulphate, barium sulphate, calcium sulphate, strontium sulphate will not be given).

Anions: Dilute acid group – CO_3^{2-} , NO_2^- , S^{2-} , SO_3^{2-}

Concentrated Acid Group – NO_3^- , Cl^- , Br^- , I^- , CH_3COO^- .

Special Group - SO_4^{2-} , PO_4^{3-} , $\text{C}_2\text{O}_4^{2-}$.

Cations: Group Zero: NH_4^+

Group I: Pb^{2+}

Group II: Cu^{2+} , Pb^{2+}

Group III: Al^{3+} , Fe^{3+}

Group IV: Zn^{2+} , Mn^{2+} , Ni^{2+} , Co^{2+}

Group V: Ba^{2+} , Sr^{2+} , Ca^{2+}

Group VI: Mg^{2+}

NOTE:

- Formal analytical procedure is required for Qualitative Analysis.
- Specific solvent for O.S. to be used;
- Before adding Group III reagents to the filtrate of Group II, H_2S must be removed followed by boiling with conc. Nitric acid.
- The right order for buffer (NH_4Cl and NH_4OH) must be used.
- The flame test with the precipitate obtained in Group V for Ba^{2+} , Sr^{2+} , Ca^{2+} will also be accepted as a confirmatory test.

For wet test of anions, sodium carbonate extract must be used (except for carbonate).

PATTERN OF CHEMISTRY PRACTICAL PAPER

Questions in the practical paper will be set as follows:

Question 1	Volumetric Analysis
Question 2	Any one or a combination of the following experiments:
	<ul style="list-style-type: none"> • Study of the rate of reaction.
	<ul style="list-style-type: none"> • Identification of the organic compounds and functional groups based on observations.
	<ul style="list-style-type: none"> • Characteristic tests of carbohydrates and proteins.
Question 3	Qualitative Analysis (single salt).

PROJECT WORK AND PRACTICAL FILE - 15 Marks

Project Work – 10 Marks

The project work is to be assessed by a Visiting Examiner appointed locally and approved by the Council.

The candidate is to creatively execute **one** project/assignment on an aspect of Chemistry. Teachers may assign or students may select a topic of

their choice. Following is only a suggestive list of projects.

Suggested Evaluation criteria for Project Work:

- Introduction / purpose
- Contents
- Analysis/ material aid (graph, data, structure, pie charts, histograms, diagrams, etc.)
- Presentation
- Bibliography

Suggested Assignments:

1. Amino acids: Peptides, structure and classification, proteins structure and their role in the growth of living beings.
2. Nucleic Acid: DNA and RNA – their structure. Unique nature. Importance in evolution and their characteristic features.
3. Carbohydrates and their metabolism, Blood - haemoglobin and respiration.
4. Vitamins and hormones
5. Simple idea of chemical evolution.
6. Natural polymers (any **five**) - structure, characteristics, uses. Synthetic polymers (any

five) - method of preparation, structure, characteristics and uses.

7. Types of Dyes - methods of preparation, characteristics and uses.
8. Chemicals in medicines: antiseptics, antibiotics, antacids, etc. and their uses.
9. Preparation of soap, nail polish, boot polish, varnish, nail polish remover, shampoo and perfumes.
10. Chemicals and chemical processes in forensic studies.
11. Insecticides, pesticides and chemical fertilisers.
12. Ancient Indian medicines and medicinal plants.
13. Organic Chemistry in Nutrition, Food Science and Biotechnology.
14. Effect of Green House Gases.
15. How Plastics have changed the world, both socially and economically.

Practical File – 5 Marks

The Visiting Examiner is required to assess students on the basis of the Chemistry Practical file maintained by them during the academic year.

NOTE: According to the recommendation of International Union of Pure and Applied Chemistry (IUPAC), the groups are numbered from 1 to 18 replacing the older notation of groups IA VIIA, VIII, IB VIIB and 0. However, for the examination both notations will be accepted.

Old notation	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	IIIA	IVA	VA	VIA	VIIA	0
New notation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

BIOLOGY (863)

CLASS XII

There will be two papers in the subject:

Paper I: Theory: 3 hours ... 70 marks

Paper II: Practical: 3 hours ... 15 marks

Project Work ... 10 marks

Practical File ... 5 marks

PAPER I- THEORY: 70 Marks

*There will be no overall choice in the paper. Candidates will be required to answer **all** questions. Internal choice will be available in two questions of 2 marks each, two questions of 3 marks each and all the three questions of 5 marks each.*

S. No.	UNIT	TOTAL WEIGHTAGE
1.	Reproduction	16 Marks
2.	Genetics and Evolution	15 Marks
3.	Biology and Human Welfare	14 Marks
4.	Biotechnology and its Applications	10 marks
5.	Ecology and Environment	15 Marks
TOTAL		70 Marks

PAPER I –THEORY – 70 Marks

All structures (internal and external) are required to be taught along with diagrams.

1. Reproduction

(i) Sexual reproduction in flowering plants

Development of male and female gametophytes; pollen-pistil interaction; double fertilization; post fertilization events - development of endosperm and embryo, special modes - apomixis, parthenocarpy, polyembryony.

Pre-fertilisation structures and events.

Structure of microsporangium, T.S. of anther microsporogenesis, structure and development of pollen grain, viability of pollen grain, economic importance of pollen grain. Pistil – structure of megasporangium (L.S. of anatropous ovule), megasporogenesis, structure and development of female gametophyte.

Pollen-pistil interaction in terms of incompatibility/compatibility, events leading to fertilisation, definition of triple fusion and double fertilization. Significance of double fertilization. Apomixis, polyembryony, parthenocarpy to be explained briefly.

Post-fertilisation events - embryo formation (dicot); types of endosperm (cellular, nuclear and helobial); definition of perisperm.

(ii) Human Reproduction

Microscopic anatomy of testis and ovary; gametogenesis - spermatogenesis and oogenesis; menstrual cycle; fertilisation, embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea).

Internal structure of testis and ovary to be taught with the help of diagrams; gametogenesis- spermatogenesis (including spermiogenesis and spermiation) oogenesis; hormonal control of gametogenesis, structure

of sperm and mature ovum, menstrual cycle - different phases and hormone action, menarche and menopause, physico-chemical events during fertilisation, implantation, embryonic development up to blastocyst formation, important features of human embryonic development (formation of heart, limbs, digits, appearance of hair on head, eyelashes, separation of eye lids, external genital organs and first movement of foetus with reference to time period) placenta and its functions. Parturition; lactation – hormonal control and importance.

(iii) Reproductive Health

Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs); birth control - need and methods, contraception and medical termination of pregnancy (MTP); amniocentesis; infertility and assisted reproductive technologies - IVF, ZIFT, GIFT (elementary idea for general awareness).

Definition of reproductive health, programs of reproductive health (family planning, RCH), contraceptive methods and their methods of action (natural-periodic abstinence, withdrawal or coitus interruptus, lactational amenorrhea; artificial – barriers, IUDs, oral pills, implants and surgical methods, definition of medical termination of pregnancy (MTP) and reasons for it; causes of infertility. Amniocentesis and its role in detecting genetic defects. Assisted reproductive technologies: IVF, IUT, ZIFT, ICSI, GIFT, AI, IUI. - definition and application only. Causes, symptoms and methods of prevention of sexually transmitted diseases (gonorrhoea, syphilis, genital herpes, chlamydiasis, genital warts, trichomoniasis, hepatitis- B, AIDS).

2. Genetics and Evolution

(i) Principles of inheritance and variation

Heredity and variation: Mendelian inheritance; deviations from Mendelism - incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosomal theory of inheritance; chromosomes and genes; sex determination - in humans, fruit fly, birds and honey bee; linkage and crossing over; mutation; Mendelian disorders in humans; chromosomal disorders in humans.

Explanation of the terms heredity and variation; Mendel's Principles of inheritance; reasons for Mendel's success; back cross and test cross, definitions to be taught with simple examples using Punnett square. Incomplete dominance with examples from plants (snapdragon - Antirrhinum) and co-dominance in human blood group, multiple alleles - e.g. blood groups, polygenic inheritance with one example of inheritance of skin colour in humans (students should be taught examples from human genetics through pedigree charts. They should be able to interpret the patterns of inheritance by analysis of pedigree chart). Biological importance of Mendelism. Pleiotropy with reference to the example of starch synthesis in pea seeds. Chromosomal theory of inheritance; autosomes and sex chromosomes (sex determination in humans, fruit fly, birds, honey bees and grasshopper), definition and significance of linkage and crossing over. Mutation: spontaneous, induced, gene (point - transition, transversion and frame-shift); chromosomal aberration: euploidy and aneuploidy; human genetic disorders: phenylketonuria, thalassaemia, colour blindness, sickle cell anaemia; chromosomal disorders: Down's syndrome, Klinefelter's syndrome, Turner's syndrome.

(ii) Molecular basis of Inheritance

Search for genetic material and DNA as genetic material; structure of DNA and RNA; DNA packaging; DNA replication; central dogma; transcription, genetic code, translation; gene expression and regulation - lac operon; human genome project; DNA fingerprinting.

Properties of genes such as ability to replicate, chemical stability, mutability and inheritability. Search for DNA as genetic material - Hershey and Chase's experiment, double helical model of DNA (contributions of Meischer, Watson and Crick, Wilkins, Franklin and Chargaff); Differences between DNA and RNA; types of RNA (tRNA, mRNA and rRNA, snRNA, hnRNA); central dogma - concept only; reverse transcription (basic idea only), Meselson and Stahl's experiment, replication of DNA (role of enzymes, namely DNA polymerase and ligase), transcription, essential features of genetic code. Definition of codon. Protein synthesis - translation in prokaryotes. Gene expression in prokaryotes; lac operon in E. coli.

Human Genome Project: goal; methodologies [Expressed Sequence Tags (EST), Sequence Annotation], salient features and applications. DNA finger printing - technique, application and ethical issues to be discussed briefly.

3. Biology and Human Welfare

(i) Human Health and Diseases

Pathogens; parasites causing human diseases (common cold, dengue, chikungunya, pneumonia, malaria, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug abuse.

Communicable and non-communicable diseases; modes of transmission, causative agents, symptoms and prevention; viral diseases (common cold, chikungunya and

dengue), bacterial diseases (pneumonia, diphtheria and plague), protozoal diseases (malaria, graphic outline of life cycle of *Plasmodium*); fungal (ringworm); cancer - types of tumour (benign, malignant), causes, diagnosis and treatment, characteristics of cancer cells (loss of contact inhibition and metastasis).

Immunity (definition and types – innate and acquired, active and passive, humoral and cell-mediated), Interferons – definition, source and function; structure of a typical antibody molecule, types of antibodies - IgG, IgA, IgM, IgD and IgE (function and occurrence, e.g. in serum, saliva, colostrum); vaccination and immunisation, allergies and allergens – definition and general symptoms of allergies; autoimmunity, primary and secondary lymphoid organs and tissues, brief idea of AIDS – causative agent (HIV), modes of transmission, diagnosis (ELISA), symptoms, replication of retrovirus in the infected human cell (including diagram) and prevention.

Drugs: effects and sources of opioids, cannabinoids, cocaine and barbiturates. Reasons for addiction; prevention and control of drug abuse.

(ii) Microbes in Human Welfare

In industrial production, sewage treatment, energy generation and microbes as biocontrol agents and biofertilisers.

*Use of microbes in: (i) Industrial products: beverages (with and without distillation); sources (microbes) and uses of organic acids, alcohols and enzymes (lipase, pectinase, protease, streptokinase) in industry, source (microbes) and applications of Cyclosporin-A, Statins; (ii) Production of biogas (methanogens, biogas plant, composition of biogas and process of production); (iii) Microbes as biocontrol agents (*Bacillus thuringiensis*, *Trichoderma*, Nucleopolyhedrovirus (*Baculovirus*), and (iv) Microbes as*

*biofertilisers (*Rhizobium*, *Azospirillum*, *Azotobacter*, *Mycorrhiza*, *Cyanobacteria*), IPM - harmful effects of chemical pesticides.*

4. Biotechnology and its Applications

(i) Biotechnology - Principles and processes

Genetic Engineering (recombinant DNA technology).

*Definition and principles of biotechnology; isolation of genomic (chromosomal) DNA (from plant cell, by cell lysis), isolation of gene of interest (by electrophoresis), steps of formation of recombinant DNA, discovery, nomenclature, features and role of restriction enzymes (*EcoRI*) and role of ligase; cloning vectors (features of a good cloning vector, examples of cloning vectors like pBR322, *Agrobacterium*, retroviruses, bacterial artificial chromosome (BAC), yeast artificial chromosome (YAC)), methods of transfer of rDNA into a competent host, e.g. by direct-method (temperature shock), microinjection, gene gun, methods of selection of recombinants (antibiotic resistance, blue-white selection), cloning of recombinants, i.e., gene amplification (by in vivo or in vitro method - using PCR technique), bioreactor (basic features and uses of stirred tank and sparged tank bioreactors), downstream processing.*

(ii) Biotechnology and its applications

Applications of biotechnology in health and agriculture: human insulin and vaccine production, stem cell technology, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues, biopiracy and biopatents.

*In agriculture: for production of crops tolerant to abiotic stresses (cold, drought, salt, heat); pest-resistant crops (Bt-crops, RNAi with reference to *Meloidogyne**

incognita); crops with enhanced nutritional value (golden rice).

In medicine: insulin, gene therapy - with reference to treatment of SCID, molecular diagnosis by PCR, ELISA and use of DNA/RNA probe.

Transgenic animals for bioactive products like alpha-1-antitrypsin for emphysema, alpha-lactalbumin; vaccine safety testing, chemical safety testing; study of diseases.

Role of GEAC, definition and two examples of biopiracy, biopatient; ethical issues.

5. Ecology and Environment

(i) Organisms and Populations

Organisms and environment: habitat and niche, population and ecological adaptations; population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution.

Definition of ecology; definition of habitat and niche.

Definition of population; population attributes: sex ratio, types of age distribution pyramids for human population; definition of population density, natality, mortality, emigration, immigration, carrying capacity. Ways to measure population density. Calculation of natality and mortality.

Population growth: factors affecting population growth and population growth equation; growth models: exponential growth and logistic growth along with equations, graph and examples of the same; life history variations: definition of reproductive fitness and examples.

Population interactions – definition of mutualism, competition (interspecific, interference, competitive release and Gause's Principle of Competitive Exclusion), predation (adaptations in organisms to avoid predation), parasitism (ecto-, endo-, and brood parasites), commensalism, amensalism.

(ii) Biodiversity and its Conservation

Concept of biodiversity; patterns of biodiversity; importance of biodiversity; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, national parks, sanctuaries and Ramsar sites

Definition of biodiversity, few examples of each type of biodiversity - species, ecosystem and genetic. Global biodiversity and proportionate number of species of major taxa of plants, invertebrates and vertebrates; patterns of biodiversity (latitudinal gradients, species-area relationship – graph and equation), “rivet popper hypothesis”, importance of species diversity to the ecosystem (narrowly utilitarian, broadly utilitarian, ethical terms).

Examples of some recently extinct organisms, causes of loss of biodiversity (habitat loss and fragmentation, over-exploitation, alien species invasion, co-extinction).

Biodiversity conservation: In-situ methods - protected areas: biosphere reserves, national parks, wildlife sanctuaries, sacred groves; ex-situ methods - captive breeding, zoo, botanical gardens, cryopreservation, wild life safari, seed banks. Definitions and examples of each of the above. Hotspots, Ramsar sites and Red Data Book.

The place, year and main agenda of historic conventions on biological diversity (the Earth Summit and the World Summit).

PAPER II

PRACTICAL WORK – 15 Marks

- 1) **Taxonomy:** Study floral characteristics through dissection of flowers, drawing floral formula and diagrams of following families:

(i) Malvaceae: type – China rose / Hollyhock or any other locally available flower of the family.

(ii) Solanaceae: type – *Petunia* / *Datura* / Brinjal Flower / *Solanum nigrum* any other locally available flower of the family

Floral characteristics should be explained by dissection of flowers. Students should be taught how to cut vertical section of the flower and draw accurately labelled diagrams. The technique of drawing floral diagrams with the **mother axis in the right position is necessary**. Floral formula should be correctly written. Identification of the correct family giving reasons, technique of cutting T.S. and L.S of ovary should be explained and accordingly correct labelled-diagram should be drawn.

Students should know the examples of plants (belonging to each family) which are of economic importance. The examples of common names of plants must be supported with correct scientific names as well.

NOTE: In the examination, candidates will be tested on any one of the above families.

2) Simple biochemical and physiological experiments

To isolate DNA from available plant material.

Isolation of DNA from spinach leaves, green pea seeds, pulp of banana and papaya.

Take half a ripe and peeled banana into a beaker and add 50 ml of extraction fluid (1.5gm table salt +10 ml liquid detergent +90 ml distilled water). Place the beaker in a water bath set at 60 °C for 15 minutes. Stir gently with a glass rod. Filter 5ml of cooled content into a clean test tube and add 5ml of cold 90% ethanol. DNA molecules separate out and appear as white fibres.

3) Slide preparation

T.S. of ovary of any locally available flower, to show marginal / axile placentation.

*The technique of staining and mounting neatly should be explained. Students should also know how to make labelled outline diagrams. They should also be taught to identify the mount under low/ high power of microscope. **Two** identifying features of the above need to be mentioned.*

4) Spotting: (three minutes to be given for each spot which includes identification, drawing a labelled diagram and writing at least two identifying characteristics).

NOTE: Spotting must be done on a separate answer sheet during examination, which should be handed over to the Examiner immediately after spotting.

(i) Identify and comment on the following:

- T.S. of ovary of mammal (Permanent slide).
- T.S. of testis of mammal (Permanent slide).
- T.S. of blastula / blastocyst of a mammal (chart/ slide).
- Whole mount of *Plasmodium* sporozoite (slide /chart).
- Whole mount of *Entamoeba histolytica* trophozoite (slide/chart).
- Preserved specimen/ chart/ model of *Ascaris*.

(ii) Comment upon ecological adaptations of plants and animals.

Models/ virtual images/ charts of one plant and one animal found in xeric and aquatic habitats. Examples: Hydrilla, cactus, fish and camel.

(iii) Flowers adapted to pollination by different agencies – insect and wind.

*Students should be able to identify the type of pollination of the given flower, draw the diagram of the flower and **give two reasons** for the type of pollination. Example: Hibiscus and grass.*

Students should be taught how to identify, draw, label and give significantly visible characteristics as observed, of each spot, in a given time of three minutes. 'T.S.', 'model', 'whole mount', 'chart', 'image' of the specimen should be mentioned as a part of identification.

PROJECT WORK AND PRACTICAL FILE –

15 Marks

Project Work – 10 Marks

The project work is to be assessed by a Visiting Examiner appointed locally and approved by the Council.

The candidate is to creatively execute **one** project/assignment on an aspect of biology. Preference is to be given to investigatory projects. Teachers may assign or students may choose any **one** project of their choice. Students can choose any other project besides the ones indicated in the list. Following is **only a suggestive** list of topics:

- (i) Genetic disorders
- (ii) Gene therapy
- (iii) Human Genome Project
- (iv) DNA fingerprinting
- (v) Bio-piracy
- (vi) Cancer.
- (vii) AIDS/Hepatitis.
- (viii) Drug addiction and community.
- (ix) Role of micro-organisms in industry.
- (x) Human population.
- (xi) Mendelian Inheritance
- (xii) Environmental resistance.
- (xiii) Traditional and modern methods: Study of a few traditional methods of pest deterrence vis-a-vis modern methods of pest control - viability of traditional methods in today's scenario and limitations and dangers of modern methods.
- (xiv) Role of agrochemicals in increasing food production.

Suggested Evaluation Criteria for Project Work:

Format of the Project:

- Content
- Introduction
- Presentation (graphs, tables, charts, newspaper cuttings, handmade diagrams, photographs, statistical analysis if relevant)
- Conclusion/ Summary
- Bibliography

Projects should be handwritten by the candidate. Written pages should not exceed 15-20 pages.

Practical File – 5 Marks

The Visiting Examiner is required to assess students on the basis of the Biology Practical file maintained by them during the academic year.

Each practical done during the year, needs to be recorded by the student in the Practical file and the same must be checked, signed and dated by the teacher.

SCIENTISTS AND THEIR CONTRIBUTIONS:

1. Hugo de Vries: Mutation
2. Alec Jeffreys: DNA finger printing
3. Temin and Baltimore: Reverse transcription.
4. Jacob, Monod and Lwoff: proposed Lac operon.
5. Watson and Crick: Structure of DNA
6. Nirenberg and Khorana: Genetic code
7. Gregor Mendel: Father of genetics
8. Sutton and Boveri: Chromosomal theory of inheritance
9. Hugo de Vries: Correns and Tschermack: Rediscovered Mendelism
10. T. H. Morgan: Linkage
11. Henking: Discovered X-chromosome
12. F. Meischer: Isolated nucleic acid from pus cells, called Nuclein
13. Chargaff: Rule of equivalence in DNA structure
14. Hershey and Chase: DNA is the genetic material
15. Meselson and Stahl: Semi-conservative replication of DNA
16. G. Gamow: Triplet nature of codons
17. S. Ochoa: discovered polynucleotide phosphorylase
18. H Boyer: discovered Restriction Enzyme
19. S Cohen: method to transfer plasmid DNA in host cells
20. E. Wilson: coined the term Biodiversity
21. P. Ehrlich: Rivet Popper Hypothesis
22. Sanger: DNA/Protein sequencing

LIST OF ABBREVIATIONS TO BE STUDIED

1. ADA- Adenosine Deaminase
2. CMI- Cell Mediated Immunity
3. EFB- European Federation of Biotechnology
4. EST- Expressed Sequence Tags
5. GMO- Genetically Modified Organism
6. hnRNA - Heterogeneous Nuclear Ribo Nucleic Acid
7. IMR- Infant Mortality Rate
8. ICSI - Intra Cytoplasmic Sperm Injection
9. IUCD/IUD – Intra uterine contraceptive device
10. IUCN- International Union for Conservation of Nature and Natural Resources
11. IUT- Intra Uterine Transfer
12. MALT- Mucosal Associated Lymphoid Tissue
13. MMR- Maternal Mortality Rate
14. NACO- National AIDS Control Organisation
15. PID- Pelvic Inflammatory Diseases
16. PKU- Phenyl ketonuria
17. RCH- Reproductive and Child Health Care Programmes
18. SCID – Severe Combined Immuno Deficiency
19. SNPs - Single Nucleotide Polymorphisms
20. snRNA- Small Nuclear Ribo Nucleic Acid
21. SSBP – Single Strand Binding Protein
22. UTR - Untranslated Region
23. VNTRs - Variable Number of Tandem Repeats

SOCIOLOGY (854)

CLASS XII

There will be **two** papers in the subject:

Paper I - Theory: 3 hours70 marks

Paper II- Practical Work30 marks

PAPER - I (THEORY) – 70 Marks

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

Part II (50 marks) will consist of **eight** questions out of which the candidate will be required to answer **five** questions, each carrying **10 marks**.

1. Social Institutions

- (i) Definition and features of Social Institutions.
Self explanatory.

- (ii) Types of Social Institutions: Kinship, Marriage and Family

Kinship: Meaning of kinship, Types of kinship: consanguineous and affinal kinship. Degree of kinship (primary, secondary, tertiary; descent (matrilineal, patrilineal); residence (matrilocal, patrilocal and avunculocal) discuss Kinship usages: avoidance, joking relationship, teknonymy, avunculate, amitate, couvade; also discuss descriptive and classificatory kinship terms.

Marriage: definition and functions.

Definition, merits, demerits, functions of the following:

- *Rules of marriage: exogamy and endogamy (clan, gotra, pravara, village and sapinda), cross and parallel cousin, levirate, sororate, hypergamy and hypogamy.*
- *Forms of marriage: polygamy (polyandry and polygyny), monogamy.*

Family: definition and features (MacIver's features); Functions of family to be discussed explaining the reasons for its universal existence.

Types of family: consanguineous and conjugal family (family of origin and procreation), matriarchal and patriarchal family (matripotestal, patripotestal and avuncupotestal), nuclear and joint families.

Structural changes (disintegration of the joint family), functional changes; Factors responsible for the changes. Small family norm.

2. Religion and Society

- (i) Definition and concepts of religion and science; beliefs, rituals, superstitions, taboo.

Definition of the above and a basic understanding of each of the above. Differences and similarities between religion and science.

- (ii) Theories of religion: animism, naturism, totemism, functional theories.

A brief discussion of animism, naturism, totemism; functional theories (Malinowski, Radcliffe Brown and Durkhiem).

- (iii) Functions and dysfunctions of religion.

A brief discussion on the positive and negative functions of religion.

- (iv) Morality and social control.

Definition of morality and social control; relation between religion, morality and social control, moral code, religious code.

3. Political Organization

Political Organization and its role in bringing about change in society.

Definition of political organization; definition of Panchayati Raj (the 73rd Constitution Amendment Act, Bal Panchayats); discuss the role of the Panchayat in empowerment of women and children.

4. Economic Organisation

- (i) Economic Organisation

Definition of economic organization, economic and free goods.

- (ii) Economies of Indian tribes: food gathering, agriculture, shifting axe cultivation, handicrafts, pastoralism, industrial labour.

Economies of Indian tribes: (i) Food gathering; (ii) agriculture: shifting axe cultivation (jhum, dahi, koman, penda, podu and bewar), criticism of this type of cultivation, examples of tribes having this practice; (iii) handicraft making; (iv)

pastoralism; (v) industrial labour - migration of large numbers of Santhal, Kond and Gond to tea gardens in the north east; large resources of coal, iron and steel in Bengal, Bihar and Madhya Pradesh; examples of Santhal, Ho in pick-mining, coal-cutting, the mica and the iron & steel industry.

- (iii) Agrarian Economy, Jajmani system and Rural Employment.

Agrarian Economy: land relations – owner, tenant, share cropper.

Jajmani system: caste based occupations and exchange of services.

A brief understanding of MGNREGA and its implications.

- (iv) Traditional Markets

To be discussed with respect to Weekly markets, barter exchange.

5. Tribal India - Past, Present and Future

- (i) Definition of tribe and features.

Definition of tribe, features (unity and self-sufficiency, clan and family, common totemic ancestor, territory, occupation, endogamy, dormitories, language, common culture, common name, common religion, political organization and territory).

- (ii) Dormitories in Tribal India

Definition; origin of dormitories; features and functions; culture contact and change in dormitories.

- (iii) Present conditions, problems and solutions.

Economic, political (regionalism and separatism), social and cultural conditions and problems.

Discuss briefly the following policies of the Government of India (post independence) for upliftment of the Indian tribes: Tribal Panchsheel, important constitutional safeguards: important Committees and Commissions: Backward Classes Commission; Special Central Assistance; Economic programmes and facilities: Integrated Rural Development Programme (IRDP); Large Sized Multi-Purpose Cooperative Societies (LAMPS); 20 Point Programme; Programme for encouragement in crafts, home industries and agriculture; Educational policies.

6. Social Stratification

- (i) Social stratification: the elements.

Definition of social stratification, features, inequality, difference.

- (ii) Class: The class system: its nature, development, types of classes.

Discuss briefly the growth, nature of the different classes (lower, middle, upper).

- (iii) Caste: The caste system: concept, caste origin, caste and class comparison, its features.

Definition; Theory of Divine Origin; characteristics of caste.

Social mobility - brahminisation, sanskritisation and westernization - definitions only.

- (iv) Gender: Difference between sex and gender, patriarchal ideology and the status of women in India.

Difference between sex and gender, gender bias and its consequences for both men and women – at the workplace, property rights and family status.

Gender issues: female infanticide, foeticide, dowry, sati, child marriage, domestic violence, rape, widowhood, sexual harassment; women as perpetrators of violence.

7. Social Change and Development

- (i) Social change and Development

Definition of Social Change and development – features and sources.

- (ii) Aspects of Development

Industrialization, urbanization, modernization, globalization and sustainable development - definitions and their role in social change.

The relationship between social change and development, (special focus on sustainable development, ecological and environment issues for improving quality of life for the present and future).

- (iii) Social Movements:

Meaning, causes and their role in society.

- (iv) Role of Education in creating Social change.

Meaning and functions of education. Emphasize the role of education in creating

social change. Role of Right to Education (RTE) and its implications to be discussed briefly.

- (v) Role of Mass Media in creating Social change

Role of Mass Media (Print, electronic, audio-visual; positive and negative aspects of mass media). Understanding each of the above forms of mass media and their role in creating social change; their role in creating a civil society that confronts the bureaucracy and the authoritarianism of the state machinery through NGO activity, vigils and acts like the Right to Information (RTI).

Positive and negative aspects of mass media.

PAPER II (PROJECT WORK) – 30 MARKS

To do justice to the basic structural principles and theoretical orientation of the discipline, empirical and ethnographic substantiation is essential. In keeping with the significance of doing practical work and gaining a hands-on understanding of various social issues, candidates are expected to undertake **two studies**. Topics for the studies should be chosen from within the overall syllabus as there is ample scope for diversity.

Candidates will be expected to have completed **two studies** from any chapter covered in Theory. Assessment for each study will be as detailed below:

The practical work will be assessed by the teacher and a Visiting Examiner appointed locally and approved by the Council.

Mark allocation **per study** [15 marks] will be as follows:

1	Evaluation by the teacher	5 Marks
2	Evaluation by the Visiting Examiner	10 Marks

Evaluation by the Teacher:

S. No.	Assessment objective	Criteria	Marks
1.	Process	Candidates should be able to: Identify the topic. Plan and detail a research project.	1

		Select and use appropriate research methods.	
2.	Understanding, application of knowledge and Analysis	Candidates should be able to: Explain issues and themes clearly and in context. Interpret, analyse and evaluate critically a range of evidence to present reasoned, substantiated arguments/statements.	2
3	Presentation	Overall format, referencing (footnotes &/or bibliography), within word limit of 2000 words, title page, header/footer, etc.	2
TOTAL			05

Evaluation by Visiting Examiner:

S. No.	Assessment objective	Criteria	Marks
1.	Choice of Technique/ Detailed procedure & Presentation	Candidates should be able to: Overall format, referencing (footnotes &/or bibliography), title page, header/footer, etc.	4
2.	Analysis and evaluation	Candidates should be able to: Interpret, analyse and evaluate critically a range of evidence to present reasoned, substantiated arguments/statement.	3
3.	Viva	Range of questions based on the project only.	3
TOTAL			10

List of suggested studies for Project Work:

1. Different types of kinship systems (patriarchal/matriarchal with examples as the base of discussion).

2. Different marriage customs in India (comparisons can also be done).
3. Changing nature of the Indian family.
4. Religion and Society (focus can be on the biography of a world religion).
5. The problem of Communalism in India.
6. Traditional economies and the barter system.
7. Consumerism and modernization.
8. The status of women in traditional society.
9. The changing status of women in India.
10. Women Leaders.
11. The role of Education in creating social change.
12. Media and modernization.
13. The internet as a substitute for family and school.
14. Globalisation and its impact on the individual and society.
15. Role of society in development and environment – (public awareness, education programmes, campaigns, public participation in decision-making, etc. e.g. Chipko Movement, Appiko in Karnataka, Eco Clubs, etc.
16. Study a few noteworthy examples of sustainable development e.g.- Barefoot College in Tilonia, the work of NGOs like DDS in Andhra Pradesh in promoting self-sustenance in rural communities through developing seed banks, cultivation of millets and through promoting microfinance in the Grameen bank model.
17. The policy of reservation in India or The Backward Class Movement.
18. The significance of the Mandal Commission.
19. The rising Middle Class in India.
20. The nature of protest in rural India (example Singur).
21. Race and examples of Racism (Apartheid/ American Racism).
22. The Uttarakhand tragedy: natural or manmade disaster?
23. Superstitions and Taboos.

The studies chosen are primarily theoretically oriented and based on concepts learnt in the class. Because these studies are theoretical, the methodology will be different and would be based on secondary data collection and its analysis and interpretation. Broad suggestions about how to approach similar studies are given below:

1. Changing nature of the Indian family (S. No. 3 - List of suggested assignments for Practical Work)

Aim: To study the changing nature of the family in an urban setting.

Data: Students need to identify their sample and then gather their data by interviewing members from five families. Members of different generations from each family should be interviewed.

The student needs to collect data with the help of a questionnaire and interviews. The questions can be framed on the following:

- Description of the family structure (members, who does what in the family, the jobs outside, etc.)
- How they see themselves – joint or nuclear in terms of family relatives, who all live together, or share a kitchen or pool resources, etc.
- Seeking different family members opinion on whether they feel family life has changed. Nature of changes that have taken places and what have caused the changes.
- Has the status of the women in the family has changed in the recent past.
- Whether the women in the family work?
- Relationship between the different members of the family.

Interpretation: Once students have gathered this information they can analyse whether the family they have interviewed has changed over a period of time.

Students should examine:

- whether the respondents' perception of the nature of the family matches with what the student has learnt in class.
- analyse what are the reasons for change in the nature of the family, if any.

For instance:

- (i) whether migration has caused the family to change
- (ii) occupational changes and shift in residence has caused changes.
- (iii) the education and working of the women of the family has created changes
- (iv) failure of the generations to cope with each other has led to changes
- (v) constraint of space has caused the changes

Conclusion: Students should also do a minor statistical analysis of:

- the types of families that they are able to identify into nuclear and joint
- make an approximation about what type of family is the trend in their sample.
- proceed to find out whether there are common factors in their sample that keep a family nuclear or joint.

2. Consumerism and Modernization (S. No. 7 - List of suggested assignments for Practical Work)

3. Media and Modernization (S. No. 12 - List of suggested assignments for Practical Work)

4. Globalisation and its impact on the Individual and the Society (S. No. 14 - List of suggested assignments for Practical Work)

These three topics are interrelated and yet can be looked at independently.

(The same aim, methodology and interpretation will apply for the above studies).

Aim: To discuss how the processes of modernization and globalisation have had an impact on society, culture and the individual.

Data: Students need to interview members of a family from different generations (grandparents /parents and grandchildren/children) by identifying a sample of families in their neighbourhood who could belong to different economic backgrounds. Data should also be gathered from secondary sources such as the newspaper, internet and magazine articles.

Students need to begin by first discussing the concepts of modernization and globalisation as learnt in class. They should then proceed to gather information on consumerism, media and the changes in a society as a result of the process of globalisation.

Students need to ask these respondents:

- Nature of their life style
- Patterns of expenditure
- How they use their leisure time
- Students should then ask how this is different from the earlier times so that they get a sense of the change in the lifestyle
- How their daily life has changed with modernization
- What is the nature of the change

- Ask respondents what role the media has played in bringing about change and adaptation
- Ask about the role of the market in influencing consumption
- How their consumption patterns have changed
- How their thinking has changed and what are their political leanings
- Whether these are positive or negative changes

Sociological interpretation: Students need to do a simple analysis of the patterns of change and the reasons for the change.

They should also see if there is a common pattern in the classes of this change.

They should try and compare the changes between classes and understand if factors such as:

- education
- income
- family background
- religion etc., play a role in the changing life following modernization and globalisation.

5. Internet as a substitute for the Family and School (S. No. 13 - List of suggested assignments for Practical Work)

This topic is self-evident and requires a critical analysis of the positive and negative impact of the internet. Given the amount of time the youth spend on the internet, it would be interesting to let the students engage in an auto- biographical critical analysis of the topic.

The analyses could be presented as a debate of ideas, supported by interviews with family members, parents, teachers and peers.

6. Changing status of women in India (S. No. 9 - List of suggested assignments for Practical Work)

7. Women Leaders (S. No. 10 - List of suggested assignments for Practical Work)

Aim: These two topics are meant to understand whether the position of women has changed in society

Data: For both the topics, students would be required to take up specific areas where women participate. For instance, the role of women in the economy or women in education or women in the public arena can be looked at.

For topic 9 (Changing status of women in India): Students can interview women in these areas and ask questions such as:

- how their lives have changed socially and economically
- how their status has changed
- how education has changed their lives
- what they see as symbols of this change

Students should also have a summary of the Government's legislations/bills on women, as this will help analyse how successful the Government's efforts have been at emancipating women.

A comparison between the past and present can also be done by the students.

For topic 10 (Women Leaders): After following the above aim and data, students should take up the life of a woman leader from any time frame and present a biographical sketch supported by photographs.

They can also take up the life of two women from two different time periods and compare the changes that have taken place.

Case studies of women in different arenas, across cultures/religions can be presented.

8. The rising Middle Class in India (S. No. 19 - List of suggested assignments for Practical Work)

Aim: To study the rise of the middle class and its changing lifestyle, consumption habits and mindset.

Data: Students will have to gather data by interviewing middle class family members in their neighbourhood. Students need to interview members of a family from different generations (grandparents /parents and grandchildren/children).

They need to create a questionnaire for this where the kind of questions asked should be:

- About family background (age /religion, etc.).
- Their history in the city (how long they have lived there /where they have come from/why they came, etc.).
- Their past and present occupation.
- Income levels.
- Patterns of expenditure.
- What are the gadgets they use
- The car they drive.
- How they use their leisure time.

- Their opinion on careers for their children.
- Where they go for holidays.
- What are their political leanings

Students should then ask how this is different from the earlier times so that they get a sense of the change in the lifestyle.

Sociological interpretation: A major focus of the questions asked would have to be on the changing consumption patterns of the household. This would enable students to analyse not only changes in the consumerism of the class but also understand how mobility is closely related to class.

Students should be asked to read about the changing role of the middle class through India's history in the political arena.

GUIDELINES FOR TEACHERS:

1. It must be emphasized that the process of doing the project is as important as the final project.
2. Once the project/projects are chosen, there should be a process of brainstorming to encourage students to make out a draft/structure for the project before embarking on research.
3. During the brainstorming/discussion, the teacher should discuss the assessment criteria with the students.
4. The teacher should discuss the draft with the student with regard to the central question and the type of sources to be used.
5. The students should be guided on doing the research and looking at different types of evidence.
6. Books and suitable reference material could be suggested by the teachers and made available to the students.
7. Internet sites could be suggested, but care must be taken in selecting, using and citing these sites.
8. Students must be cautioned against plagiarism and be penalized for the same.
9. Marks must be awarded for content and originality and not for decorative elements and embellishments.
10. Projects must be the original work of the student.