

ENGLISH CORE
Class-XII (2026-27)

Section A
Reading Skills-22 Marks

I. Reading Comprehension through Unseen Passage

12+10 = 22 Marks

1. One unseen passage to assess comprehension, interpretation, analysis and inference. Vocabulary assessment will also be assessed via inference. The passage may be factual, descriptive or literary.
2. One unseen **case-based factual** passage with verbal/visual inputs like statistical data, charts etc. to assess comprehension, interpretation, analysis, inference and evaluation.

Note: The combined word limit for both the passages will be 700-750 words.

Multiple Choice Questions / Objective Type Questions and Short Answer Type Questions (to be answered in 40-50 words) will be asked.

Section B
Creative Writing Skills-18 Marks

3. Notice, up to 50 words. One out of the two given questions to be answered.
(4 Marks: Format :1 / Content: 2 / Accuracy of Spelling and Grammar: 1).
4. Formal/Informal Invitation and Reply, up to 50 words. One out of the two given questions to be answered. **(4 Marks:** Format: 1 / Content: 2 / Accuracy of Spelling and Grammar :1).
5. Letters based on verbal/visual input, to be answered in approximately 120-150 words. Letter types include application for a job with bio data or resume. Letters to the editor (giving suggestions or opinion on issues of public interest). One out of the two given questions to be answered. **(5 Marks:** Format: 1/Organisation of Ideas:1/Content:2/ Accuracy of Spelling and Grammar :1).
6. Article/ Report Writing, descriptive and analytical in nature, based on verbal inputs, to be answered in 120-150 words. One out of the two given questions to be answered. **(5 Marks:**Format:1/Organisation of Ideas:1/Content:2/Accuracy of Spelling and Grammar:1).

Section C

Literature Text Book and Supplementary Reading Text- 40 Marks

This section will have variety of assessment items including Multiple Choice Questions, Objective Type Questions, Short Answer Type Questions and Long Answer Type Questions to assess comprehension, interpretation, analysis, evaluation and extrapolation beyond the text.

7. One Poetry extract out of two, from the book **Flamingo**, to assess comprehension, interpretation, analysis, inference and appreciation. **(6x1=6 Marks)**
8. One Prose extract out of two, from the book **Vistas**, to assess comprehension, interpretation, analysis, evaluation and appreciation. **(4x1=4 Marks)**
9. One prose extract out of two from the book **Flamingo**, to assess comprehension, interpretation, analysis, inference and evaluation. **(6x1=6Marks)**
10. Short answer type questions (**from Prose and Poetry from the book Flamingo**), to be answered in 40-50 words each. Questions should elicit inferential responses through critical thinking. Five questions out of the six given, are to be answered. **(5x2=10 Marks)**
11. Short answer type questions, from **Prose (Vistas)**, to be answered in 40- 50 words each. Questions should elicit inferential responses through critical thinking. Any two out of three questions to be done. **(2x2=4 Marks)**
12. One Long answer type question, from **Prose/Poetry (Flamingo)**, to be answered in 120-150 words. Questions can be based on incident / theme / passage / extract / event as reference points to assess extrapolation beyond and across the text. The question will elicit analytical and evaluative response from the student. Any one out of two questions to be done. **(1x5=5 Marks)**
13. One Long answer type question, based on the chapters from the book **Vistas**, to be answered in 120-150 words, to assess global comprehension and extrapolation beyond the text. Questions to provide analytical and evaluative responses using incidents, events, themes, as reference points. Any one out of two questions to be done. **(1x5=5 Marks)**

Prescribed Books

1. **Flamingo:** English Reader published by National Council of Education Research and Training, New Delhi

Prose

- The Last Lesson
- Lost Spring
- Deep Water
- The Rattrap
- Indigo
- Poets and Pancakes
- The Interview
- Going Places

Poetry

- My Mother at Sixty-Six
- Keeping Quiet
- A Thing of Beauty
- A Roadside Stand
- Aunt Jennifer's Tigers

2. **Vistas:** Supplementary Reader published by National Council of Education Research and Training, New Delhi

- The Third Level
- The Tiger King
- Journey to the End of the Earth
- The Enemy
- On the Face of It
- Memories of Childhood
 - The Cutting of My Long Hair
 - We Too are Human Beings

INTERNAL ASSESSMENT

Assessment of Listening Skills	- 05 marks.
Assessment of Speaking Skills	- 05 Marks
Project Work	- 10 Marks

ENGLISH CORE
QUESTION PAPER DESIGN
Class-XII (2026-27)

Section	Competencies	Total marks
Reading Skills	Conceptual understanding, decoding, Analyzing, inferring, interpreting, appreciating, literary, conventions and vocabulary, summarizing and using appropriate format/s.	22
Creative Writing Skills	Conceptual Understanding, application of rules, Analysis, Reasoning, appropriate style and tone, using appropriate format and fluency, inference, analysis, evaluation and creativity.	18
Literature Text Book and Supplementary Reading Text	Recalling, reasoning, critical thinking, appreciating literary convention, inference, analysis, creativity with fluency.	40
	TOTAL	80
Internal Assessment	Assessment of Listening and Speaking Skills	10
	<ul style="list-style-type: none"> • Listening • Speaking 	5+5
	<ul style="list-style-type: none"> • Project Work 	10
	GRAND TOTAL	100

GUIDELINES FOR INTERNAL ASSESSMENT

Classes XI-XII

Total Marks: 20

ALS must be seen as an integrated component of all four language skills rather than a compartment of two. Suggested activities, therefore, take into consideration an integration of the four language skills but during assessment, emphasis will be given to speaking and listening, since reading and writing are already being assessed in the written exam.

Assessment of Listening and Speaking Skills: (5+5=10 Marks)

i. Activities:

- Subject teachers must refer to books prescribed in the syllabus.
- In addition to the above, teachers may plan their own activities and create their own material for assessing the listening and speaking skills.

ii. Parameters for Assessment: The listening and speaking skills are to be assessed on the following parameters:

- a. Interactive competence (Initiation & turn taking, relevance to the topic)
- b. Fluency (cohesion, coherence and speed of delivery)
- c. Pronunciation
- d. Language (grammar and vocabulary)

SUGGESTIVE RUBRICS

	1	2	3	4	5
Interaction	<ul style="list-style-type: none"> • Contributions are mainly unrelated to those of other speakers • Shows hardly any initiative in the development of conversation • Very limited interaction 	<ul style="list-style-type: none"> • Contributions are often unrelated to those of the other speaker • Generally passive in the development of conversation 	<ul style="list-style-type: none"> • Develops interaction adequately, makes however minimal effort to initiate conversation • Needs constant prompting to take turns 	<ul style="list-style-type: none"> • Interaction is adequately initiated and developed • Takes turn but needs some prompting 	<ul style="list-style-type: none"> • Initiates & logically develops simple conversation on familiar topics • Takes turns appropriately
Fluency & Coherence	<ul style="list-style-type: none"> • Noticeably/ long pauses; rate of speech is slow 	<ul style="list-style-type: none"> • Usually fluent; produces simple speech 	<ul style="list-style-type: none"> • Is willing to speak at length, however repetition is 	<ul style="list-style-type: none"> • Speaks without noticeable effort, with a little repetition 	<ul style="list-style-type: none"> • Speaks fluently almost with no repetition & minimal

	<ul style="list-style-type: none"> • Frequent repetition and/or self-correction this is all right in informal conversation • Links only basic sentences; breakdown of coherence evident 	<p>fluently, but loses coherence in complex communication</p> <ul style="list-style-type: none"> • Often hesitates and/or resorts to slow speech • Topics partly developed; not always concluded logically 	<p>noticeable</p> <ul style="list-style-type: none"> • Hesitates and/or self corrects; occasionally loses coherence • Topics developed, but usually not logically concluded 	<ul style="list-style-type: none"> • Demonstrates hesitation to find words or use correct grammatical structures and/or self-correction • Topics not fully developed to merit. 	<p>hesitation</p> <p>Develops topic fully & coherently</p>
Pronunciation	<ul style="list-style-type: none"> • Frequent inaccurate pronunciation • Communication is severely affected 	<ul style="list-style-type: none"> • Frequently unintelligible articulation • Frequent phonological errors • Major communication problems 	<ul style="list-style-type: none"> • Largely correct pronunciation & clear articulation except occasional errors 	<ul style="list-style-type: none"> • Mostly correct pronunciation & clear articulation • Is clearly understood most of the time; very few phonological errors 	<ul style="list-style-type: none"> • Pronounces correctly & articulates clearly • Is always comprehensible • uses appropriate intonation
Vocabulary & Grammar	<ul style="list-style-type: none"> • Demonstrates almost no flexibility, and mostly struggles for appropriate words • Many Grammatical errors impacting communication 	<ul style="list-style-type: none"> • Is able to communicate on some of the topics, with limited vocabulary. • Frequent errors, but self- corrects 	<ul style="list-style-type: none"> • Is able to communicate on most of the topics, with limited vocabulary. A few grammatical errors 	<ul style="list-style-type: none"> • Is able to communicate on most of the topics with appropriate vocabulary • Minor errors that do not hamper communication 	<ul style="list-style-type: none"> • Is able to communicate on most of the topics using a wide range of appropriate vocabulary, using new words and expression • No grammatical errors

iii. Schedule:

- The practice of listening and speaking skills should be done throughout the academic year.
- The final assessment of the skills is to be done as per the convenience and schedule of the school.

Project Work + Viva: 10 Marks

Out of ten marks, 5 marks will be allotted for the project report/script /essay etc. and 5 marks for the viva

I. Schedule:

- Schools may refer to the suggestive timeline given in these guidelines for the planning, preparation and viva-voce of ALS based projects.
- The final assessment of the skills may be done on the basis of parameters suggested by the Board. Language teachers, however, have the option to adopt/ modify these parameters according to their school specific requirements.

II. Suggestions for Project Work:

- The Project can be inter-disciplinary in theme. The ideas/issues highlighted in the chapters/ poems/ drama given the prescribed books can also be developed in the form of a project. Students can also take up any relevant and age-appropriate theme.
- Such topics may be taken up that provide students with opportunities for listening and speaking. Some suggestions are as follows:

a) Interview-Based research:

Example:

- Students can choose a topic on which to do their research/ interview, e.g. a student can choose the topic: “Evolving food tastes in my neighbourhood” or “Corona pandemic and the fallout on families.” Read the available literature.
 - The student then conducts interviews with a few neighbours on the topic. For an interview, with the help of the teacher, student will frame questions based on the preliminary research/background.
 - The student will then write an essay/ write up / report etc. up to 1000 words on his/her research and submit it. He/ She will then take a viva on the research project. The project can be done in individually or in pairs/ groups
- b) Students listen to podcasts/ interviews/radio or TV documentary on a topic and prepare a report countering or agreeing with the speakers. Write an 800 - 1000 words report and submit. Take a viva on the report.
- c) Students create their own video/ Audio, after writing a script. Before they decide a format, the following elements can be taken into consideration:
- Theme/topic of the audio / video. Would the child like to pick a current issue or something artistic like theatre?
 - What are the elements that need to be part of the script?
 - Will the video/audio have an interview with one or more guests?

- Would they prefer to improvise while chatting with guests, or work from a script?
- What would be the duration?
- How would they present the script/report to the teacher? Can it be in the form of a narrative?

d) Students write, direct and present a theatrical production, /One act play

This will be a project which will be done as a team. It will involve planning, preparation and presentation. In short, various language skills will be utilised. There will be researching, discussion, writing the script, auditioning and ultimately producing the play. The project will end with a presentation and subsequently a viva. Teachers will be able to assess the core language skills of the students and help them grow as 21st century critical thinkers.

II. Instructions for the Teachers: -

1. Properly orient students about the Project work, as per the present Guidelines.
2. Facilitate the students in the selection of theme and topic.
3. Create a rubric for assessment and share with the students before they start so that they know the parameters of assessment:
 - Teachers need to familiarize themselves with the method of assessing students with the rubric-- a table with different criteria and a grading scale.
 - Choose the criteria on which you will grade students and list them along the left side of the page.
 - Create an even number of columns along the top of the page. These columns will represent potential skill levels of the students.
 - Assessing students on four/five criteria is an easy way to begin. For each criterion, define the ability that student would exhibit at each of the levels.
 - The more detailed you make your criteria, the easier it will be to evaluate each student and define the level at which the student is presenting.

{Sample Rubric is attached at the end for reference}

III. Parameters for Overall Assessment: -

1. Pronunciation:

- When evaluating the pronunciation of the students, teachers must listen for clearly articulated words, pronunciation of unusual spellings and intonation.
- Assess the students for the pronunciation skills and determine at which level the student needs improvement.

2. Vocabulary:

After noting their pronunciation levels, evaluate the students on the use of extensive and appropriate **vocabulary** during the viva. Check if students are using vocabulary appropriate to the context about which they are speaking.

3. Accuracy:

Grammar has always been an important component of language skills. As students speak/ answer the questions during the viva, listen to their **grammatical structures**. *Are they competent enough to use multiple tenses? Is their word order correct in a given sentence? An effective speaker will automatically use the correct grammatical structures of his language.*

4. Communication:

Assessing the **communication skills** of the students means looking at more than language. Look at how creatively students use the language to make their points understood. Students with a low level of vocabulary and grammar may still have good communication skills if they are able to make the teacher understand their point of view.

5. Interaction:

- During the viva teachers need to ask the students some questions. Questions need to be based on the projects that have been suggested or chosen by the students.
- It is imperative for a teacher to read the essays/project reports before they can be ready to ask questions.
- Teachers need to observe how students answer the questions that are posed to them: *Are they able to understand and answer questions independently or can they answer only when the questions are translated into simpler words or repeated? Are they able to give appropriate responses in a conversation?*
- These elements of **interaction** are necessary for clear and effective communication. A student with effective interaction skills will be able to answer questions with relative ease and follow the flow of conversation.

6. Fluency:

- Fluency may be the easiest quality to judge in the students' speech: *How comfortable are they as they speak and express themselves? How easily do the words come out? Are there inappropriate pauses and gaps in the way a student speaks?*
- **Fluency** is a judgement of this communication and is an important criterion when evaluating speaking skills. These criteria: pronunciation, vocabulary, accuracy, interaction and fluency are all the hallmarks of a student's overall speaking abilities.
- Teachers must also remember that some **students may excel in one area and struggle in another**. Helping the students understand these issues will enable them to become effective speakers in future. Let your students know that you will be assessing them in these various areas when you evaluate their progress and encourage them to work and improve in these areas.
- **Finally**, teachers must remember that a proper evaluation of the students will take into consideration **more than just one oral interview on the final ASL project**. Teachers must take note of a student's progress throughout the academic year.

IV. Project-Portfolio/ Project Report

The **Project-Portfolio/Project Report** is a compilation of the work that the students produce during the process of working on their ALS Project.

The Project-Portfolio may include the following:

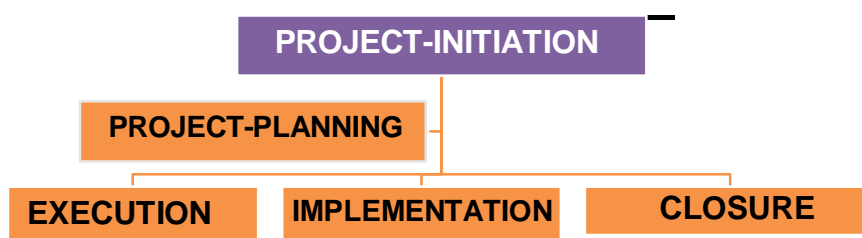
- Cover page, with title of project, school details/details of students.
- Statement of purpose/objectives/goals
- Certificate of completion under the guidance of the teacher.
- Students Action Plan for the completion of assigned tasks.
- Materials such as scripts for the theatre/role play, questionnaires for interview, written assignments, essays, survey-reports and other material evidence of learning progress and academic accomplishment.
- The 800-1000 words essay/Script/Report.
- Student/group reflections.
- If possible, Photographs that capture the positive learning experiences of the student(s).
- List of resources/bibliography

The following points must be kept for consideration while assessing the project portfolios:

- Quality of content of the project
- Accuracy of information
- Adherence to the specified timeline
- Content in respect of (spellings, grammar, punctuation)
- Clarity of thoughts and ideas
- Creativity
- Contributions by group members
- Knowledge and experience gained

V. Suggestive Timeline:

The FIVE Steps in Project Plan



Month	Objectives
<p>Planning and Research for the Project Work</p> <p>Preferably till November-December</p>	<ul style="list-style-type: none"> • Teachers plan a day to orient students about the ALS projects, details are shared with all stakeholders. • Students choose a project, select team members and develop project- plan. • Group meets (preferably online) and reports to the team leader about the progress: shortfalls and successes are detailed. • Team leader apprises teacher-mentor. • Students working individually or in pairs also update the teachers. • A logical, deliverable and practical plan is drafted by the team/ pair/individual. Goals/objectives are clearly defined for all. • Work is delegated to team members by the team leader. Students wishing to work alone develop their own plan of Action. • Detailed project schedules are shared with the teacher.
<p>December- January</p>	<ul style="list-style-type: none"> • Suggestions and improvements are shared by the teacher, wherever necessary. • Group members coordinate and keep communication channels open for interaction. • Gaps (if any) are filled with the right skill sets by the Team Leader/ individual student. • The final draft of the project portfolio/ report is prepared and submitted for evaluation.
<p>January-February</p>	<ul style="list-style-type: none"> • Students are assessed on their group/pair/individual presentations on allotted days. Final Viva is conducted by the External/Internal examiner.
<p>February-March or as per the timelines given by the Board</p>	<ul style="list-style-type: none"> • Marks are uploaded on the CBSE website.

**SAMPLE RUBRIC FOR ALS Project Work (For Theatre/Role Play/Oral presentation/
Interview/ Podcast)**

CATEGORY	1	2	3	4	5
TIME LIMIT	Presentation is less than or more than 5 minutes long	Presentation exceeded or less than specified time limit by 4 to 5 minutes	Presentation exceeded or less than specified time limit by 3 to 4 minutes	Presentation exceeded or less than specified time limit by 2 to 3 mins	Student/ group adhered to the given time limit
CONTENT/ SCRIPT/ QUESTIONNAIRE	Script is not related to topic or issue	Well written script/content shows little understanding of parts of topic	Well written script/content shows good understanding of parts of topic	Well written script/content shows a good understanding of subject topic	Well written script/content shows full understanding of subject topic
CREATIVITY	No props/ costumes/ stage presentation lack-lustre	Some work done, average stage set-up and costumes	Well organized presentation, could have improved	Logical use of props, reasonable work done, creative	Suitable props /effort seen/ considerable work done/ Creative and relevant costumes
PREPAREDNESS	Student/ group seems to be unprepared	Some visible preparedness but Rehearsal is lacking	Somewhat prepared, rehearsal is lacking	Good preparedness but need better rehearsal	Complete Preparedness /rehearsed presentation
CLARITY OF SPEECH	Lack of clarity in presentation many words mis-pronounced	Speaks clearly some words are mis-pronounced	Speaks clearly 90% of the time/ a few mis-pronounced words	Speaks clearly and distinctly 95% of time/ Few mis-pronounced words	Speaks clearly distinctly 95% of time/ fluency in pronunciation
USE OF PROPS (Theatre/Role Play)	Only 1/no relevant props used Very little use of facial expressions /body language, Does not generate much interest	1 to 2 relevant props used Little Use of facial expressions and body language	2 to 3 relevant props used Facial expressions and body language is used to try to generate some enthusiasm	3 to 4 relevant props used Facial expression and body language sometimes generate enthusiasm with the topic	4 to 5 relevant props used Facial expression and body language generate enthusiasm with the topic
PORTFOLIO- PRESENTATION	Inadequate & unimpressive	Somewhat suitable & convincing	Adequate & relevant	Interesting, enjoyable & relevant	Brilliant, creative& exceptional

ENGLISH ELECTIVE
Subject Code-001
Classes-XI-XII (2026-27)

Background

The course is intended to give students a higher level of competence in English with an emphasis on the study of literary texts. The course will provide extensive exposure to a variety of rich texts of world literature as well as Indian writings in English, including classics; develop sensitivity to the creative and imaginative use of English Language and give them a taste for reading with delight and discernment. The course is primarily designed to equip the students to pursue higher studies in English literature and English language at the college level.

The general objectives are to:

- i. provide extensive exposure to a variety of writings in English, including some classicsto develop sensitivity to literary and creative uses of the language.
- ii. further expand the learners' vocabulary resources through the use of dictionary, thesaurus and encyclopedia.
- iii. develop a taste for reading with discernment and delight.
- iv. critically examine a text and comment on its different aspects.
- v. develop proficiency in English Language, in both receptive and productive skills.
- vi. grasp the global meaning of the text, its gist and understand how its theme and sub-themes relate.
- vii. relate to the details provided in the text. For example, how the details support a generalisation or the conclusion either by classification or by contrast and comparison.
- viii. comprehend details, locate and identify facts, arguments, logical relationships, generalisation and conclusion, in the texts.
- ix. draw inferences, supply missing details, predict outcomes, grasp the significance of particular details and interpret texts.
- x. assess and analyse the point of view of the author.
- xi. infer the meanings of words and phrases from the context; differentiate between apparent synonyms.
- xii. appreciate stylistic nuances, the lexical structure; its literal and figurative uses and analyse a variety of texts.
- xiii. identify different styles of writing like humorous, satirical, contemplative, ironical and burlesque.
- xiv. can produce text-based writing (writing in response to questions or tasks based on prescribed as well as 'unseen' texts)

- xv. develop the advanced skills of inferring, analysing, reasoning, evaluating and creating.
- xvi. develop familiarity with the poetic uses of language including features of the language through which artistic effect is achieved.

Methods and Techniques

The techniques used for teaching should promote habits of self-learning and reduce dependence on the teacher.

- The multi-skill, learner-centric, activity-based approach already recommended for the previous stages of education, is still in place, though it will be used in such a way that silent reading of prescribed selected texts for comprehension will receive greater focus as one of the activities.
- Learners will be trained to read independently and intelligently, interacting actively with texts and other reference materials (dictionary, thesaurus, encyclopedia, etc.) where necessary.
- Some pre-reading activity will generally be required, as suggested in the course books.
- The reading of texts should be followed by post reading activities. It is important to remember that every text can generate different reading strategies.
- Students should be encouraged to interpret texts in different ways, understand the views of others and present their views on a literary text.
- Some projects may be assigned to students from time to time, for instance, students may be asked to put together a few literary pieces on a given theme, so as to create a meaningful singular hold.

ENGLISH ELECTIVE

Class-XII (2026-27)

Section A

I. Reading Comprehension

20 Marks

This section will have two unseen passages and a poem:

1. 12 Multiple Choice Questions / Objective Type Questions, out of 15, from a literary or discursive passage, of about 950-1000 words to assess comprehension, interpretation, inference, analysis, appreciation and vocabulary. **1x12 =12 marks**
2. 4 out of 5 multiple choice questions / Objective Type Questions, to test interpretation, inference and appreciation of a poem of about 10-12 lines. **1x4=4 marks**
3. 4 out of 5 multiple choice questions / Objective Type Questions, from a case-based factual passage (with visual input- statistical data, chart etc.), of 100-120 words to test interpretation, analysis and evaluation. **1x4= 4 marks**

Section B

II. Applied Grammar

8 Marks

4. Eight multiple choice questions / Objective Type Questions, out of ten, involving transformation of sentences. **1x8=8 marks**

III. Creative Writing

20 Marks

5. Three Long Writing Tasks, out of four, to be answered in 120-150 words each as discursive and interpretative writing. **5x3=15 marks**
6. One Long Writing Task out of two to be answered in 120-150 words: An essay on an argumentative/discursive topic such as an article/report/speech pertaining to contemporary topics/issues. **5x1=5 marks**

Section C

This section will have variety of assessment items including Multiple Choice Questions, Objective Type Questions, Short Answer Type Questions and Long Answer Type Questions to assess comprehension, analysis, interpretation and extrapolation beyond the text.

IV. Textbook

22 Marks

7. Reference to the Context

- i. One Prose extract, out of two, to assess literary appreciation and analysis. **6x1=6 marks**
- ii. One Poetry extract, out of two, to assess literary appreciation and analysis. **6x1=6 marks**

8. One Short Answer Question, out of two, to be answered in 30-40 words, to assess Understanding, analysis and critical appreciation. Questions should elicit inferential responses through critical thinking. **2x1=2 marks**
9. One Short Answer Question, out of two, to be answered in 40-50 words, to assess understanding, analysis and critical appreciation. Questions should elicit inferential responses through critical thinking and draw inferences in poetry and prose. **3x1=3marks**
10. One Long Answer Question, out of two, to be answered in 120-150 words each, to assess deeper understanding, interpretation, appreciation and drawing inferences. Questions to elicit creative responses and assess ability to form personal points of view. **5x1=5 Marks**

Fiction

10 Marks

11. One Short Answer Question, out of two, to be answered in 30-40 words, to test understanding and appreciation and seek comments, interpretation, evaluation and appreciation of characters, events, episodes and interpersonal relationships. **12x1=2 marks**
12. One Short Answer Question, out of two, to be answered in 40-50 words, to test understanding and appreciation and seek comments, interpretation, evaluation and appreciation of characters, events, episodes and interpersonal relationships. **3x1=3 marks**
13. One Long Answer Question, out of two, to be answered in 120-150 words, to test in-depth understanding, interpretation, appreciation and drawing of global inferences from the given text, with reference to characters /events/ incidents and episodes, leading to creative rendering, forming and defending of personal points of view. **5x1=5 marks**

Note-Students can select one of the two prescribed texts.

V. Seminar

20 Marks

- Presentation - book review /a play /a short story/a novel/novella (tale, fable, parable) to be followed by a question-answer session.
- Poetry reading to be followed by interpretative tasks based on close reading and literary analysis of the text. Critical review of a film or a play
- Conducting a theatre workshop to be followed by a discussion

Prescribed Books:

1. Kaleidoscope - Text book published by NCERT

Short Stories

- I Sell my Dreams
- Eveline
- A Wedding in Brownsville

Poetry

- A Lecture Upon the Shadow
- Poems by Milton
- Poems by Blake
- Kubla Khan
- Trees
- The Wild Swans of Coole
- Time and Time Again

Non fiction

- Freedom
- The Mark on the Wall
- Film-making
- Why the Novel Matters
- The Argumentative Indian

Drama

- Chandalika- RABINDRANATH TAGORE

2. Fiction

A Tiger for Malgudi

OR

The Financial Expert by R.K. Narayan (Novel)

English Elective
Question Paper Design
Class-XII (2026-27)

Marks - 80+20=100

Section	Competencies	Total marks	% Weightage
Reading Comprehension	Conceptual understanding, decoding, Analyzing, inferring, interpreting, appreciating, literary, conventions and vocabulary, summarizing and using appropriate format/s	20	25%
Applied Grammar	Applying appropriate language conventions comprehension using structures interactively, application, accuracy	8	10%
Creative Writing	Reasoning, appropriate style and tone, using appropriate format and fluency, inference, analysis, evaluating, creativity with Fluency.	20	25%
Textbook	Recalling, reasoning, appreciating literary convention, inference, analysis, creativity with fluency	22	27.5%
Fiction	Recalling, reasoning, appreciating literary conventions, illustrating with relevant quotations from the text, inferring, analyzing, evaluating and creating, giving opinions, justifying with fluency	10	12.50%
	TOTAL	80	100%
Seminar	Seeking information and clarifying, illustrating with relevant quotations from the texts, reasoning, diction, articulation clarity of pronunciation, using appropriate language conventions Addressing participants using appropriate titles or nomenclatures and overall fluency	20	
	Grand Total	100	

BIOLOGY
Subject Code – 044
Classes XI - XII (2026–27)

The present curriculum provides the students with updated concepts along with an extended exposure to contemporary areas of the subject. The curriculum also aims at emphasizing the underlying principles that are common to animals, plants and microorganisms as well as highlighting the relationship of Biology with other areas of knowledge. The format allows a simple, clear, sequential flow of concepts. It links the discoveries and innovations in biology to everyday life such as environment, industry, health and agriculture. The Biology curriculum is expected to enable the students to:

- develop capacities for observation, experimentation, documentation, and familiarity with quantitative reasoning and multi-disciplinary approaches.
- engender sensitivity towards biological issues (environment, health) in their surroundings and be aware of how citizens can contribute to their local communities and to science.
- be aware of bioethical concerns that arise in biology today.
- understand the integration of different fields of biology and highlight the interconnections between these fields.
- be exposed to diverse careers in the life sciences.

This curriculum of Biology will help in achieving the following curricular goals and competencies delineated in the National Curriculum Framework for School Education 2023:

<p>CG-3</p> <p>Explores the structure and function of the living world at the cellular level</p>	<p>C-3.1 Explains the role of cellular components (nucleus, mitochondria, endoplasmic reticulum, vacuoles, chloroplast, cell wall), including the semi permeability of cell membrane in making cell the structural basis of living organisms and functional basis of life processes</p> <p>C-3.2 Analyses similarities and differences in the life processes involved in nutrition (photosynthesis in plants; absorption of nutrients in fungi; digestion in animals), transport (transport of water in plants; circulation in animals), exchange of materials (respiration and excretion), and reproduction</p> <p>C-3.3 Describes mechanisms of heredity (in terms of DNA, genes, chromosomes) and variation (as changes in the sequence of DNA)</p>
<p>CG-4</p> <p>Explores interconnectedness between organisms and their</p>	<p>C-4.1 Applies the knowledge of cellular diversity in organisms along with the ecological role organisms play (autotrophic/heterotrophic nutrition) to classify them into five-kingdoms</p>

environment	<p>C-4.2 Illustrates different levels of organisations of living organisms (from molecules to organisms)</p> <p>C-4.3 Analyses different levels of biological organisation from organisms to ecosystems and biomes along with interactions that take place at each level</p> <p>C-4.4 Analyses patterns of inheritance of traits in terms of Mendel's laws and its consequences at a population level (using models and/or simulations)</p> <p>C-4.5 Analyses evidences of biological evolution demonstrating the consequences of the process of natural selection in terms of changes — in allele frequency in population, structure, and function of organisms</p>
CG-5 Draws linkages between scientific knowledge and knowledge across other curricular areas	C-5.3 Applies scientific principles to explain phenomena in other subjects (sound pitch, octave, and amplitude in music; use of muscles in dance form and sports)
CG-6 Understands and appreciates the contribution of India through history and the present times to the overall field of Science, including the disciplines that constitute it	C-6.1 Knows and explains the significant contributions of India to all matters (concepts, explanations, methods) that are studied within the curriculum in an integrated manner
CG-7 Develops awareness of the most current discoveries, ideas, and frontiers in all areas of scientific knowledge in order to appreciate that Science is ever evolving, and that there are still many unanswered questions	<p>C-7.1 States concepts that represent the most current understanding of the matter being studied — ranging from mere familiarity to conceptual understanding of the matter as appropriate to the developmental stage of the students</p> <p>C-7.2 States questions related to matters in the curriculum for which current scientific understanding is well-recognised to be inadequate</p>
CG-8 Explores the nature of Science by doing Science	<p>C-8.1 Develops accurate and appropriate models (including geometric, mathematical, graphical) to represent real-life events and phenomena using scientific principles and use these models to manipulate variables and predict results</p> <p>C-8.2 Designs and implements a plan for scientific inquiry (formulates hypotheses, makes predictions, identifies variables, accurately uses scientific instruments, represents data — primary and secondary — in multiple modes, draws inferences based on data and understanding of scientific concepts, theories, laws, and principles, communicates findings using scientific terminology)</p>

It is expected that the students would get an exposure to various branches of Biology in the curriculum in a more contextual and systematic manner as they study its various units. (NCFSE-2023)

Attainment of the competencies shall be done through transaction of the curriculum using appropriate pedagogy; these shall be assessed through an integrated evaluation scheme.

**COURSE STRUCTURE
CLASS XI (2026-27)
(THEORY)**

Time: 03 Hours

Max. Marks: 70

Unit	Title	Marks
I	Diversity of Living Organisms	15
II	Structural Organization in Plants and Animals	10
III	Cell: Structure and Function	15
IV	Plant Physiology	12
V	Human Physiology	18
	Total	70

Unit-I Diversity of Living Organisms

Chapter-1: The Living World

Biodiversity; Need for classification; three domains of life; taxonomy and systematics; concept of species and taxonomical hierarchy; binomial nomenclature

Chapter-2: Biological Classification

Five kingdom classification; Salient features and classification of Monera, Protista and Fungi into major groups; Lichens, Viruses and Viroids.

Chapter-3: Plant Kingdom

Classification of plants into major groups; Salient and distinguishing features and a few examples of Algae, Bryophyta, Pteridophyta, Gymnospermae and Angiosperms.

Chapter-4: Animal Kingdom

Salient features and classification of animals, non-chordates up to phyla level and chordates upto class level (salient features and at a few examples of each category).

(No live animals or specimen should be displayed.)

Unit-II Structural Organization in Plants and Animals

Chapter-5: Morphology of Flowering Plants

Morphology of different parts of flowering plants: root, stem, leaf, inflorescence, flower, fruit and seed. Description of family Solanaceae

COURSE STRUCTURE
CLASS XII (2026 - 27)
(THEORY)

Time: 03 Hours

Max. Marks: 70

Unit	Title	Marks
VI	Reproduction	16
VII	Genetics and Evolution	20
VIII	Biology and Human Welfare	12
IX	Biotechnology and its Applications	12
X	Ecology and Environment	10
	Total	70

Unit-VI Reproduction

Chapter-1: Sexual Reproduction in Flowering Plants

Flower structure; development of male and female gametophytes; pollination - types, agencies and examples; out breeding devices; pollen-pistil interaction; double fertilization; post fertilization events - development of endosperm and embryo, development of seed and formation of fruit; special modes- apomixis, parthenocarpy, polyembryony; Significance of seed dispersal and fruit formation.

Chapter-2: Human Reproduction

Male and female reproductive systems; 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).

Chapter-3: 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).

Unit-VII Genetics and Evolution

Chapter-4: 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; chromosome theory of inheritance; chromosomes and genes; Sex determination - in humans, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorders in humans - thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

Chapter-5: 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; Genome, Human and rice genome projects; DNA fingerprinting.

Chapter-6: Evolution

Origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences); Darwin's contribution, modern synthetic theory of evolution; mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy- Weinberg's principle; adaptive radiation; human evolution.

Unit-VIII: Biology and Human Welfare

Chapter-7: Human Health and Diseases

Pathogens; parasites causing human diseases (malaria, dengue, chikungunya, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse.

Chapter-8: Microbes in Human Welfare

Microbes in food processing, industrial production, sewage treatment, energy generation and microbes as bio-control agents and bio-fertilizers. Antibiotics; production and judicious use.

Unit-IX Biotechnology and its Applications

Chapter-9: Biotechnology - Principles and Processes

Genetic Engineering (Recombinant DNA Technology).

Chapter-10: Biotechnology and its Applications

Application 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 patents.

Unit-X Ecology and Environment

Chapter-11: Organisms and Populations

Population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution.

Chapter-12: Ecosystem

Ecosystems: Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy.

Chapter-13: Biodiversity and its Conservation

Biodiversity-Concept, patterns, importance; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, Sacred Groves, biosphere reserves, national parks, wildlife, sanctuaries and Ramsar sites.

The following topics are included in the syllabus but will be assessed only formatively to reinforce understanding without adding to summative assessments. This reduces academic stress while ensuring meaningful learning. Schools can integrate these with existing chapters as they align well. Relevant NCERT textual material is enclosed for reference.

Environmental Issues (available as a part of CBSE Reading Material):

Air pollution and its control, Water pollution and its control, Solid Wastes, Agro-chemicals and their effects, Radioactive wastes, Greenhouse effect and global warming, Ozone depletion in the stratosphere, Degradation by improper resource utilization and maintenance, deforestation.

PRACTICALS

Time allowed: 3 Hours

Max. Marks: 30

Evaluation Scheme		Marks
One Major Experiment	5	5
One Minor Experiment	2 & 3	4
Slide Preparation	1 & 4	5
Spotting		7
Practical Record + Viva Voce	(Credit to the student's work over the academic session may be given)	4
Investigatory Project and its Project Record + Viva Voce		5
Total		30

A. List of Experiments

1. Prepare a temporary mount to observe pollen germination.
2. Study the plant population density by quadrat method.
3. Study the plant population frequency by quadrat method.
4. Prepare a temporary mount of onion root tip to study mitosis.
5. Isolate DNA from available plant material such as spinach, green pea seeds, papaya, banana etc.

B. Study and observe the following (Spotting):

1. Flowers adapted to pollination by different agencies (wind, insects, birds).
2. Pollen germination on stigma through a permanent slide or scanning electron micrograph.
3. Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper/mice).
4. Meiosis in onion bud cell or grasshopper testis through permanent slides.
5. T.S. of blastula through permanent slides (Mammalian).
6. Mendelian inheritance using seeds of different colour/sizes of any plant.
7. Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups, ear lobes, widow's peak and colour blindness.
8. Controlled pollination - emasculation, tagging and bagging.
9. Common disease causing organisms like *Ascaris*, *Entamoeba*, *Plasmodium*, any fungus causing ringworm through permanent slides, models or virtual images or specimens. Comment on symptoms of diseases that they cause.

10. Models specimens showing symbiotic association in lichens, root nodules of leguminous plants, and parasitic mode of nutrition shown by *Cuscuta* on host.
11. Flash cards / models showing examples of homologous and analogous organs.

Practical Examination for Visually Impaired Students of Classes XI and XII
Evaluation Scheme

Time: 02 Hours

Max. Marks: 30

Topic	Marks
Identification/Familiarity with the apparatus	5
Written test (Based on given / prescribed practicals)	10
Practical Records	5
Viva	10
Total	30

General Guidelines

- The practical examination will be of two-hour duration. A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.
- The written test will be of 30 minutes duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question paper should be related to the listed practicals. Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.

- Questions may be generated jointly by the external/internal examiners and used for assessment.
- The viva questions may include questions based on basic theory / principle / concept, apparatus / materials / chemicals required, procedure, precautions, sources of error etc.

Class XII

A. Items for Identification/ familiarity with the apparatus for assessment in practicals (All experiments) Beaker, flask, petriplates, soil from different sites - sandy, clayey, loamy, small potted plants, aluminium foil, paint brush, test tubes, starch solution, iodine, ice cubes, Bunsen burner/spirit lamp/water bath, large flowers, Maize inflorescence, model of developmental stages highlighting morula and blastula of frog, beads/seeds of different shapes/size/texture *Ascaris*, Cactus/*Opuntia* (model).

B. List of Practicals

1. Study of flowers adapted to pollination by different agencies (wind, insects).
2. Identification of T.S of morula or blastula of frog (Model).
3. Study of Mendelian inheritance pattern using beads/seeds of different sizes/texture.
4. Preparation of pedigree charts of genetic traits such as rolling of tongue, colour blindness.
5. Study of emasculation, tagging and bagging by trying out an exercise on controlled pollination.
6. Identify common disease causing organisms like *Ascaris* (model) and learn some common symptoms of the disease that they cause.
7. Comment upon the morphological adaptations of plants found in xerophytic conditions.

Note: The above practicals may be carried out in an experiential manner rather than recording observations.

Prescribed Books:

1. Biology, Class-XII, Published by NCERT.
2. Other related books and manuals brought out by NCERT (includes multimedia).
3. Biology Supplementary Material (Revised). Available on CBSE website.
4. Reading Material Biology Class XII.

Question Paper Design (Theory)

Class XII (2026 - 27)

Biology (044)

Competencies	Total
Demonstrate Knowledge and Understanding	50 %
Application of Knowledge / Concepts	30 %
Analyze, Evaluate and Create	20 %

Note:

- Typology of questions: VSA including MCQs, Assertion – Reasoning type questions; SA; LA-I; LA-II; Source-based/ Case-based/ Passage-based/ Integrated assessment questions.
- An internal choice of approximately 33% would be provided.

Suggestive verbs for various competencies

- **Demonstrate, Knowledge and Understanding**
State, name, list, identify, define, suggest, describe, outline, summarize, etc.
- **Application of Knowledge/Concepts**
Calculate, illustrate, show, adapt, explain, distinguish, etc.
- **Analyze, Evaluate and Create**
Interpret, analyse, compare, contrast, examine, evaluate, discuss, construct, etc.

PHYSICS

Subject Code – 042

Class XI-XII (2026-27)

Senior Secondary stage of school education is a stage of transition from general education to discipline-based focus on curriculum. The present updated syllabus keeps in view the rigor and depth of disciplinary approach as well as the comprehension level of learners. Due care has also been taken that the syllabus is comparable to the international standards. Salient features of the syllabus include:

- • Emphasis on basic conceptual understanding of the content.
- • Emphasis on use of SI units, symbols, nomenclature of physical quantities and formulations as per international standards.
- • Providing logical sequencing of units of the subject matter and proper placement of concepts with their linkage for better learning.
- • Reducing the curriculum load by eliminating overlapping of concepts/content within the discipline and other disciplines.
- Promotion of process-skills, problem-solving abilities and applications of Physics concepts.

Besides, the syllabus also attempts to

- Strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject.
- Expose the learners to different processes used in Physics-related industrial and technological applications.
- Develop process-skills and experimental, observational, manipulative, decision making and investigatory skills in the learners.
- Promote problem solving abilities and creative thinking in learners.
- Develop conceptual competence in the learners and make them realize and appreciate the interface of Physics with other disciplines.

CLASS XII (2026-27)**PHYSICS (THEORY)**

Time: 3 hrs.

Max Marks: 70

UNIT	CHAPTERS	MARKS
Unit-I	Electrostatics	16
	Chapter-1: Electric Charges and Fields	
	Chapter-2: Electrostatic Potential and Capacitance	
Unit-II	Current Electricity	17
	Chapter-3: Current Electricity	
Unit-III	Magnetic Effects of Current and Magnetism	18
	Chapter-4: Moving Charges and Magnetism	
	Chapter-5: Magnetism and Matter	
Unit-IV	Electromagnetic Induction and Alternating Currents	18
	Chapter-6: Electromagnetic Induction	
	Chapter-7: Alternating Current	
Unit-V	Electromagnetic Waves	7
	Chapter-8: Electromagnetic Waves	
Unit-VI	Optics	12
	Chapter-9: Ray Optics and Optical Instruments	
	Chapter-10: Wave Optics	
Unit-VII	Dual Nature of Radiation and Matter	7
	Chapter-11: Dual Nature of Radiation and Matter	
Unit-VIII	Atoms and Nuclei	7
	Chapter-12: Atoms	
	Chapter-13: Nuclei	
Unit-IX	Electronic Devices	7
	Chapter-14: Semiconductor Electronics: Materials, Devices and Simple Circuits	
Total		70

Unit I: Electrostatics

Chapter–1: Electric Charges and Fields

Electric charges, Conservation of charge, Coulomb's law-force between two- point charges, forces between multiple charges; 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, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

Chapter–2: Electrostatic Potential 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 polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor (no derivation, formulae only).

Unit II: Current Electricity

Chapter–3: Current Electricity

Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity, temperature dependence of resistance, Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's rules, Wheatstone bridge.

Unit III: Magnetic Effects of Current and Magnetism

Chapter–4: Moving Charges and Magnetism

Concept of magnetic field, Oersted's experiment.

Biot - Savart law and its application to current carrying circular loop.

Ampere's law and its applications to infinitely long straight wire. Straight solenoid (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; Current loop as a magnetic dipole and its magnetic dipole moment, moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter.

Chapter–5: Magnetism and Matter

Bar magnet, bar magnet as an equivalent solenoid (qualitative treatment only), magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis (qualitative treatment only), torque on a magnetic dipole (bar magnet) in a uniform magnetic field (qualitative treatment only), magnetic field lines.

Magnetic properties of materials- Para-, dia- and ferro – magnetic substances with examples, Magnetization of materials, effect of temperature on magnetic properties.

Unit IV: Electromagnetic Induction and Alternating Currents

Chapter–6: Electromagnetic Induction

Electromagnetic induction; Faraday's laws, induced EMF and current; Lenz's Law, Self and mutual induction.

Chapter–7: Alternating Current

Alternating currents, peak and RMS value of alternating current/voltage; reactance and impedance; LCR series circuit (phasors only), resonance, power in AC circuits, power factor, wattless current. AC generator, Transformer.

Unit V: Electromagnetic waves

Chapter–8: Electromagnetic Waves

Basic idea of displacement current, Electromagnetic waves, their characteristics, their transverse nature (qualitative idea only).

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

Unit VI: Optics

Chapter–9: Ray Optics and Optical Instruments

Ray Optics: Reflection of light, spherical mirrors, mirror formula, refraction of light, total internal reflection and optical fibers, refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, magnification, power of a lens, combination of thin lenses in contact, refraction of light through a prism.

Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

Chapter–10: Wave Optics

Wave optics: Wave front and Huygen's principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width (No derivation final expression only), coherent sources and sustained interference of light, diffraction due to a single slit, width of central maxima (qualitative treatment only).

Unit VII: Dual Nature of Radiation and Matter

Chapter–11: Dual Nature of Radiation and Matter

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation-particle nature of light.

Experimental study of photoelectric effect

Matter waves-wave nature of particles, de-Broglie relation.

Unit VIII: Atoms and Nuclei

Chapter–12: Atoms

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model of hydrogen atom, Expression for radius of nth possible orbit, velocity and energy of electron in nth orbit, hydrogen line spectra (qualitative treatment only).

Chapter–13: Nuclei

Composition and size of nucleus, nuclear force

Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear fusion.

Unit IX: Electronic Devices

Chapter–14: Semiconductor Electronics: Materials, Devices and Simple Circuits

Energy bands in conductors, semiconductors and insulators (qualitative ideas only) Intrinsic and extrinsic semiconductors- p and n type, p-n junction

Semiconductor diode - I-V characteristics in forward and reverse bias, application of junction diode -diode as a rectifier.

PRACTICALS

The record to be submitted by the students at the time of their annual examination has to include:

- Record of at least 8 Experiments [with 4 from each section], to be performed by the students.
- Record of at least 6 Activities [with 3 each from section A and section B], to be performed by the students.
- The Report of the project carried out by the students.

Evaluation Scheme

Max. Marks: 30

Time 3 hours

Two experiments one from each section	7+7 Marks
Practical record [experiments and activities]	5 Marks
One activity from any section	3 Marks
Investigatory Project	3 Marks
Viva on experiments, activities and project	5 Marks
Total	30 marks

Experiments

SECTION–A

1. To determine resistivity of two / three wires by plotting a graph for potential difference versus current.
2. To find resistance of a given wire / standard resistor using metre bridge.
3. To verify the laws of combination (series) of resistances using a metre bridge.

OR

To verify the laws of combination (parallel) of resistances using a metre bridge.

4. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
5. To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of desired range and to verify the same.

OR

To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of desired range and to verify the same.

6. To find the frequency of AC mains with a sonometer.

Activities

1. To measure the resistance and impedance of an inductor with or without iron core.
2. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
3. To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.
4. To assemble the components of a given electrical circuit.
5. To study the variation in potential drop with length of a wire for a steady current.
6. To draw the diagram of a given open circuit comprising at least a battery, resistor/rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.

SECTION-B

Experiments

1. To find the value of v for different values of u in case of a concave mirror and to find the focal length.
2. To find the focal length of a convex mirror, using a convex lens.
3. To find the focal length of a convex lens by plotting graphs between u and v or between $1/u$ and $1/v$.
4. To find the focal length of a concave lens, using a convex lens.
5. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
6. To determine refractive index of a glass slab using a travelling microscope.
7. To find the refractive index of a liquid using convex lens and plane mirror.
8. To find the refractive index of a liquid using a concave mirror and a plane mirror.
9. To draw the I-V characteristic curve for a p-n junction diode in forward and reverse bias.

Activities

1. To identify a diode, an LED, a resistor and a capacitor from a mixed collection of such items.
2. Use of multimeter to see the unidirectional flow of current in case of a diode and an LED and check whether a given electronic component (e.g., diode) is in working order.

3. To study effect of intensity of light (by varying distance of the source) on an LDR.
4. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
5. To observe diffraction of light due to a thin slit.
6. To study the nature and size of the image formed by a (i) convex lens, or (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
7. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

Suggested Investigatory Projects

1. To study various factors on which the internal resistance/EMF of a cell depends.
2. To study the variations in current flowing in a circuit containing an LDR because of a variation in
 - (a) the power of the incandescent lamp, used to 'illuminate' the LDR (keeping all the lamps at a fixed distance).
 - (b) the distance of an incandescent lamp (of fixed power) used to 'illuminate' the LDR.
3. To find the refractive indices of (a) water (b) oil (transparent) using a plane mirror, an equiconvex lens (made from a glass of known refractive index) and an adjustable object needle.
4. To investigate the relation between the ratio of (i) output and input voltage and (ii) number of turns in the secondary coil and primary coil of a self-designed transformer.
5. To investigate the dependence of the angle of deviation on the angle of incidence using a hollow prism filled one by one, with different transparent fluids.
6. To estimate the charge induced on each one of the two identical Styrofoam (or pith) balls suspended in a vertical plane by making use of Coulomb's law.
7. To study the factor on which the self-inductance of a coil depends by observing the effect of this coil, when put in series with a resistor/(bulb) in a circuit fed up by an A.C. source of adjustable frequency.
8. To study the earth's magnetic field using a compass needle -bar magnet by plotting magnetic field lines and tangent galvanometer.

**Practical Examination for Visually Impaired Students of
Classes XI and XII Evaluation Scheme**

Time 2 hours

Max. Marks: 30

Identification/Familiarity with the apparatus	5 marks
Written test (based on given/prescribed practicals)	10 marks
Practical Record	5 marks
Viva	10 marks
Total	30 marks

General Guidelines

- The practical examination will be of two-hour duration.
- A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.
- The written test will be of 30 minutes duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question papers should be related to the listed practicals.
- Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.
- Questions may be generated jointly by the external/internal examiners and used for assessment.
- The viva questions may include questions based on basic theory/principle/concept, apparatus/ materials/chemicals required, procedure, precautions, sources of error etc.

Class XII

A. Items for Identification/ familiarity with the apparatus for assessment in practicals (All experiments)

Meter scale, general shape of the voltmeter/ammeter, battery/power supply, connecting wires, standard resistances, connecting wires, voltmeter/ammeter, meter bridge, screw gauge, jockey Galvanometer, Resistance Box, standard Resistance, connecting wires, Potentiometer, jockey, Galvanometer, Leclanche cell, Daniell cell [simple distinction between the two vis-à-vis their outer (glass and copper) containers], rheostat connecting wires, Galvanometer, resistance box, Plug-in and tapping keys, connecting wires battery/power supply, Diode, Resistor (Wire-wound or carbon ones with two wires connected to two ends), capacitors (one or two types), Inductors, Simple electric/electronic bell, battery/power supply, Plug- in and tapping keys, Convex lens, concave lens, convex mirror, concave mirror, Core/hollow wooden cylinder, insulated wire, ferromagnetic rod, Transformer core, insulated wire.

B. List of Practicals

1. To determine the resistance per cm of a given wire by plotting a graph between voltage and current.
2. To verify the laws of combination (series/parallel combination) of resistances by Ohm's law.
3. To find the resistance of a given wire / standard resistor using a meter bridge.
4. To determine the resistance of a galvanometer by half deflection method.
5. To identify a resistor, capacitor, inductor and diode from a mixed collection of such items.
6. To observe the difference between
 - (i) a convex lens and a concave lens
 - (ii) a convex mirror and a concave mirror and to estimate the likely difference between the power of two given convex /concave lenses.
7. To design an inductor coil and to know the effect of
 - (i) change in the number of turns
 - (ii) Introduction of ferromagnetic material as its core material on the inductance of the coil.
8. To design a (i) step up (ii) step down transformer on a given core and know the relation between its input and output voltages.

Note: The above practicals may be carried out in an experiential manner rather than recording observations.

Prescribed Books:

1. Physics, Class XI, Part -I and II, Published by NCERT.
2. Physics, Class XII, Part -I and II, Published by NCERT.
3. Laboratory Manual of Physics for class XII Published by NCERT.
4. The list of other related books and manuals brought out by NCERT (consider multimedia also).

Note:

The content indicated in NCERT textbooks as excluded for the year 2026-27 is not to be tested by schools and will not be assessed in the Board examinations 2026-27.

QUESTION PAPER DESIGN

Theory (Class: XI/XII)

Maximum Marks: 70

Duration: 3 hrs.

S No.	Typology of Questions	Total Marks	Approximate Percentage
1	<p>Remembering: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.</p> <p>Understanding: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas</p>	27	38 %
2	<p>Applying: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.</p>	22	32%
3	<p>Analysing : Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations</p> <p>Evaluating: Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.</p> <p>Creating: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.</p>	21	30%
	Total Marks	70	100
	Practical	30	
	Gross Total	100	

Note:

The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.

For more details kindly refer to Sample Question Paper of class XII for the year 2026-27 to be published by CBSE at its website.

CHEMISTRY
SUBJECT CODE: 043
CLASSES XI-XII (2026-27)

Rationale

The second phase of Secondary stage is the most crucial stage of school education because at this juncture specialised discipline based, content oriented courses are introduced. Students reach this stage after 10 years of general education and opt for Chemistry with a purpose of pursuing their career in basic sciences or professional courses like medicine, engineering, technology and to study courses in applied areas of science and technology at tertiary level. Therefore, there is a need to provide the learners with sufficient conceptual background of Chemistry, which will make them competent to meet the challenges of academic and professional courses after this stage.

The new and updated curriculum is based on a disciplinary approach with rigour and depth ensuring that the syllabus is not heavy and at the same time it is comparable to that at the international level. The pedagogy of Chemistry has undergone tremendous changes in recent times. To keep pace with the developments in Chemistry, many new areas like green chemistry, material science, biomolecules, and industrial chemistry deserve to be an integral part of the chemistry syllabus at this stage. In addition, the nomenclature of elements and compounds; symbols, and units of physical quantities, recommended by scientific bodies like IUPAC and CGPM also need to be incorporated in the updated syllabus. The proposed syllabus takes due care to address these issues.

Objectives

The curriculum of Chemistry at the second phase of Secondary stage has been designed to:

- equip the learners with tools to understand the working of Chemistry rather than mere facts of it;
- develop the necessary conceptual foundations of chemistry and ability to apply them to real life situations;
- enable the learners to represent chemical phenomena at macroscopic, molecular, and symbolic levels;
- make the learners identify patterns and form connections that underlie various chemical phenomena;
- prepare the learners to contribute to frontier research areas related to climate change, environmental issues, materials science, biology and medicine etc.;
- inculcate problem solving skills in the learners and integrate life skills and values in the context of chemistry; and
- apprise learners of the interface of chemistry with other disciplines of science such as physics, biology, geology, engineering etc.

COURSE STRUCTURE
CLASS XII
THEORY

Time: 3 Hours

Total Marks: 70

S. No.	Title	Marks
1	Solutions	7
2	Electrochemistry	9
3	Chemical Kinetics	7
4	d -and f -Block Elements	7
5	Coordination Compounds	7
6	Haloalkanes and Haloarenes	6
7	Alcohols, Phenols and Ethers	6
8	Aldehydes, Ketones and Carboxylic Acids	8
9	Amines	6
10	Biomolecules	7
	Total	70

Unit 1: Solutions

Types of Solutions, Expression of Concentration of Solutions, Solubility, Vapour Pressure of Liquid Solutions, Ideal and Non –Ideal Solutions, Colligative Properties and Determination of Molar Mass, Abnormal Molecular Masses.

Unit 2: Electrochemistry

Electrochemical Cells, Galvanic Cells, Nernst Equation, Conductance of Electrolytic solutions, Electrolytic Cells and Electrolysis, Batteries, Fuel Cells, Corrosion.

Unit 3: Chemical Kinetics

Rate of a Chemical reaction, factors influencing rate of reaction, integrated rate equations, Temperature Dependence of the rate of a reaction, Collision theory of Chemical Reactions

Unit 4: d and f Block Elements

Position in the Periodic Table, Electronic configuration of the d-Block Elements, General properties of the Transition Elements (d-Block), Some Important Compounds of Transition Elements, The Lanthanoids, The Actinoids, Some Applications of d- and f- Block Elements.

Unit 5: Coordination Compounds

Werner's Theory of Coordination Compound, Definition of Some important terms pertaining to Coordination Compounds, Nomenclature of Coordination Compounds. Isomerism in Coordination Compounds, Bonding in coordination compounds, Bonding in Metal Carbonyls, Importance and Applications of Coordination Compounds.

Unit 6: Haloalkanes and Haloarenes

Classification, Nomenclature, Nature of C–X bond, Methods of Preparation of Haloalkanes, Preparation of Haloarenes, Physical Properties, Chemical Reactions, Polyhalogen Compounds.

Unit 7: Alcohols, Phenols and Ethers

Classification, Nomenclature, Structures of Functional Groups, Alcohols and Phenols, Some commercially Important Alcohols, Ethers.

Unit 8: Aldehydes, Ketones and Carboxylic Acids

Nomenclature and Structure of Carbonyl Group, Preparation of Aldehydes and Ketones, Physical Properties and Chemical Reactions, Uses of Aldehydes and Ketones

Nomenclature Structure of Carboxyl Group, Methods of Preparation of Carboxylic Acids, Physical Properties and Chemical Reactions, Uses of Carboxylic Acids.

Unit 9: Amines

Structure of Amines, Classification, Nomenclature, Preparation of Amines, Physical Properties, Chemical Reactions, Methods of Preparation of Diazonium Salts, Physical Properties, Chemical Reactions, Chemical Reactions Importance of Diazonium Salts in Synthesis of Aromatic Compounds.

Unit 10: Biomolecules

Carbohydrates. Proteins, Enzymes, Vitamins Nucleic Acids, Hormones

Note: The following topics are included in the syllabus but will be assessed only formatively to reinforce understanding without adding to summative assessments. This reduces academic stress while ensuring meaningful learning. Schools can integrate these with existing chapters as they align well. Relevant NCERT textual material is enclosed for reference.

1. **Surface Chemistry** - Adsorption - physisorption and chemisorption, factors affecting adsorption of gases on solids, colloidal state distinction between true solutions, colloids and suspension; lyophilic, lyophobic properties of colloids; coagulation, emulsion - types of emulsions.
2. **General Principles and Processes of Isolation of Elements** - Principles and methods of extraction - concentration, oxidation, reduction - electrolytic method and refining
3. **Polymers** – Polymerisation, Homopolymers and copolymer with few examples
4. **Chemistry in Everyday life** - Chemicals in medicines - analgesics, tranquilizers antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines. Chemicals in food - preservatives, artificial sweetening agents, antioxidants.

PRACTICAL

Evaluation Scheme for Examination	Marks
Volumetric Analysis	08
Salt Analysis	08
Content Based Experiment	06
Project Work	04
Class record and viva	04
Total	30

PRACTICAL SYLLABUS

Micro-chemical methods are available for several of the practical experiments, wherever possible such techniques should be used.

A. Surface Chemistry

1. Preparation of one lyophilic and one lyophobic sol
Lyophilic sol - starch, egg albumin and gum
Lyophobic sol – aluminum hydroxide, ferric hydroxide, arsenous sulphide.
2. Dialysis of sol-prepared in (a) above.
3. Study of the role of emulsifying agents in stabilizing the emulsion of different oils.

B. Chemical Kinetics

1. Effect of concentration and temperature on the rate of reaction between Sodium Thiosulphate and Hydrochloric acid.
2. Study of reaction rates of any one of the following:
 - Reaction of Iodide ion with Hydrogen Peroxide at room temperature using different concentration of Iodide ions.
 - Reaction between Potassium Iodate, (KIO_3) and Sodium Sulphate: (Na_2SO_3) using starch solution as indicator (clock reaction).

C. Thermochemistry

Any one of the following experiments

- Enthalpy of dissolution of Copper Sulphate or Potassium Nitrate.
- Enthalpy of neutralization of strong acid (HCl) and strong base (NaOH).
- Determination of enthalpy change during interaction (Hydrogen bond formation) between Acetone and Chloroform.

D. Electrochemistry

Variation of cell potential in $Zn/Zn^{2+} || Cu^{2+}/Cu$ with change in concentration of electrolytes ($CuSO_4$ or $ZnSO_4$) at room temperature.

E. Chromatography

1. Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R_f values.
2. Separation of constituents present in an inorganic mixture containing two cations only (constituents having large difference in R_f values to be provided).

F. Preparation of Inorganic Compounds

1. Preparation of double salt of Ferrous Ammonium Sulphate or Potash Alum.
2. Preparation of Potassium Ferric Oxalate.

G. Preparation of Organic Compounds

Preparation of any one of the following compounds

1. Acetanilide
2. Di-benzal acetone
3. p-Nitroacetanilide
4. Aniline yellow or 2 - Naphthol Aniline dye.

H. Tests for the functional groups present in organic compounds

Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (Primary) groups.

I. Characteristic tests of carbohydrates, fats and proteins in pure samples and their detection in given foodstuffs.

J. Determination of concentration/ molarity of $KMnO_4$ solution by titrating it against a standard solution of:

1. Oxalic acid,
2. Ferrous Ammonium Sulphate
(Students will be required to prepare standard solutions by weighing themselves).

K. Qualitative analysis

Determination of one anion and one cation in a given salt

Cations: $Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Mn^{2+}, Ni^{2+}, Zn^{2+}, Co^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+$

Anions: $CO_3^{2-}, S^{2-}, SO_3^{2-}, NO_3^-, NO_2^-, Cl^-, Br^-, I^-, SO_4^{2-}, PO_4^{3-}, CH_3COO^-, C_2O_4^{2-}$

(Note: Insoluble salts excluded)

PROJECTS

Scientific investigations involving laboratory testing and collecting information from other sources.

A few suggested Projects

- a) Study of the presence of oxalate ions in guava fruit at different stages of ripening.
- b) Study of quantity of casein present in different samples of milk.
- c) Preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.
- d) Study of the effect of Potassium Bisulphate as food preservative under various conditions (temperature, concentration, time, etc.)
- e) Study of digestion of starch by salivary amylase and effect of pH and temperature on it.
- f) Comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice, etc.
- g) Extraction of essential oils present in Saunf (aniseed), Ajwain (carom), Illaichi (cardamom).
- h) Study of common food adulterants in fat, oil, butter, sugar, turmeric powder, chili powder and pepper.

Note: Any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.

Practical Examination for Visually Challenged Learners Classes XI and XII

Evaluation Scheme	Marks
Identification/Familiarity with the apparatus	5
Written test (based on given/prescribed practical's)	10
Practical Record	5
Viva	10
Total	30

General Guidelines

- The practical examination will be of two-hour duration.
- A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.
- The written test will be of 30 minutes' duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question papers should be related to the listed practicals
- Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.
- Questions may be generated jointly by the external/internal examiners and used for assessment.
- The viva questions may include questions based on basic theory/principle/concept, apparatus/materials/ chemicals required, procedure, precautions, sources of error etc.

List of apparatus for identification/familiarity for assessment in practical (All experiments)

Beaker, glass rod, tripod stand, wire gauze, Bunsen burner, Whatman filter paper, gas jar, capillary tube, pestle and mortar, test tubes, tongs, test tube holder, test tube stand, burette, pipette, conical flask, standard flask, clamp stand, funnel, filter paper.

Hands-on Assessment

- Identification/familiarity with the apparatus
- Odour detection in qualitative analysis

List of Experiments

The experiments have been divided into two sections: Section A and Section B. The experiments mentioned in Section B are mandatory.

SECTION A

A. Surface Chemistry

1. Preparation of one lyophilic and one lyophobic sol
 - i. Lyophilic sol - starch, egg albumin and gum
 - ii. Lyophobic sol – Ferric hydroxide

B. Chromatography

Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R_f values (distance values may be provided).

C. Tests for the functional groups present in organic compounds

1. Alcoholic and Carboxylic groups
2. Aldehyde and Ketonic groups

D. Characteristic tests of carbohydrates and proteins in the given foodstuffs.

E. Preparation of Inorganic Compounds- Potash Alum

SECTION B (Mandatory)

F. Quantitative analysis

1. (a) Preparation of a given volume of the standard solution of Oxalic acid.
(b) Determination of molarity of KMnO₄ solution by titrating it against a standard solution of Oxalic acid.
2. The above exercise [F 1 (a) and (b)] to be conducted using Ferrous ammonium sulphate (Mohr's salt)

G. Qualitative Analysis

Determination of one anion and one cation in a given salt

Cation - NH₄⁺

Anions: CO₃²⁻, S²⁻, SO₃²⁻, , Cl⁻, CH₃COO⁻

(Note: insoluble salts excluded)

Note: *The above practical may be carried out in an experiential manner rather than recording observations.*

Prescribed Books:

1. Chemistry Part – I, Class-XII, Published by NCERT.
2. Chemistry Part – II, Class-XII, Published by NCERT.
3. Manual of Microscale Chemistry Laboratory Kit, Published by NCERT.

Links for NCERT textbooks:

1. <https://ncert.nic.in/textbook.php?lech1=0-5>
2. <https://ncert.nic.in/textbook.php?lech2=0-5>
3. https://ncert.nic.in/division/dek/pdf/Manual_01.pdf

QUESTION PAPER DESIGN CLASSES XI & XII

S. No	Domains	Total Marks	%
1	Remembering and Understanding: Exhibit memory of previously learned material by recalling facts, terms, basic concepts and answers. Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions and stating main ideas.	28	40
2	Applying: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	21	30
3	Analysing, Evaluating and Creating: Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations. Present and defend opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria. Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.	21	30

1. No chapter wise weightage is provided, however, care to be taken to cover all the chapters.
2. Suitable internal variations may be made for generating various templates.
3. There will be no overall choice in the question paper.
4. However, 33% internal choices will be given in all the sections.

Mathematics
Subject Code – 041
Classes XI-XII (2026 – 27)

The Syllabus in the subject of Mathematics has undergone changes from time to time in accordance with growth of the subject and emerging needs of the society. Senior Secondary stage is a launching stage from where the students go either for higher academic education in Mathematics or for professional courses like Engineering, Physical and Biological science, Commerce or Computer Applications. The present revised syllabus has been designed in accordance with National Curriculum Framework 2005 and as per guidelines given in Focus Group on Teaching of Mathematics 2005 which is to meet the emerging needs of all categories of students. Motivating the topics from real life situations and other subject areas, greater emphasis has been laid on application of various concepts.

Objectives

The broad objectives of teaching Mathematics at senior school stage intend to help the students:

- to acquire knowledge and critical understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles, symbols and mastery of underlying processes and skills.
- to feel the flow of reasons while proving a result or solving a problem.
- to apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method.
- to develop positive attitude to think, analyze and articulate logically.
- to develop interest in the subject by participating in related competitions.
- to acquaint students with different aspects of Mathematics used in daily life.
- to develop an interest in students to study Mathematics as a discipline.
- to develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of gender biases.
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.

COURSE STRUCTURE

CLASS – XII

(2026-27)

One Paper

Max. Marks: 80

No.	Units	Marks
I.	Relations and Functions	08
II.	Algebra	10
III.	Calculus	35
IV.	Vectors and Three - Dimensional Geometry	14
V.	Linear Programming	05
VI.	Probability	08
	Total	80
	Internal Assessment	20

Unit-I: Relations and Functions

1. Relations and Functions

Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

2. Inverse Trigonometric Functions

Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions.

Unit-II: Algebra

1. Matrices

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non- commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

2. Determinants

Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Unit-III: Calculus

1. Continuity and Differentiability

Continuity and differentiability, chain rule, derivative of composite functions, derivatives of inverse trigonometric functions like $\sin^{-1} x$, $\cos^{-1} x$ and $\tan^{-1} x$, 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.

2. Applications of Derivatives

Applications of derivatives: rate of change of quantities, increasing/decreasing functions, 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- life situations).

3. 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.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}, \int \frac{px + q}{ax^2 + bx + c} dx,$$
$$\int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx, \int \sqrt{x^2 - a^2} dx, \int \sqrt{ax^2 + bx + c} dx$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

4. Application of the Integrals

Applications in finding the area under simple curves, especially lines, circles/ parabolas/ellipses (in standard form only)

5. Differential Equations

Definition, order and degree, general and particular solutions of a differential equation. 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:

$$\frac{dy}{dx} + py = q, \text{ where } p \text{ and } q \text{ are functions of } x \text{ or constants.}$$

$$\frac{dx}{dy} + px = q, \text{ where } p \text{ and } q \text{ are functions of } y \text{ or constants.}$$

Unit-IV: Vectors and Three-dimensional Geometry

1. 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, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

2. Three-dimensional Geometry

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, skew lines, shortest distance between two lines. Angle between two lines.

Unit-V: Linear Programming Problem

1. Linear Programming

Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Unit-VI: Probability

1. Probability

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem.

MATHEMATICS (Code No. – 041)**QUESTION PAPER DESIGN****CLASS – XII (2026-27)****Time: 3 hours****Max. Marks: 80**

S. No.	Typology of Questions	Total Marks	% Weightage
1	Remembering: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. Understanding: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	44	55
2	Applying: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	20	25
3	Analysing : Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations Evaluating: Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. Creating: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	16	20
	Total	80	100

1. *No chapter wise weightage. Care to be taken to cover all the chapters*
2. *Suitable internal variations may be made for generating various templates keeping the overall weightage to different form of questions and typology of questions same.*

Choice(s):

There will be no overall choice in the question paper. However, 33% internal choices will be given in all the sections

INTERNAL ASSESSMENT	20 MARKS
Periodic Tests (Best 2 out of 3 tests conducted)	10 Marks
Mathematics Activities	10 Marks

Note: For activities NCERT Lab Manual may be referred.

Conduct of Periodic Tests:

Periodic Test is a Pen and Paper assessment which is to be conducted by the respective subject teacher. The format of periodic test must have questions items with a balance mix, such as, very short answer (VSA), short answer (SA) and long answer (LA) to effectively assess the knowledge, understanding, application, skills, analysis, evaluation and synthesis. Depending on the nature of subject, the subject teacher will have the liberty of incorporating any other types of questions too. The modalities of the PT are as follows:

- a) **Mode:** The periodic test is to be taken in the form of pen-paper test.
- b) **Schedule:** In the entire Academic Year, three Periodic Tests in each subject may be conducted as follows:

Test	Pre-Mid-term (PT-I)	Mid-Term (PT-II)	Post Mid-Term (PT-III)
Tentative Month	July-August	November	December-January

This is only a suggestive schedule and schools may conduct periodic tests as per their convenience. The winter bound schools would develop their own schedule with similar time gaps between two consecutive tests.

- c) **Average of Marks:** Once schools complete the conduct of all the three periodic tests, they will convert the weightage of each of the three tests into ten marks each for identifying best two tests. The best two will be taken into consideration and the average of the two shall be taken as the final marks for PT.
- d) The school will ensure simple documentation to keep a record of performance as suggested in detail circular no. Acad-05/2017.
- e) **Sharing of Feedback/Performance:** The students' achievement in each test must be shared with the students and their parents to give them an overview of the level of learning that has taken place during different periods. Feedback will help parents formulate interventions (conducive ambience, support materials, motivation and morale-boosting) to further enhance learning. A teacher, while sharing the feedback with student or parent, should be empathetic, non- judgmental and motivating. It is recommended that the teacher share best examples/performances of IA with the class to motivate all learners

Assessment of Activity Work:

Throughout the year any 10 activities shall be performed by the student from the activities given in the NCERT Laboratory Manual for the respective class (XI or XII) which is available on the link:

<http://www.ncert.nic.in/exemplar/labmanuals.html> a record of the same may be kept by the student. An year end test on the activity may be conducted

The weightage are as under:

- The activities performed by the student throughout the year and record keeping: 5 marks
- Assessment of the activity performed during the year end test: 3 marks
- Viva-voce: 2 marks

Prescribed Books:

- 1) Mathematics Textbook for Class XI, NCERT Publications
- 2) Mathematics Part I - Textbook for Class XII, NCERT Publication
- 3) Mathematics Part II - Textbook for Class XII, NCERT Publication
- 4) Mathematics Exemplar Problem for Class XI, Published by NCERT
- 5) Mathematics Exemplar Problem for Class XII, Published by NCERT
- 6) Mathematics Lab Manual class XI, published by NCERT
- 7) Mathematics Lab Manual class XII, published by NCERT

Applied Mathematics

Subject Code – 241

Classes XI-XII

Secondary School Education prepares students to explore future career options after graduating from schools. Mathematics is an important subject that helps students to choose various fields of their choices. Mathematics is widely used in higher studies as an allied subject in the field of Economics, Commerce, Social Sciences and many others. It has been observed that the syllabus of Mathematics in senior secondary grades meant for science subjects may not be appropriate for the students who wish to pursue Commerce or Social Science-based subjects in university education. By keeping this in mind, one more elective course in the mathematics syllabus is developed for Senior Secondary classes with an aim to provide students relevant experience in Mathematics that can be used in fields other than Physical Sciences.

This course is designed to develop substantial mathematical skills and methods needed in other subject areas. Topics covered in two years aim to enable students to use mathematical knowledge in the field of business, economic and social sciences. It aims to promote appreciation of mathematical power and simplicity for its countless applications in diverse fields. The course continues to develop mathematical language and symbolism to communicate and relate everyday experiences mathematically. In addition, it reinforces the logical reasoning skills of formulating and validating mathematical arguments, framing examples, finding counterexamples. It encourages students to engage in mathematical investigations and to build connections within mathematical topics and with other disciplines. The course prepares students to use algebraic methods as a means of representation and as a problem-solving tool. It also enables students to interpret two-dimensional geometrical figures using algebra and to further deduce properties of geometrical figures in a coordinate system. The course content will help students to develop a sound understanding of descriptive and inferential statistics which they can use to describe and analyze a given set of data and to further make meaningful inferences out of it. Data based case studies from the field of business, economics, psychology, education, biology and census data will be used to appreciate the power of data in contemporary society.

It is expected that the subject is taught connecting concepts to the applications in various fields. The objectives of the course areas are as follows:

Course Objectives:

- To develop an understanding of essential mathematical and statistical concepts that are relevant to areas such as business, economic and social sciences.
- To enable students to interpret real-life situations into structured numerical, algebraic and graphical representations for analysis and decision making.
- To develop ability to organise, analyse and interpret data, and to draw meaningful conclusions in practical contexts.
- To strengthen logical thinking and reasoning by engaging students in problem-solving situations that require nuance understanding of qualification and relative change.
- To develop clarity in mathematical communication, including the ability to justify solutions, examine assumptions and validate results.
- To help students recognise connections between mathematics and other disciplines, and to use these connections meaningfully.

Grade XII (2026-27)

Number of Paper: 1
Time: 3 Hours
Max Marks: 80

No.	Units	Marks
I	Numbers, Quantification and Numerical Applications	11
II	Algebra	10
III	Calculus	15
IV	Probability Distributions	10
V	Inferential Statistics	05
VI	Time-based data	06
VII	Financial Mathematics	15
VIII	Linear Programming	08
Total		80
Internal Assessment		20

CLASS- XII

Sl. No.	Contents	Learning Outcomes: Students will be able to	Notes / Explanation
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UNIT – 1 NUMBERS, QUANTIFICATION AND NUMERICAL APPLICATIONS

Numbers & Quantification

1.1	Modulo Arithmetic	<ul style="list-style-type: none">• Define modulus of an integer• Apply arithmetic operations using modular arithmetic rules	<ul style="list-style-type: none">• Definition and meaning• Introduction to modulo operator• Modular addition and subtraction
1.2	Congruence Modulo	<ul style="list-style-type: none">• Define congruence modulo• Apply the definition in various problems	<ul style="list-style-type: none">• Definition and meaning• Solution using congruence modulo• Equivalence class
1.3	Alligation and Mixture	<ul style="list-style-type: none">• Understand the rule of alligation to produce a mixture at a given price• Determine the mean price of a mixture• Apply rule of allegation	<ul style="list-style-type: none">• Meaning and Application of rule of alligation• Mean price of a mixture
1.4	Numerical Problems	Solve real life problems mathematically	
	Boats and Streams (upstream and downstream)	<ul style="list-style-type: none">• Distinguish between upstream and downstream• Express the problem in the form of an equation	<ul style="list-style-type: none">• Problems based on speed of stream and the speed of boat in still water
	Pipes and Cisterns	<ul style="list-style-type: none">• Determine the time taken by two or more pipes to fill or empty the tank	<ul style="list-style-type: none">• Calculation of the portion of the tank filled or drained by the pipe(s) in unit time
	Races and Games	<ul style="list-style-type: none">• Compare the performance of two players w.r.t. time, distance	<ul style="list-style-type: none">• Calculation of the time taken/ distance covered / speed of each player
1.5	Numerical Inequalities	<ul style="list-style-type: none">• Describe the basic concepts of numerical inequalities• Understand and write numerical inequalities	<ul style="list-style-type: none">• Comparison between two statements/situations which can be compared numerically• Application of the techniques of numerical solution of algebraic inequations

UNIT-2 ALGEBRA			
2.1	Matrices and types of matrices	<ul style="list-style-type: none"> Define matrix Identify different kinds of matrices. Find the size / order of matrices 	<ul style="list-style-type: none"> The entries, rows and columns of matrices Present a set of data in a matrix form
2.2	Equality of matrices, Transpose of a matrix, Symmetric and Skew symmetric matrix	<ul style="list-style-type: none"> Determine equality of two matrices Write transpose of given matrix Define symmetric and skew symmetric matrix 	<ul style="list-style-type: none"> Examples of transpose of matrix A square matrix as a sum of symmetric and skew symmetric matrix Observe that diagonal elements of skew symmetric matrices are always zero
2.3	Algebra of Matrices	<ul style="list-style-type: none"> Perform operations like addition & subtraction on matrices of same order Perform multiplication of two matrices of appropriate order Perform multiplication of a scalar with matrix 	<ul style="list-style-type: none"> Addition and Subtraction of matrices Multiplication of matrices (It can be shown to the students that Matrix multiplication is similar to multiplication of two polynomials) Multiplication of a matrix with a real number
2.4	Determinants	<ul style="list-style-type: none"> Find determinant of a square matrix 	<ul style="list-style-type: none"> Singular matrix, Non-singular matrix $AB = A B$ Simple problems to find determinant value
2.5	Inverse of a matrix	<ul style="list-style-type: none"> Define the inverse of a square matrix Apply properties of inverse of matrices 	<ul style="list-style-type: none"> Inverse of a matrix using cofactors If A and B are invertible square matrices of same size, <ul style="list-style-type: none"> i) $(AB)^{-1} = B^{-1}A^{-1}$ ii) $(A^{-1})^{-1} = A$ iii) $(A')^{-1} = (A^{-1})'$
2.6	Solving system of simultaneous equations using matrix method and Cramer's rule	<ul style="list-style-type: none"> Solve the system of simultaneous equations using <ul style="list-style-type: none"> i) Cramer's Rule ii) Inverse of coefficient matrix Formulate real life problems into a system of simultaneous linear equations and solve it using these methods 	<ul style="list-style-type: none"> Solution of system of simultaneous equations up to three variables only (non-homogeneous equations)

UNIT- 3 CALCULUS

Differentiation and its Applications

3.1	Derivatives up to second order	<ul style="list-style-type: none">• Determine derivatives up to second order• Understand differentiation of parametric functions and implicit functions	<ul style="list-style-type: none">• Simple problems based on up to second order derivatives• Differentiation of parametric functions and implicit functions (upto 2nd order)
3.2	Application of Derivatives	<ul style="list-style-type: none">• Determine the rate of change of various quantities	<ul style="list-style-type: none">• To find the rate of change of quantities such as area and volume with respect to time or its dimension
3.3	Marginal Cost and Marginal Revenue using derivatives	<ul style="list-style-type: none">• Define marginal cost and marginal revenue• Find marginal cost and marginal revenue	<ul style="list-style-type: none">• Examples related to marginal cost, marginal revenue, etc.
3.4	Increasing /Decreasing Functions	<ul style="list-style-type: none">• Determine whether a function is increasing or decreasing• Determine the conditions for a function to be increasing or decreasing	<ul style="list-style-type: none">• Simple problems related to increasing and decreasing behaviour of a function in the given interval
3.5	Maxima and Minima	<ul style="list-style-type: none">• Determine critical points of the function• Find the point(s) of local maxima and local minima and corresponding local maximum and local minimum values• Find the absolute maximum and absolute minimum value of a function• Solve applied problems related to optimization of cost, revenue and profit only.	<ul style="list-style-type: none">• A point $x = c$ is called the critical point of f if f is defined at c and $f'(c) = 0$ or f is not differentiable at c• To find local maxima and local minima by:<ol style="list-style-type: none">i) First Derivative Testii) Second Derivative Test• Contextualized real life problems

Integration and its Applications

3.6	Integration	<ul style="list-style-type: none">• Understand and determine indefinite integrals of simple functions as anti-derivative	<ul style="list-style-type: none">• Integration as a reverse process of differentiation• Vocabulary and Notations related to Integration
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3.7	Indefinite Integrals as family of curves	<ul style="list-style-type: none"> Evaluate indefinite integrals of simple algebraic functions by method of: <ul style="list-style-type: none"> i) substitution ii) partial fraction iii) by parts 	<ul style="list-style-type: none"> Simple integrals based on each method (non-trigonometric function)
3.8	Definite Integrals as area under the curve	<ul style="list-style-type: none"> Define definite integral as area under the curve Understand fundamental theorem of Integral calculus and apply it to evaluate the definite integral 	<ul style="list-style-type: none"> Evaluation of area under simple algebraic curves up to 2nd degree.
3.9	Application of Integration	<ul style="list-style-type: none"> Identify the region representing consumer surplus and producer surplus graphically Apply the definite integral to find consumer surplus-producer surplus 	Problems based on finding <ul style="list-style-type: none"> Total cost when Marginal Cost is given Total Revenue when Marginal Revenue is given Equilibrium price and equilibrium quantity and hence consumer and producer surplus

Differential Equations and Modeling

3.10	Differential Equations	<ul style="list-style-type: none"> Recognize a differential equation Find the order and degree of a differential equation 	<ul style="list-style-type: none"> Definition, order, degree and examples
3.11	Formulating and Solving Differential Equations	<ul style="list-style-type: none"> Formulate differential equation Verify the solution of differential equation Solve simple differential equation using variable separable method only 	<ul style="list-style-type: none"> Formation of differential equation by eliminating arbitrary constants Solution of simple differential equations (direct integration only)

UNIT- 4 PROBABILITY DISTRIBUTIONS

4.1	Probability Distribution	<ul style="list-style-type: none"> Understand the concept of Random Variables and its Probability Distributions Find probability distribution of discrete random variable 	<ul style="list-style-type: none"> Definition and example of discrete and continuous random variable and their distribution
4.2	Mathematical Expectation	<ul style="list-style-type: none"> Apply arithmetic mean of frequency distribution to find the expected value of a random variable 	<ul style="list-style-type: none"> The expected value of discrete random variable as summation of product of discrete random variable by the probability of its occurrence.
4.3	Variance	<ul style="list-style-type: none"> Calculate the Variance and S.D. of a random variable 	<ul style="list-style-type: none"> Questions based on variance and standard deviation

4.4	Binomial Distribution	<ul style="list-style-type: none"> • Identify the Bernoulli Trials and apply Binomial Distribution • Evaluate Mean, Variance and S.D of a binomial distribution 	<ul style="list-style-type: none"> • Characteristics of binomial distribution • Binomial formula: $P(r) = nC_r p^r q^{n-r}$ Where n = number of trials p = probability of success q = probability of failure Mean = np Variance = npq Standard deviation = \sqrt{npq}
4.5	Poisson Distribution	<ul style="list-style-type: none"> • Understand the Conditions of Poisson Distribution • Evaluate the Mean and Variance of Poisson distribution 	<ul style="list-style-type: none"> • Characteristics of Poisson Probability distribution • Poisson formula: $P(X) = \frac{\lambda^x e^{-\lambda}}{x!}$ • Mean = Variance = λ
4.6	Normal Distribution	<ul style="list-style-type: none"> • Understand normal distribution is a Continuous distribution • Evaluate value of Standard normal variate • Area relationship between Mean and Standard Deviation 	<ul style="list-style-type: none"> • Characteristics of a normal probability distribution • Total area under the curve = total probability = 1 • Standard Normal Variate: $Z = \frac{x-\mu}{\sigma}$, where x = value of random variable, μ = mean, σ = S.D

UNIT - 5 INFERENCE STATISTICS

5.1	Population and Sample	<ul style="list-style-type: none"> • Define Population and Sample • Differentiate between population and sample • Define a representative sample from a population • Differentiate between a representative and non-representative sample • Draw a representative sample using simple random sampling • Draw a representative sample using and systematic random sampling 	<ul style="list-style-type: none"> • Population data from census, economic surveys and other contexts from practical life • Examples of drawing more than one sample set from the same population • Examples of representative and non-representative sample • Unbiased and biased sampling • Problems based on random sampling using simple random sampling and systematic random sampling (sample size less than 100)
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5.2	Parameter and Statistics and Statistical Inferences	<ul style="list-style-type: none"> • Define Parameter with reference to Population • Define Statistics with reference to Sample • Explain the relation between Parameter and Statistic • Explain the limitation of Statistic to generalize the estimation for population • Interpret the concept of Statistical Significance and Statistical Inferences • State Central Limit Theorem • Explain the relation between Population-Sampling Distribution-Sample 	<ul style="list-style-type: none"> • Conceptual understanding of Parameter and Statistics • Examples of Parameter and Statistic limited to Mean and Standard deviation only • Examples to highlight limitations of generalizing results from sample to population • Only conceptual understanding of Statistical Significance/Statistical Inferences • Only conceptual understanding of Sampling Distribution through simulation and graphs
5.3	t-Test (one sample t-test and for a small group sample)	<ul style="list-style-type: none"> • Define a hypothesis • Differentiate between Null and Alternate hypothesis • Define and calculate degree of freedom • Test Null hypothesis and make inferences using t-test statistic for one group 	<ul style="list-style-type: none"> • Examples and non-examples of Null and Alternate hypothesis (only non-directional alternate hypothesis) • Framing of Null and Alternate hypothesis • Testing a Null Hypothesis to make Statistical Inferences for small sample size <i>(for small sample size: t-test for one group)</i>

UNIT – 6 TIME-BASED DATA

6.1	Time Series	<ul style="list-style-type: none"> • Identify time series as chronological data 	<ul style="list-style-type: none"> • Meaning and Definition
6.2	Components of Time Series	<ul style="list-style-type: none"> • Distinguish between different components of time series 	<ul style="list-style-type: none"> • Secular trend • Seasonal variation • Cyclical variation • Irregular variation
6.3	Time Series analysis for univariate data	<ul style="list-style-type: none"> • Solve practical problems based on statistical data and interpret the result 	<ul style="list-style-type: none"> • Fitting a straight-line trend and estimating the value
6.4	Secular Trend	<ul style="list-style-type: none"> • Understand the long-term tendency 	<ul style="list-style-type: none"> • The tendency of the variable to increase or decrease over a long period of time
6.5	Methods of Measuring trend	<ul style="list-style-type: none"> • Demonstrate the techniques of finding trend by different methods 	<ul style="list-style-type: none"> • Moving Average method • Method of Least Squares

UNIT - 7 FINANCIAL MATHEMATICS

7.1	Perpetuity, Sinking Funds	<ul style="list-style-type: none">• Explain the concept of perpetuity and sinking fund• Calculate perpetuity• Differentiate between sinking fund and saving account	<ul style="list-style-type: none">• Meaning of Perpetuity and Sinking Fund• Real life examples of sinking fund• Advantages of Sinking Fund• Sinking Fund vs. Savings account
7.2	Valuation of Bonds	<ul style="list-style-type: none">• Define the concept of valuation of bond and related terms.• Calculate value of bond using present value approach	<ul style="list-style-type: none">• Meaning of Bond Valuation• Terms related to valuation of bond: Coupon rate, Maturity rate and Current price.• Bond Valuation Method: Present Value Approach
7.3	Calculation of EMI	<ul style="list-style-type: none">• Explain the concept of EMI• Calculate EMI using various methods	<ul style="list-style-type: none">• Methods to calculate EMI:<ol style="list-style-type: none">i) Flat-Rate Methodii) Reducing-Balance Method• Real life examples to calculate EMI of various types of loans, purchase of assets, etc.
7.4	Compound Annual Growth Rate	<ul style="list-style-type: none">• Understand the concept of Compound Annual Growth Rate• Differentiate between Compound Annual Growth Rate and Annual Growth Rate• Calculate Compound Annual Growth Rate	<ul style="list-style-type: none">• Meaning and use of Compound Annual Growth Rate• Formula for Compound Annual Growth Rate
7.5	Linear method of Depreciation	<ul style="list-style-type: none">• Define the concept of linear method of Depreciation• Interpret cost, residual value and useful life of an asset from the given information• Calculate depreciation	<ul style="list-style-type: none">• Meaning and formula for Linear Method of Depreciation• Advantages and disadvantages of Linear Method

UNIT - 8 LINEAR PROGRAMMING

8.1	Introduction and related terminology	<ul style="list-style-type: none">• Familiarize with terms related to Linear Programming Problem	<ul style="list-style-type: none">• Need for framing linear programming problem• Definition of Decision Variable, Constraints, Objective function, Optimization and Non negative constraints
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8.2	Mathematical formulation of Linear Programming Problem	<ul style="list-style-type: none"> Formulate Linear Programming Problem upto 3 non-trivial constraints 	<ul style="list-style-type: none"> Set the problem in terms of decision variables, identify the objective function, identify the set of problem constraints, express the problem in terms of inequations
8.3	Different types of Linear Programming Problems	<ul style="list-style-type: none"> Identify and formulate different types of LPP 	<ul style="list-style-type: none"> Formulate various types of LPP's like Manufacturing Problem, Diet Problem etc.
8.4	Graphical method of solution for problems in two variables	<ul style="list-style-type: none"> Draw the Graph for a system of linear inequalities involving two variables and to find its solution graphically 	<ul style="list-style-type: none"> Corner Point Method for the Optimal solution of LPP
8.5	Feasible and Infeasible Regions	<ul style="list-style-type: none"> Identify feasible, infeasible, bounded and unbounded regions 	<ul style="list-style-type: none"> Definition and Examples to explain the terms
8.6	Feasible and infeasible solutions, optimal feasible solution	<ul style="list-style-type: none"> Understand feasible and infeasible solutions Find optimal feasible solution 	<ul style="list-style-type: none"> Problems based on optimization Examples of finding the solutions by graphical method

Practical: Use of spreadsheet

Graphs of an exponential function, demand and supply functions on Excel and study the nature of function at various points, maxima/minima, Matrix operations using Excel

Suggested practical using the spreadsheet

- i) Plot the graphs of functions on excel and study the graph to find out the point of maxima/minima
- ii) Probability and dice roll simulation
- iii) Matrix multiplication and the inverse of a matrix
- iv) Stock Market data sheet on excel
- v) Collect the data on weather, price, inflation, and pollution analyze the data and make meaningful inferences
- vi) Collect data from newspapers on traffic, sports activities and market trends and use excel to study future trends

List of Suggested projects (Class XI /XII)

- i) Use of prime numbers in coding and decoding of messages
- ii) Prime numbers and divisibility rules
- iii) Logarithms for financial calculations such as interest, present value, future value, profit/loss etc. with large values)
- iv) The cardinality of a set and orders of infinity
- v) Comparing sets of Natural numbers, rational numbers, real numbers and others
- vi) Use of Venn diagram in solving practical problems
- vii) Fibonacci sequence: Its' history and presence in nature
- viii) Testing the validity of mathematical statements and framing truth tables

- ix) Investigating Graphs of functions for their properties
- x) Visit the census site of India <http://www.censusindia.gov.in/Census Data 2001/Census Data Online/Language/State ment3.html> Depict the information given there in a pictorial form
- xi) Prepare a questionnaire to collect information about money spent by your friends in a month on activities like travelling, movies, recharging of the mobiles, etc. and draw interesting conclusions
- xii) Check out the local newspaper and cut out examples of information depicted by graphs. Draw your own conclusions from the graph and compare it with the analysis given in the report
- xiii) Analysis of population migration data – positive and negative influence on urbanization
- xiv) Each day newspaper tells us about the maximum temperature, minimum temperature, and humidity. Collect the data for a period of 30 days and represent it graphically. Compare it with the data available for the same time period for the previous year
- xv) Analysis of career graph of a cricketer (batting average for a batsman and bowling average for a bowler). Conclude the best year of his career. It may be extended for other players also – tennis, badminton, athlete
- xvi) Vehicle registration data – correlating with pollution and the number of accidents
- xvii) Visit a village near Delhi and collect data of various crops over the past few years from the farmers. Also, collect data about temperature variation and rain over the period for a particular crop. Try to find the effect of temperature and rain variations on various crops
- xviii) Choose any week of your ongoing semester. Collect data for the past 10 – 15 years for the amount of rainfall received in Delhi during that week. Predict the amount of rainfall for the current year
- xix) Weather prediction (prediction of monsoon from past data)
- xx) Visit Kirana shops near your home and collect the data regarding the sales of certain commodities over a month. Try to figure out the stock of a particular commodity which should be in the store in order to maximize the profit
- xxi) Stock price movement
- xxii) Risk assessments by insurance firms from data
- xxiii) Predicting stock market crash
- xxiv) Predicting the outcome of an election – exit polls
- xxv) Predicting mortality of infants