

# PHYSICS

**Subject Code – 042**

**Class XI-XII (2025-26)**

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.

**PHYSICS (Code No. 042)**  
**COURSE STRUCTURE**  
**Class XI - 2025-26 (Theory)**

**Time: 3 hrs.**

**Max Marks: 70**

<b>UNIT</b>	<b>CHAPTERS</b>	<b>MARKS</b>
<b>Unit-I</b>	<b>Physical World and Measurement</b>	
	Chapter-1: Units and Measurements	
<b>Unit-II</b>	<b>Kinematics</b>	<b>23</b>
	Chapter-2: Motion in a Straight Line	
	Chapter-3: Motion in a Plane	
<b>Unit-III</b>	<b>Laws of Motion</b>	
	Chapter-4: Laws of Motion	
<b>Unit-IV</b>	<b>Work, Energy and Power</b>	
	Chapter-5: Work, Energy and Power	
<b>Unit-V</b>	<b>Motion of System of Particles and Rigid Body</b>	<b>17</b>
	Chapter-6: System of Particles and Rotational Motion	
<b>Unit-VI</b>	<b>Gravitation</b>	
	Chapter-7: Gravitation	
<b>Unit-VII</b>	<b>Properties of Bulk Matter</b>	
	Chapter-8: Mechanical Properties of Solids	
	Chapter-9: Mechanical Properties of Fluids	
	Chapter-10: Thermal Properties of Matter	
<b>Unit-VIII</b>	<b>Thermodynamics</b>	<b>20</b>
	Chapter-11: Thermodynamics	
<b>Unit-IX</b>	<b>Behaviour of Perfect Gases and Kinetic Theory of Gases</b>	
	Chapter-12: Kinetic Theory	
<b>Unit-X</b>	<b>Oscillations and Waves</b>	<b>10</b>
	Chapter-13: Oscillations	
	Chapter-14: Waves	
<b>Total</b>		<b>70</b>

## **Unit I:      Physical World and Measurements**

### **Chapter–1: Units and Measurements**

Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. significant figures, Determining the uncertainty in result. Dimensions of physical quantities, dimensional analysis and its applications.

## **Unit II:      Kinematics**

### **Chapter–2: Motion in a Straight Line**

Frame of reference, Motion in a straight line, Elementary concepts of differentiation and integration for describing motion, uniform and non- uniform motion, average speed and average velocity and instantaneous velocity, uniformly accelerated motion, velocity - time and position-time graphs. Relations for uniformly accelerated motion (graphical and calculus treatment).

### **Chapter–3: Motion in a Plane**

Scalar and vector quantities; position and displacement vectors, general vectors and their notations; equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors, Unit vector; resolution of a vector in a plane, rectangular components, Scalar and Vector product of vectors.

Motion in a plane, cases of uniform velocity and uniform acceleration- projectile motion, uniform circular motion.

## **Unit III:      Laws of Motion**

### **Chapter–4: Laws of Motion**

Intuitive concept of force, Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion.

Law of conservation of linear momentum and its applications.

Equilibrium of concurrent forces, Static and kinetic friction, laws of friction, rolling friction, lubrication.

Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on a level circular road, vehicle on a banked road).

## **Unit IV:      Work, Energy and Power**

### **Chapter– 5: Work, Energy and Power**

Work done by a constant force and a variable force; kinetic energy, work- energy theorem, power.

Notion of potential energy, potential energy of a spring, conservative forces: non-conservative forces, motion in a vertical circle; elastic and inelastic collisions in one and two dimensions.

## **Unit V:      Motion of System of Particles and Rigid Body**

### **Chapter–6: System of Particles and Rotational Motion**

Centre of mass of a two-particle system, momentum conservation and Centre of mass motion. Centre of mass of a rigid body; centre of mass of a uniform rod. Moment of a force, torque, angular momentum, law of conservation of angular momentum and its applications.

Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

Moment of inertia, radius of gyration, values of moments of inertia for simple geometrical objects (no derivation).

## **Unit VI:      Gravitation**

### **Chapter – 7: Gravitation**

Kepler's laws of planetary motion, universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy and gravitational potential, escape speed, orbital velocity of a satellite, energy of an orbiting satellite.

## **Unit VII:      Properties of Bulk Matter**

### **Chapter–8: Mechanical Properties of Solids**

Elasticity, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus of rigidity (qualitative idea only), Poisson's ratio; elastic energy. Application of elastic behavior of materials (qualitative idea only).

## **Chapter–9: Mechanical Properties of Fluids**

Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes), effect of gravity on fluid pressure.

Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's theorem and its simple applications (Torricelli's law and Dynamic lift).

Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise.

## **Chapter–10: Thermal Properties of Matter**

Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion of water; specific heat capacity;  $C_p$ ,  $C_v$  - calorimetry; change of state - latent heat capacity.

Heat transfer-conduction, convection and radiation, thermal conductivity, qualitative ideas of Blackbody radiation, Wein's displacement Law, Stefan's law.

## **Unit VIII: Thermodynamics**

### **Chapter–11: Thermodynamics**

Thermal equilibrium and definition of temperature, zeroth law of thermodynamics, heat, work and internal energy. First law of thermodynamics, Second law of thermodynamics: Thermodynamic state variable and equation of state. Change of condition of gaseous state - isothermal, adiabatic, reversible, irreversible, and cyclic processes.

## **Unit IX: Behavior of Perfect Gases and Kinetic Theory of Gases**

### **Chapter–12: Kinetic Theory**

Equation of state of a perfect gas, work done in compressing a gas.

Kinetic theory of gases - assumptions, concept of pressure. Kinetic interpretation of temperature; rms speed of gas molecules; degrees of freedom, law of equi-partition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro's number.

## **Unit X:        Oscillations and Waves**

### **Chapter–13: Oscillations**

Periodic motion - time period, frequency, displacement as a function of time, periodic functions and their applications.

Simple harmonic motion (S.H.M), uniform circular motion and its equations of motion; phase; oscillations of a loaded spring- restoring force and force constant; energy in S.H.M.

Kinetic and potential energies; simple pendulum derivation of expression for its time period.

### **Chapter–14: Waves**

Wave motion: Transverse and longitudinal waves, speed of travelling wave, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats.

## 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.
- Report of the project carried out by the students.

## EVALUATION SCHEME

**Time 3 hours**

**Max. Marks: 30**

Topic	Marks
Two experiments one from each section	7+7
Practical record (experiment and activities)	5
One activity from any section	3
Investigatory Project	3
Viva on experiments, activities and project	5
<b>Total</b>	<b>30</b>

## SECTION–A

### Experiments

1. To measure diameter of a small spherical/cylindrical body and to measure internal diameter and depth of a given beaker/calorimeter using Vernier Callipers and hence find its volume.
2. To measure diameter of a given wire and thickness of a given sheet using screw gauge.
3. To determine volume of an irregular lamina using screw gauge.
4. To determine radius of curvature of a given spherical surface by a spherometer.
5. To determine the mass of two different objects using a beam balance.
6. To find the weight of a given body using parallelogram law of vectors.

7. Using a simple pendulum, plot its graph and use it to find the effective length of second's pendulum.
8. To study variation of time period of a simple pendulum of a given length by taking bobs of same size but different masses and interpret the result.
9. To study the relationship between force of limiting friction and normal reaction and to find the co-efficient of friction between a block and a horizontal surface.
10. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination  $\theta$  by plotting graph between force and  $\text{Sin}\theta$ .

### **Activities**

1. To make a paper scale of given least count, e.g., 0.2cm, 0.5 cm.
2. To determine mass of a given body using a metre scale by principle of moments.
3. To plot a graph for a given set of data, with proper choice of scales and error bars.
4. To measure the force of limiting friction for rolling of a roller on a horizontal plane.
5. To study the variation in range of a projectile with angle of projection.
6. To study the conservation of energy of a ball rolling down on an inclined plane (using a double inclined plane).
7. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.

## SECTION-B

### Experiments

1. To determine Young's modulus of elasticity of the material of a given wire.
2. To find the force constant of a helical spring by plotting a graph between load and extension.
3. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between  $P$  and  $V$ , and between  $P$  and  $1/V$ .
4. To determine the surface tension of water by capillary rise method.
5. To determine the coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.
6. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
7. To determine specific heat capacity of a given solid by method of mixtures.
8. To study the relation between frequency and length of a given wire under constant tension using sonometer.
9. To study the relation between the length of a given wire and tension for constant frequency using sonometer.
10. To find the speed of sound in air at room temperature using a resonance tube by two resonance positions.

### Activities

1. To observe change of state and plot a cooling curve for molten wax.
2. To observe and explain the effect of heating on a bi-metallic strip.
3. To note the change in level of liquid in a container on heating and interpret the observations.
4. To study the effect of detergent on surface tension of water by observing capillary rise.
5. To study the factors affecting the rate of loss of heat of a liquid.
6. To study the effect of load on depression of a suitably clamped metre scale loaded at (i) its end (ii) in the middle.
7. To observe the decrease in pressure with increase in velocity of a fluid.

## Practical Examination for Visually Impaired

### Students Class XI

**Note:** Same Evaluation scheme and general guidelines for visually impaired students as given for Class XII may be followed.

#### A. Items for Identification/Familiarity of the apparatus for assessment in practical's (All experiments)

Spherical ball, Cylindrical objects, vernier calipers, beaker, calorimeter, Screw gauge, wire, Beam balance, spring balance, weight box, gram and milligram weights, forceps, Parallelogram law of vectors apparatus, pulleys and pans used in the same 'weights' used, Bob and string used in a simple pendulum, meter scale, split cork, suspension arrangement, stop clock/stop watch, Helical spring, suspension arrangement used, weights, arrangement used for measuring extension, Sonometer, Wedges, pan and pulley used in it, 'weights' Tuning Fork, Meter scale, Beam balance, Weight box, gram and milligram weights, forceps, Resonance Tube, Tuning Fork, Meter scale, Flask/Beaker used for adding water.

#### B. List of Practicals

1. To measure diameter of a small spherical/cylindrical body using vernier calipers.
2. To measure the internal diameter and depth of a given beaker/calorimeter using vernier calipers and hence find its volume.
3. To measure diameter of given wire using screw gauge.
4. To measure thickness of a given sheet using screw gauge.
5. To determine the mass of a given object using a beam balance.
6. To find the weight of given body using the parallelogram law of vectors.
7. Using a simple pendulum plot L-T and graphs. Hence find the effective length of second's pendulum using appropriate length values.
8. To find the force constant of given helical spring by plotting a graph between load and extension.
9. (i) To study the relation between frequency and length of a given wire under constant tension using a sonometer.  
(ii) To study the relation between the length of a given wire and tension, for constant frequency, using a sonometer.
10. To find the speed of sound in air, at room temperature, using a resonance tube, by observing the two resonance positions.

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

**Prescribed Books:**

1. Physics Part-I, Textbook for Class XI, Published by NCERT
2. Physics Part-II, Textbook for Class XI, Published by NCERT
3. Laboratory Manual of Physics, Class XI 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 2025-26 is not to be tested by schools.**

**CLASS XII (2025-26)****PHYSICS (THEORY)**

Time: 3 hrs.

Max Marks: 70

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

## **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
<b>Total</b>	<b>30 marks</b>

### 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
<b>Total</b>	<b>30 marks</b>

**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 2025-26 is not to be tested by schools and will not be assessed in the Board examinations 2025-26.**

## QUESTION PAPER DESIGN

Theory (Class: XI/XII)

Maximum Marks: 70

Duration: 3 hrs.

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

### 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 2025-26 to be published by CBSE at its website.***

**CHEMISTRY**  
**Subject Code: 043**  
**Classes XI-XII (2025-26)**

**Rationale**

The second phase of Secondary stage is the most crucial stage of school education because at this juncture specialized 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 study courses in applied areas of science and technology at tertiary level. Therefore, there is a need to provide the learners with a 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 rigor and depth taking care 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. 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. Globally, nomenclature of elements and compounds, symbols and units of physical quantities recommended by scientific bodies like IUPAC and CGPM are of immense importance and also need to be incorporated in the updated syllabus. The proposed syllabus adequately addresses 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 XI**  
**THEORY**

Time: 3 Hours

Total Marks: 70

S. No	UNIT	Marks
1	Some Basic Concepts of Chemistry	7
2	Structure of Atom	9
3	Classification of Elements and Periodicity in Properties	6
4	Chemical Bonding and Molecular Structure	7
5	Chemical Thermodynamics	9
6	Equilibrium	7
7	Redox Reactions	4
8	Organic Chemistry: Some basic Principles and Techniques	11
9	Hydrocarbons	10
	<b>TOTAL</b>	<b>70</b>

**Unit 1: Some Basic Concepts of Chemistry**

General Introduction: Importance and scope of Chemistry, Nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules, atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

**Unit 2: Structure of Atom**

Discovery of Electron, Proton and Neutron, atomic number, isotopes and isobars. Thomson's model and its limitations. Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.

**Unit 3: Classification of Elements and Periodicity in Properties**

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements -atomic radii, ionic radii, inert gas radii, Ionization enthalpy, electron gain enthalpy, electronegativity, valiancy, Nomenclature of elements with atomic number greater than 100.

#### **Unit 4: Chemical Bonding and Molecular Structure**

Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), Hydrogen bond.

#### **Unit 5: Chemical Thermodynamics**

Concepts of System and types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics -internal energy and enthalpy, heat capacity and specific heat, measurement of  $\Delta U$  and  $\Delta H$ , Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution. Second law of Thermodynamics (brief introduction), Introduction of entropy as a state function, Gibb's energy change for spontaneous and non- spontaneous processes, criteria for equilibrium, Third law of thermodynamics (brief introduction).

#### **Unit 6: Equilibrium**

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium – Le Chatelier's principle, ionic equilibrium- ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of poly basic acids, acid strength, concept of pH, hydrolysis of salts (elementary idea), buffer solution, Henderson Equation, solubility product, common ion effect (with illustrative examples).

#### **Unit 7: Redox Reactions**

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number, applications of redox reactions.

#### **Unit 8: Organic Chemistry – Some Basic Principles and Techniques**

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electrometric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions.

## Unit 9: Hydrocarbons

### Aliphatic Hydrocarbons

Alkanes - Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

Alkenes - Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes - Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of - hydrogen, halogens, hydrogen halides and water.

### Aromatic Hydrocarbons

Introduction, IUPAC nomenclature, benzene: resonance, aromaticity, chemical properties: mechanism of electrophilic substitution. Nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation, directive influence of functional group in mono substituted benzene, carcinogenicity and toxicity

**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. s & p Block Elements

Electronic configuration, atomic & ionic radii, Ionization Enthalpy, Hydration Enthalpy and general trends in physical and chemical properties of s and p block elements across the periods and down the groups; unique behavior of the first element in each group.

#### 2. The Gaseous State

Qualitative treatment of Gas laws, Ideal gas equation and deviations from it.

## PRACTICAL

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

### PRACTICAL SYLLABUS

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

#### A. Basic Laboratory Techniques

1. Cutting glass tube and glass rod
2. Bending a glass tube
3. Drawing out a glass jet
4. Boring a cork

#### B. Characterization and Purification of Chemical Substances

1. Determination of melting point of an organic compound.
2. Determination of boiling point of an organic compound.
3. Crystallization of impure sample of any one of the following: Alum, Copper Sulphate, Benzoic Acid.

#### C. Experiments based on pH

1. Any one of the following experiments:
  - Determination of pH of some solutions obtained from fruit juices, solution of known and varied concentrations of acids, bases and salts using pH paper or universal indicator.
  - Comparing the pH of solutions of strong and weak acids of same concentration.
  - Study the pH change in the titration of a strong base using a universal indicator.
2. Study the pH change by common-ion in case of weak acids and weak bases.

## D. Chemical Equilibrium

Any one of the following experiments:

- Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either of the ions.
- Study the shift in equilibrium between  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  and chloride ions by changing the concentration of either of the ions.

## E. Quantitative Estimation

1. Using a mechanical balance/electronic balance.
2. Preparation of standard solution of Oxalic acid.
3. Determination of strength of a given solution of Sodium hydroxide by titrating it against standard solution of Oxalic acid.
4. Preparation of standard solution of Sodium carbonate.
5. Determination of strength of a given solution of hydrochloric acid by titrating it against standard Sodium Carbonate solution.

## F. Qualitative Analysis

1. Determination of one anion and one cation in a given salt

**Cations:**  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{NH}_4^+$

**Anions:**  $\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{NO}_2^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{PO}_4^{3-}$ ,  $\text{CH}_3\text{COO}^-$

**(Note: Insoluble salts excluded)**

2. Detection of -Nitrogen, Sulphur, Chlorine in organic compounds.

## PROJECTS

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

### A few suggested Projects

- a) Checking the bacterial contamination in drinking water by testing sulphide ion
- b) Study of the methods of purification of water
- c) Testing the hardness, presence of Iron, Fluoride, Chloride, etc., depending upon the regional variation in drinking water and study of causes of presence of these ions above permissible limit (if any).

- d) Investigation of the foaming capacity of different washing soaps and the effect of addition of Sodium carbonate on it
- e) Study the acidity of different samples of tea leaves.
- f) Determination of the rate of evaporation of different liquids
- g) Study the effect of acids and bases on the tensile strength of fibers.
- h) Study of acidity of fruit and vegetable juices.

**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 Students Class XI**

**Note:** Same Evaluation scheme and general guidelines for visually challenged students as given for Class XII may be followed.

#### **List of apparatus for identification for assessment in practicals (All experiments)**

Beaker, tripod stand, wire gauze, glass rod, funnel, filter paper, Bunsen burner, test tube, test tube stands, dropper, test tube holder, ignition tube, china dish, tongs, standard flask, pipette, burette, conical flask, clamp stand, dropper, wash bottle

- Odor detection in qualitative analysis.
- Procedure/Setup of the apparatus.

#### **List of Experiments**

##### **A. Characterization and Purification of Chemical Substances**

Crystallization of an impure sample of any one of the following:  
copper sulphate, benzoic acid.

##### **B. Experiments based on pH**

1. Determination of pH of some solutions obtained from fruit juices, solutions of known and varied concentrations of acids, bases and salts using pH paper.
2. Comparing the pH of solutions of strong and weak acids of same concentration.

##### **C. Chemical Equilibrium**

1. Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either ions.
2. Study the shift in equilibrium between  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  and chloride ions by changing the concentration of either of the ions.

##### **D. Quantitative estimation**

1. Preparation of standard solution of oxalic acid.

2. Determination of molarity of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.

### **E. Qualitative Analysis**

1. Determination of one anion and one cation in a given salt

**Cations -  $NH_4^+$**

**Anions:  $CO_3^{2-}$ ,  $S^{2-}$ ,  $SO_3^{2-}$ , ,  $Cl^-$ ,  $CH_3COO^-$**

**(Note: insoluble salts excluded)**

2. Detection of Nitrogen in the given organic compound.
3. Detection of Halogen in the given organic compound.

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

### **Prescribed Books:**

1. Chemistry Part – I, Class-XI, Published by NCERT.
2. Chemistry Part – II, Class-XI, Published by NCERT.
3. Manual of Microscale Chemistry laboratory kit.

### **Links for NCERT textbooks:**

1. <https://ncert.nic.in/textbook.php?kech1=0-6>
2. <https://ncert.nic.in/textbook.php?kech2=0-3>
3. [https://ncert.nic.in/division/dek/pdf/Manual\\_01.pdf](https://ncert.nic.in/division/dek/pdf/Manual_01.pdf)

**COURSE STRUCTURE**  
**CLASS XII**  
**THEORY**

**Time: 3 Hours**

**Total Marks: 70**

<b>S. No.</b>	<b>Title</b>	<b>Marks</b>
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
	<b>Total</b>	<b>70</b>

**Unit 1: Solutions**

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, Raoult's law, colligative properties - relative lowering of vapor pressure, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Van't Hoff factor

**Unit 2: Electrochemistry**

Redox reactions, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and EMF of a cell, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and law of electrolysis (elementary idea), dry cell-electrolytic cells and Galvanic cells, lead accumulator, fuel cells, corrosion.

**Unit 3: Chemical Kinetics**

Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst; order and molecularity of a reaction, rate law and specific rate constant, integrated rate equations and half-life (only for zero and first order

reactions), concept of collision theory (elementary idea, no mathematical treatment), activation energy, Arrhenius equation.

#### **Unit 4: d and f Block Elements**

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation, preparation and properties of  $K_2Cr_2O_7$  and  $KMnO_4$ .

**Lanthanides** - Electronic configuration, oxidation states, chemical reactivity and lanthanide contraction and its consequences.

**Actinides** - Electronic configuration, oxidation states and comparison with lanthanides

#### **Unit 5: Coordination Compounds**

Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory, VBT, and CFT; structure and stereoisomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological system).

#### **Unit 6: Haloalkanes and Haloarenes**

**Haloalkanes:** Nomenclature, nature of C–X bond, physical and chemical properties, optical rotation mechanism of substitution reactions.

**Haloarenes:** Nature of C–X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only).

Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

#### **Unit 7: Alcohols, Phenols and Ethers**

**Alcohols:** Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses with special reference to methanol and ethanol.

**Phenols:** Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

**Ethers:** Nomenclature, methods of preparation, physical and chemical properties, uses

#### **Unit 8: Aldehydes, Ketones and Carboxylic Acids**

**Aldehydes and Ketones:** Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes, uses.

**Carboxylic Acids:** Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

### **Unit 9: Amines**

**Amines:** Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

**Diazonium salts:** Preparation, chemical reactions and importance in synthetic organic chemistry.

### **Unit 10: Biomolecules**

**Carbohydrates** - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), D-L configuration oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); Importance of carbohydrates.

**Proteins** -Elementary idea of - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins; enzymes. Hormones - Elementary idea excluding structure.

**Vitamins** - Classification and functions.

**Nucleic Acids:** DNA and RNA.

## **PRACTICAL**

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

### **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, ( $\text{KIO}_3$ ) and Sodium Sulphate: ( $\text{Na}_2\text{SO}_3$ ) 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  $\text{Zn}/\text{Zn}^{2+}||\text{Cu}^{2+}/\text{Cu}$  with change in concentration of electrolytes ( $\text{CuSO}_4$  or  $\text{ZnSO}_4$ ) 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-benzalAcetone
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 $\text{KMnO}_4$ 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:**  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{NH}_4^+$

**Anions:**  $\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{NO}_2^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{PO}_4^{3-}$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{C}_2\text{O}_4^{2-}$

(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 power, 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
<b>Total</b>	<b>30</b>

### 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<sub>f</sub> 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  $\text{KMnO}_4$  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 -  $\text{NH}_4^+$**

**Anions:  $\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ , ,  $\text{Cl}^-$ ,  $\text{CH}_3\text{COO}^-$**

**(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.

### 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](https://ncert.nic.in/division/dek/pdf/Manual_01.pdf)

## QUESTION PAPER DESIGN CLASSES XI & XII

S.No	Domains	Total Marks	%
1	<b>Remembering and Understanding:</b> 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	<b>Applying:</b> Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	21	30
3	<b>Analysing, Evaluating and Creating:</b> 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.

**BIOLOGY**  
**Subject Code – 044**  
**Classes XI - XII (2025-26)**

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>
<p>CG-5</p> <p>Draws linkages between scientific knowledge and knowledge across other curricular areas</p>	<p>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)</p>
<p>CG-6</p> <p>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</p>	<p>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</p>
<p>CG-7</p> <p>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>	<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>
<p>CG-8</p> <p>Explores the nature of Science by doing Science</p>	<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 (2025-26)**  
**(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
	<b>Total</b>	<b>70</b>

**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

## **Chapter-6: Anatomy of Flowering Plants**

Anatomy and functions of tissue systems in dicots and monocots.

## **Chapter-7: Structural Organisation in Animals**

Morphology, Anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of frog.

### **Unit-III Cell: Structure and Function**

## **Chapter-8: Cell-The Unit of Life**

Cell theory and cell as the basic unit of life, structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall; cell organelles - structure and function; endomembrane system, endoplasmic reticulum, golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids, microbodies; cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); nucleus.

## **Chapter-9: Biomolecules**

Chemical constituents of living cells: biomolecules, structure and function of proteins, carbohydrates, lipids, and nucleic acids; Enzyme - types, properties, enzyme action. (Topics excluded: Nature of Bond Linking Monomers in a Polymer, Dynamic State of Body Constituents Concept of Metabolism, Metabolic Basis of Living, The Living State)

## **Chapter-10: Cell Cycle and Cell Division**

Cell cycle, mitosis, meiosis and their significance

### **Unit-IV Plant Physiology**

## **Chapter-11: Photosynthesis in Higher Plants**

Photosynthesis as a means of autotrophic nutrition; site of photosynthesis, pigments involved in photosynthesis (elementary idea); photochemical and biosynthetic phases of photosynthesis; cyclic and non-cyclic photophosphorylation; chemiosmotic hypothesis; photorespiration; C<sub>3</sub> and C<sub>4</sub> pathways; factors affecting photosynthesis.

## **Chapter-12: Respiration in Plants**

Exchange of gases; cellular respiration - glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); energy relations - number of ATP molecules generated; amphibolic pathways; respiratory quotient.

## **Chapter-13: Plant - Growth and Development**

Seed germination; phases of plant growth and plant growth rate; conditions of growth; differentiation, dedifferentiation and redifferentiation; sequence of developmental processes

in a plant cell; plant growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA.

## **Unit-V Human Physiology**

### **Chapter-14: Breathing and Exchange of Gases**

Respiratory organs in animals (recall only); Respiratory system in humans; mechanism of breathing and its regulation in humans - exchange of gases, transport of gases and regulation of respiration, respiratory volume; disorders related to respiration - asthma, emphysema, occupational respiratory disorders.

### **Chapter-15: Body Fluids and Circulation**

Composition of blood, blood groups, coagulation of blood; composition of lymph and its function; human circulatory system - Structure of human heart and blood vessels; cardiac cycle, cardiac output, ECG; double circulation; regulation of cardiac activity; disorders of circulatory system - hypertension, coronary artery disease, angina pectoris, heart failure.

### **Chapter-16: Excretory Products and their Elimination**

Modes of excretion - ammonotelism, ureotelism, uricotelism; human excretory system – structure and function; urine formation, osmoregulation; regulation of kidney function - renin - angiotensin, atrial natriuretic factor, ADH and diabetes insipidus; role of other organs in excretion; disorders - uremia, renal failure, renal calculi, nephritis; dialysis and artificial kidney, kidney transplant.

### **Chapter-17: Locomotion and Movement**

Types of movement - ciliary, flagellar, muscular; skeletal muscle, contractile proteins and muscle contraction; skeletal system and its functions; joints; disorders of muscular and skeletal systems - myasthenia gravis, tetany, muscular dystrophy, arthritis, osteoporosis, gout.

### **Chapter-18: Neural Control and Coordination**

Neuron and nerves; Nervous system in humans - central nervous system; peripheral nervous system and visceral nervous system; generation and conduction of nerve impulse

### **Chapter- 19: Chemical Coordination and Integration**

Endocrine glands and hormones; human endocrine system - hypothalamus, pituitary, pineal, thyroid, parathyroid, adrenal, pancreas, gonads; mechanism of hormone action (elementary idea); role of hormones as messengers and regulators, hypo - and hyperactivity and related disorders; dwarfism, acromegaly, cretinism, goiter, exophthalmic goitre, diabetes, Addison's disease.

*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.*

**Digestion and Absorption** (Please Refer to CBSE Reading Material)

Alimentary canal and digestive glands, role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; calorific values of proteins, carbohydrates and fats; egestion; nutritional and digestive disorders - PEM, indigestion, constipation, vomiting, jaundice, diarrhoea.

**PRACTICALS**

**Time: 03 Hours**

**Max. Marks: 30**

Evaluation Scheme		Marks
One Major Experiment Part A (Experiment No- 1,3,7,8)		5 Marks
One Minor Experiment Part A (Experiment No- 6,9,10,11,12,13)		4 Marks
Slide Preparation Part A (Experiment No- 2,4,5)		5 Marks
Spotting Part B		7 Marks
Practical Record + Viva Voce	(Credit to the student's work over the academic session may be given)	4 Marks
Project Record + Viva Voce		5 Marks
<b>Total</b>		<b>30 Marks</b>

**A: List of Experiments**

1. Study and describe locally available common flowering plants, from family Solanaceae (Poaceae, Asteraceae or Brassicaceae can be substituted in case of particular geographical location) including dissection and display of floral whorls, anther and ovary to show number of chambers (floral formulae and floral diagrams), type of root (tap and adventitious); type of stem (herbaceous and woody); leaf (arrangement, shape, venation, simple and compound).
2. Preparation and study of T.S. of dicot and monocot roots and stems (primary).
3. Study of osmosis by potato osmometer.
4. Study of plasmolysis in epidermal peels (e.g. Rhoem/Lily leaves or fleshy scale leaves of onion bulb).
5. Study of distribution of stomata on the upper and lower surfaces of leaves.

6. Comparative study of the rates of transpiration in the upper and lower surfaces of leaves.
7. Test for the presence of sugar, starch, proteins and fats in suitable plant and animal materials.
8. Separation of plant pigments through paper chromatography.
9. Study of the rate of respiration in flower buds/leaf tissue and germinating seeds.
10. Test for presence of urea in urine.
11. Test for presence of sugar in urine.
12. Test for presence of albumin in urine.
13. Test for presence of bile salts in urine.

**B. Study and Observe the following (spotting):**

1. Parts of a compound microscope.
2. Specimens/slides/models and identification with reasons - Bacteria, *Oscillatoria*, *Spirogyra*, *Rhizopus*, mushroom, yeast, liverwort, moss, fern, pine, one monocotyledonous plant, one dicotyledonous plant and one lichen.
3. Virtual specimens/slides/models and identifying features of - *Amoeba*, *Hydra*, liver fluke, *Ascaris*, leech, earthworm, prawn, silkworm, honey bee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit.
4. Mitosis in onion root tip cells and animal's cells (grasshopper) from permanent slides.
5. Types of inflorescence (cymose and racemose).
6. Human skeleton and different types of joints with the help of virtual images/models only.

**Practical Examination for Visually Impaired Students Class XI**

**Note:** The 'Evaluation schemes' and 'General Guidelines' for visually impaired students as given for Class XII may be followed.

**A. Items for Identification/Familiarity with the apparatus /equipment /animal and plant material / chemicals for assessment in practicals (All experiments)**

**B. Equipment** - compound microscope, test tube, petri dish, chromatography paper, chromatography chamber, beaker, scalpel

**Chemical** – alcohol

**Models** – Model of Human skeleton to show – Ball and socket joints of girdles and limbs, Rib cage, Honeycomb, Mollusc shell, Pigeon and Star fish, cockroach

**Specimen/Fresh Material** – mushroom, succulents such as *Aloe vera*/ kalenchoe, raisins, potatoes, seeds of monocot and dicot- maize and gram or any other plant, plants of Solanaceae - Brinjal, Petunia, any other

### C. List of Practicals

1. Study locally available common flowering plants of the family – Solanaceae and identify type of stem (Herbaceous or Woody), type of leaves (Compound or Simple).
2. Study the parts of a compound microscope- eye piece and objective lens, mirror, stage, coarse and fine adjustment knobs.
3. Differentiate between monocot and dicot plants on the basis of venation patterns.
4. Study the following parts of human skeleton (Model): Ball and socket joints of thigh and shoulder
5. Rib cage
6. Study honeybee/butterfly, snail/sheik snail through shell, Starfish, Pigeon (through models).
7. Identify the given specimen of a fungus – mushroom, gymnosperm-pine cone.
8. Identify and relate the experimental set up with the aim of experiment: For Potato Osmometer/endosmosis in raisins.

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

#### **Prescribed Books:**

1. Biology Class-XI, Published by NCERT
2. Other related books and manuals brought out by NCERT (including multimedia).
3. Biology supplementary Material (Revised). Available on CBSE Website.
4. Reading Material Biology Class XI.

**COURSE STRUCTURE**  
**CLASS XII (2025 - 26)**  
**(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
	<b>Total</b>	<b>70</b>

**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.

## 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
<b>Total</b>		<b>30</b>

### 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
<b>Total</b>	<b>30</b>

### 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 (consider multimedia also).
3. Biology Supplementary Material (Revised). Available on CBSE website.

## Question Paper Design (Theory)

Class XII (2025 -26)

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.

**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 XI (2026-27)

Three Hours

Max Marks: 80

No.	Units	Marks
I.	Sets and Functions	23
II.	Algebra	25
III.	Coordinate Geometry	12
IV.	Calculus	08
V.	Statistics and Probability	12
	<b>Total</b>	<b>80</b>
	<b>Internal Assessment</b>	<b>20</b>

\*No chapter/unit-wise weightage. Care to be taken to cover all the chapters.

#### Unit-I: Sets and Functions

##### 1. Sets

Sets and their representations, Empty set, Finite and Infinite sets, Equal sets, Subsets, Subsets of a set of real numbers especially intervals (with notations). Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement.

##### 2. Relations & Functions

Ordered pairs. Cartesian product of sets. Number of elements in the Cartesian product of two finite sets. Cartesian product of the set of reals with itself (up to  $\mathbb{R} \times \mathbb{R} \times \mathbb{R}$ ). Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special type of relation. Pictorial representation of a function, domain, co-domain and range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum, exponential, logarithmic and greatest integer functions, with their graphs. Sum, difference, product and quotients of functions.

##### 3. Trigonometric Functions

Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity  $\sin^2 x + \cos^2 x = 1$ , for all  $x$ . Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing  $\sin(x \pm y)$  and  $\cos(x \pm y)$  in terms of  $\sin x$ ,  $\sin y$ ,  $\cos x$  &  $\cos y$  and their simple applications. Deducing identities like the following:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \cot(x \pm y) = \frac{\cot x \mp \cot y}{\cot y \pm \cot x}$$

$$\sin \alpha \pm \sin \beta = 2 \sin \frac{1}{2}(\alpha \pm \beta) \cos \frac{1}{2}(\alpha \mp \beta)$$

$$\cos \alpha + \cos \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)$$

$$\cos \alpha - \cos \beta = -2 \sin \frac{1}{2}(\alpha + \beta) \sin \frac{1}{2}(\alpha - \beta)$$

Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$  and  $\tan 3x$ .

## **Unit-II: Algebra**

### **1. Complex Numbers and Quadratic Equations**

Need for complex numbers, especially  $\sqrt{-1}$ , to be motivated by inability to solve some of the quadratic equations. Algebraic properties of complex numbers. Argand plane.

### **2. Linear Inequalities**

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line.

### **3. Permutations and Combinations**

Fundamental principle of counting. Factorial  $n$ .  $(n!)$  Permutations and combinations, derivation of Formulae for  ${}^n P_r$ ,  ${}^n C_r$  and their connections, simple applications.

### **4. Binomial Theorem**

Historical perspective, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, simple applications.

### **5. Sequence and Series**

Sequence and Series. Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P., sum of  $n$  terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M

## **Unit-III: Coordinate Geometry**

### **1. Straight Lines**

Brief recall of two-dimensional geometry from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axis, point -slope form, slope-intercept form, two-point form, intercept form. Distance of a point from a line.

## **2. Conic Sections**

Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

## **3. Introduction to Three-dimensional Geometry**

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points.

## **Unit-IV: Calculus**

### **1. Limits and Derivatives**

Derivative introduced as rate of change both as that of distance function and geometrically. Intuitive idea of limit. Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions. Definition of derivative relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions of polynomial and trigonometric functions.

## **Unit-V Statistics and Probability**

### **1. Statistics**

Measures of Dispersion: Range, Mean deviation, variance and standard deviation of ungrouped/grouped data.

### **2. Probability**

Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with other theories of earlier classes. Probability of an event, probability of 'not', 'and' and 'or' events.

**MATHEMATICS QUESTION PAPER DESIGN****CLASS – XI (2026-27)**

Time: 3 hours

Max. Marks: 80

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

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

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

Note: Please refer the guidelines given under XII Mathematics Syllabus.

## CLASS – XI (2026-27)

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.

S.No.	Content
<b>Unit-I: Sets and Functions</b>	
<b>1.</b>	<b>Sets</b>
	Practical problems on Union and Intersection of two sets.
<b>2.</b>	<b>Relations and Functions</b>
	Composition of Functions
<b>3.</b>	<b>Trigonometric Functions</b>
	General solution of trigonometric equations of the type $\sin y = \sin a$ , $\cos y = \cos a$ and $\tan y = \tan a$ .
<b>Unit-II: Algebra</b>	
<b>1.</b>	<b>Principle of Mathematical Induction</b>
	Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.
<b>2.</b>	<b>(Complex Numbers and) Quadratic Equations</b>
	Polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations (with real coefficients) in the complex number system.
<b>3.</b>	<b>Linear Inequalities</b>
	Graphical solution of linear inequalities in two variables. Graphical method of finding a solution of system of linear inequalities in two variables.
<b>4.</b>	<b>Binomial Theorem</b>
	General and middle term in binomial expansion.
<b>5.</b>	<b>Sequence and Series</b>
	Formulae for the following special sums $\sum_{k=1}^n k, \sum_{k=1}^n k^2, \sum_{k=1}^n k^3$
<b>Unit-III: Coordinate Geometry</b>	
<b>1.</b>	<b>Straight Lines</b>
	Normal form. General equation of a line.
<b>2.</b>	<b>Introduction to Three-dimensional Geometry</b>
	Section formula.
<b>Unit-IV: Calculus</b>	
<b>1.</b>	<b>Limits and Derivatives</b>
	Derivatives of composite functions (Chain rule).
<b>Unit-V Statistics and Probability</b>	
<b>1.</b>	<b>Probability</b>
	Random experiments; outcomes, sample space (set representation).

## 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
	<b>Total</b>	<b>80</b>
	<b>Internal Assessment</b>	<b>20</b>

#### 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**

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

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

<b>INTERNAL ASSESSMENT</b>	<b>20 MARKS</b>
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 XI (2026-27)**

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

<b>No.</b>	<b>Units</b>	<b>Marks</b>
I	Numbers, Quantification and Numerical Applications	10
II	Algebra	18
III	Calculus	12
IV	Combinatorics and Probability	10
V	Descriptive Statistics	10
VI	Basics of Financial Mathematics	15
VII	Coordinate Geometry	05
<b>Total</b>		<b>80</b>
<b>Internal Assessment</b>		<b>20</b>

**CLASS- XI**

Sl. No.	Unit and Chapter	Details of content	Learning Outcomes
<b>UNIT – 1 NUMBERS, QUANTIFICATION AND NUMERICAL APPLICATIONS</b>			
<b>Numbers &amp; Quantification</b>			
1.1	Binary Numbers	<ul style="list-style-type: none"><li>• Introduction to Binary Number System</li><li>• Conversion of decimal numbers to binary system and vice-versa and its applications.</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• Understand the relation between decimal and binary number system.</li><li>• Able to convert from one system to another.</li><li>• Understand the application of Binary number system in programming, coding, machine learning etc.</li></ul>
1.2	Indices, Logarithm and Antilogarithm	<ul style="list-style-type: none"><li>• Indices and its properties</li><li>• Common and Natural logarithm</li><li>• Laws of logarithms</li><li>• Logarithm and exponential as inverse operations</li><li>• Procedure of finding logarithm and antilogarithms of given number</li><li>• Applications of logarithms</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• Apply rules of indices to simplify expressions and solve problems involving powers</li><li>• Define logarithms and antilogarithms as inverse operations</li><li>• Distinguish between common logarithms and natural logarithms</li><li>• Apply logarithmic and antilogarithmic techniques to simplify complex calculations, and solve practical problems</li></ul>
1.3	Introduction To Bhartiya System of Numeration	<ul style="list-style-type: none"><li>• Introduction To Bhartiya System of Numeration</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• Gain acquaintance with traditional way of expressing numbers</li></ul>
<b>Numbers in day-to-day Life</b>			
1.4	Clocks	<ul style="list-style-type: none"><li>• Evaluate the angular value of a minute</li><li>• Measure of angle formed between two hands of clock at given time</li><li>• Calculation of the time for which hands of clock meet</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• Calculate the angular displacement of hour and minute hands</li><li>• Find the exact time when clock hands coincide, are opposite, or form a specific angle</li><li>• Understand the practical utility of calendar</li></ul>
1.5	Calendar	<ul style="list-style-type: none"><li>• Odd days in a month/ year/ century</li><li>• Decode the day for the given date</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• Calculate odd days in any given month, year, or century</li><li>• Find the day of the week for any given date</li></ul>

1.6	Time and Work	<ul style="list-style-type: none"> <li>Relationship between work and time</li> <li>Comparison of the work done by the individual / group w.r.t. time</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>Solve time-work problems</li> <li>Represent time-work relationship graphically</li> </ul>
1.7	Speed, Distance and Time	<ul style="list-style-type: none"> <li>The time taken/ distance covered from the given data.</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>Represent distance-time relationship graphically</li> </ul>
1.8	Seating arrangement	<ul style="list-style-type: none"> <li>Creation of seating plan/ draft as per given conditions (Linear/circular).</li> <li>Locating the position of a person in a seating arrangement.</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>Design and create seating plans in linear and circular arrangements</li> <li>Determine the exact position of any person in a seating arrangement by analysing the given conditions and applying logical reasoning</li> <li>Apply seating arrangement concepts to real-life situations</li> </ul>

## UNIT – 2 ALGEBRA

### Sets

2.1	Introduction to Sets – Sets and their representation	<ul style="list-style-type: none"> <li>Set as well-defined collection of objects.</li> <li>Representation of a set in Roster form and Set builder form</li> <li>Different types of sets on the basis of number of elements in the set</li> <li>Differentiate between equal set and equivalent set</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>understand the systematic development of set theory.</li> <li>represent sets accurately using both roster form and set-builder form</li> <li>differentiate between the two methods of expressing the same set.</li> </ul>
2.2	Subsets, Intervals as subsets	<ul style="list-style-type: none"> <li>Subsets</li> <li>Power set and its elements</li> <li>Universal Set</li> <li>Subset of real numbers as intervals</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>list all possible subsets of a given set, calculate the total number of subsets</li> <li>justify why the empty set is a subset of every set through logical reasoning.</li> <li>define power sets, construct the power set of a given set by identifying all its subsets</li> <li>Get an idea about the special sets i.e., intervals which have wide utility in the study of analysis.</li> </ul>
2.3	Venn Diagrams and Operations on Sets	<ul style="list-style-type: none"> <li>Concept of Venn diagram to understand the relationship between sets</li> <li>Problems using Venn diagram</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>Use set operations to solve problems in various fields, such as probability, and data analysis.</li> <li>Develop problem-solving skills using set theory and Venn diagrams.</li> </ul>

		<ul style="list-style-type: none"> <li>• Operations on sets</li> </ul>	<ul style="list-style-type: none"> <li>• Perform operations on sets to solve practical problems</li> </ul>
<b>Relations</b>			
2.4	Ordered pairs Cartesian product of two sets	<ul style="list-style-type: none"> <li>• Significance of specific arrangement of elements in a pair</li> <li>• Cartesian product of two sets</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Understand the concept of ordered pairs</li> <li>• Find the Cartesian product of two finite sets</li> <li>• Calculate the number of elements in a Cartesian product</li> </ul>
2.5	Relations	<ul style="list-style-type: none"> <li>• Expressing relation as a subset of Cartesian product</li> <li>• Domain and range of a relation</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Identify and express relations as subsets of Cartesian products</li> <li>• Determine the domain and range of any relation</li> <li>• Create and analyse custom relations from everyday situations</li> </ul>
<b>Mathematical Logic</b>			
2.6	Mathematical Logic	<ul style="list-style-type: none"> <li>• Logical problems involving odd man out, syllogism, blood relation and coding-decoding</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Identify patterns and solve odd man out problems</li> <li>• Draw valid conclusions using syllogism</li> <li>• Decode blood relations and solve coding-decoding problems</li> <li>• Apply logical reasoning skills to real-life decision-making situations</li> </ul>
<b>Sequences and Series</b>			
2.7	Sequence and Series	<ul style="list-style-type: none"> <li>• Differentiate between sequence and series</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Distinguish between sequences and series</li> </ul>
2.8	Arithmetic Progression	<ul style="list-style-type: none"> <li>• Arithmetic mean (AM) of two positive numbers</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Calculate and apply arithmetic mean (AM) of two positive numbers to find average values in real-life situations</li> </ul>
2.9	Geometric Progression	<ul style="list-style-type: none"> <li>• Introduction of Geometric Progression (GP)</li> <li>• <math>n^{th}</math> term of a GP</li> <li>• sum of n terms and sum of infinite terms of a GP</li> <li>• Problems based on applications of GP</li> <li>• Geometric mean (GM) of two positive numbers</li> <li>• Relation between AM and GM and related problems</li> <li>• Application problems based on AP and GP</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Identify and construct geometric progressions</li> <li>• Calculate geometric mean (GM) of two positive numbers</li> <li>• Analyse and prove the AM-GM inequality relationship</li> <li>• Apply formulas of arithmetic and geometric progressions strategically to solve real-world problems</li> </ul>

## UNIT – 3 CALCULUS

### Functions

3.1	Functions and their graphs	<ul style="list-style-type: none"><li>• Dependent and independent variables</li><li>• Definition of function using dependent and independent variable</li><li>• Domain, range and co-domain of a given function</li><li>• Types of functions</li><li>• Graphical representation of function</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• Define dependent and independent variables</li><li>• Define and differentiate between domain, co-domain, and range of functions</li><li>• Classify and define various types of functions</li><li>• Determine domain, co-domain, and range of given functions</li><li>• Represent functions graphically on coordinate planes</li><li>• Apply function concepts to solve real-life problems involving mapping relationships like student enrolment systems, profit-loss calculations, and designing input-output models for business.</li></ul>
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### Limits, Continuity and Derivatives

3.2	Limits and continuity of functions	<ul style="list-style-type: none"><li>• Limit of a function</li><li>• Continuity of a function</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• Define and understand the concept of limit of a function by analysing the behaviour of functions.</li><li>• Solve problems based on the algebra of limits.</li><li>• Define continuity of a function at a point and over an interval</li></ul>
3.3	Differentiation	<ul style="list-style-type: none"><li>• Instantaneous rate of change</li><li>• Finding the derivative of the functions</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• Define the derivative of a function and relate it to the slope of the tangent to a curve.</li></ul>
3.4	Algebra of derivatives	<ul style="list-style-type: none"><li>• Differentiation of addition, subtraction, multiplication and division of two or more functions</li><li>• Differentiation of a function of a function</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• state and apply the fundamental rules of differentiation for sum, difference, product, and quotient of two or more functions</li><li>• understand the chain rule as the method for differentiating composite functions.</li></ul>

## UNIT – 4 PERMUTATIONS AND COMBINATIONS & PROBABILITY

### Combinatorics

4.1	Combinatorics	<ul style="list-style-type: none"><li>• Factorial of a number</li><li>• Fundamental Principle of Counting</li><li>• Concept of Permutation</li><li>• Simple problems based on permutations</li></ul>	Students will be able to <ul style="list-style-type: none"><li>• Understand and calculate factorials of numbers</li><li>• Appreciate how to count without counting</li><li>• Define permutation and apply the</li></ul>
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		<ul style="list-style-type: none"> <li>• Define combination</li> <li>• Difference between permutation and combination</li> <li>• Problems based on Combinations</li> </ul>	<p>concept to solve problems</p> <ul style="list-style-type: none"> <li>• Define combination and differentiate it from permutation</li> <li>• Apply permutation and combination formulas strategically</li> <li>• Model complex counting situations using permutation and combination concepts</li> </ul>
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**Probability**

4.2	Probability	<ul style="list-style-type: none"> <li>• Random experiment and sample space with suitable examples</li> <li>• Event and its Types</li> <li>• Concept of Probability</li> <li>• Problems based on calculating probabilities in real life situations</li> <li>• Concept of conditional probability</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Define random experiment and sample space with suitable examples</li> <li>• Recognize and differentiate different types of events and find their probabilities</li> <li>• Appreciate the use of probability in daily life situations</li> <li>• Apply reasoning skills to solve problems based on conditional probability</li> </ul>
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**UNIT- 5 DESCRIPTIVE STATISTICS**

**Measures of Dispersion and Percentiles**

5.1	Measures of Dispersion	<ul style="list-style-type: none"> <li>• Meaning of dispersion in a data set</li> <li>• Range, mean deviation, standard deviation and variance</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Understand the meaning of dispersion in a data set</li> <li>• Differentiate between range, mean deviation and standard deviation</li> <li>• Calculate range, range standard deviation and variance, and standard deviation for ungrouped and grouped data set</li> <li>• Choose appropriate measure of dispersion to calculate spread of data</li> </ul>
5.2	Percentiles	<ul style="list-style-type: none"> <li>• Concept of Percentile rank</li> <li>• Calculate and interpret Percentile rank of scores in a given ungrouped data set.</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Calculate, analyze and interpret Percentile rank of scores in a given ungrouped data set.</li> </ul>

**Correlation**

5.3	Correlation	<ul style="list-style-type: none"> <li>• Concept of Correlation</li> <li>• Karl Pearson's coefficient of Correlation for ungrouped data</li> <li>• Spearman's Rank Correlation for ungrouped data</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Analyze relationships between variables by calculating and interpreting Karl Pearson's coefficient of correlation and Spearman's rank correlation coefficient for ungrouped data.</li> </ul>
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**Regression**

5.4	Regression	<ul style="list-style-type: none"> <li>• Concept of Regression analysis</li> <li>• Dependent and</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Distinguish between correlation and regression analysis.</li> </ul>
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		<ul style="list-style-type: none"> <li>Independent variables</li> <li>• Regression Coefficients</li> <li>• Regression Equations</li> <li>• Properties of Regression Equations</li> </ul>	<ul style="list-style-type: none"> <li>• Compute regression coefficients.</li> <li>• Solve real-world problems by selecting and applying appropriate correlation or regression techniques.</li> </ul>
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## UNIT – 6 FINANCIAL MATHEMATICS

### Interests and Annuities

6.1	Interest and Interest Rates	<ul style="list-style-type: none"> <li>• Concept of Interest Rates</li> <li>• Comparison between Nominal Interest Rate, Effective Rate and Real Interest Rate</li> <li>• Practical applications of interest rate w.r.t simple and compound interest</li> <li>• Concept of effective rate of interest</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Understand the concept of interest rates</li> <li>• Differentiate between nominal interest rate, effective rate, and real interest rate</li> <li>• Calculate and compare simple and compound interest</li> <li>• Apply interest rate concepts to solve real-life financial problems</li> <li>• Define with examples the concept of effective rate of interest</li> <li>• Analyze and evaluate financial products and investment schemes</li> </ul>
6.2	Annuities	<ul style="list-style-type: none"> <li>• Meaning of Immediate Annuity, Annuity due and Deferred Annuity</li> <li>• Future and present value of ordinary annuity, annuity due (up to 3 period)</li> <li>• Concept of Annuity in real life situations</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Understand and differentiate between immediate annuity, annuity due, and deferred annuity</li> <li>• Calculate the future and present value of regular annuity and annuity due</li> <li>• Apply annuity concepts to real-life financial situations</li> </ul>

### Tax and Utility Bills

6.3	Taxes and Utility Bills	<ul style="list-style-type: none"> <li>• Concept of Income tax and GST w.r.t. tax new tax guidelines</li> <li>• Utility bills and its various types – Electricity, Water and PNG Bills</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Understand the concept of income tax and GST</li> <li>• Calculate income tax and GST liabilities using applicable tax brackets</li> <li>• Analyse and calculate types of utility bills – Electricity and Water Bills</li> <li>• Apply taxation and utility billing concepts to real-life situations.</li> </ul>
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## UNIT – 7 COORDINATE GEOMETRY

### Straight Lines

7.1	Straight lines	<ul style="list-style-type: none"> <li>• Concept of slope of a line</li> <li>• Various forms of equation of line</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Understand the gradient as the measure of steepness and calculate it using coordinates</li> <li>• Derive and apply various algebraic forms to represent lines in a Cartesian plane.</li> </ul>
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			<ul style="list-style-type: none"> <li>• Apply linear equations to model real-world scenarios like demand and supply curves in economics.</li> </ul>
<b>Circles and Parabola</b>			
7.2	Circles and Parabola	<ul style="list-style-type: none"> <li>• Determination of the equations of circle and parabola as a locus of a point in a plane under certain conditions</li> <li>• Different form of equations of a circle</li> <li>• Solve problems based on applications of circle</li> </ul>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Define circles and parabolas as sets of points satisfying specific geometric conditions in a plane.</li> <li>• Formulate and solve equations of circles in standard, central, diameter, and general forms.</li> <li>• Identify the properties of a parabola and express its standard form equation based on its focus and directrix.</li> <li>• Utilize the properties of circles to solve practical and coordinate-based mathematical problems.</li> </ul>

### **Suggested Practicals using spreadsheet**

1. Visualizing Functions and Their Properties: Plotting graphs of functions in GeoGebra to observe how coefficients change the graph's shape and to find out their domain and range graphically.
2. Understanding Derivatives: Constructing a tangent line to a curve in GeoGebra and observing its slope as the point moves and demonstrating the derivative as the instantaneous rate of change.
3. Personal Budgeting: Designing a comprehensive monthly budget tracker in a spreadsheet to manage income and expenditures using summation and percentage formulas.
4. Comparative Cost-Benefit Analysis: Building a decision-making model to identify the most economical purchase for a high-value product by comparing cost, shipping charges, tax and other hidden costs.
5. Descriptive Measures of Data: Using spreadsheet functions (e.g., AVERAGE, STDEV.P etc.) to compute the mean, median, mode, variance, and standard deviation of a raw dataset.
6. Interest Growth Analysis: Developing a comparative sheet for Simple vs. Compound Interest to track the growth of an investment over time.
7. Environmental & Economic Data Modelling: Analysing real-world datasets regarding local weather, inflation or AQI by generating and interpreting scatter plots, histograms, bar graphs etc. to identify correlations and seasonal trends.

**Grade XII (2026-27)**

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

<b>No.</b>	<b>Units</b>	<b>Marks</b>
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
<b>Total</b>		<b>80</b>
<b>Internal Assessment</b>		<b>20</b>

**CLASS- XII**

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

**Numbers & Quantification**

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

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

## UNIT- 3 CALCULUS

### Differentiation and its Applications

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

### Integration and its Applications

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

### Differential Equations and Modeling

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

### UNIT- 4 PROBABILITY DISTRIBUTIONS

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

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

### UNIT - 5 INFERENCE STATISTICS

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

## UNIT – 6 TIME-BASED DATA

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

**UNIT - 7 FINANCIAL MATHEMATICS**

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

**UNIT - 8 LINEAR PROGRAMMING**

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

### **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

# CBSE | DEPARTMENT OF SKILL EDUCATION CURRICULUM FOR SESSION 2026-2027

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## MARKETING (SUBJECT CODE-812) JOB ROLE: MARKETING EXECUTIVE

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### CLASS–XI

#### **COURSE OVERVIEW:**

This is the basic course in Marketing where students will get the exposure of Marketing. The subject gives them a vast and wide insight of the traditional and contemporary aspects in Marketing. The input of basic fundamentals, coupled with the practical knowledge will be given to the students to help them in understanding of contemporary marketing tactics and strategies.

#### **OBJECTIVES OF THE COURSE:**

Followings are the main objectives of this course.

- To understand the classical marketing perspectives and contrasts these with newer views from relational and service-based schools of marketing
- To understand the dynamics of various environmental factors on marketing so that students can think about a feasible marketing plan (process)
- To understand the utility of STP of marketing (i.e. segmentation, targeting, positioning)
- To have an elementary knowledge of marketing mix, consumer behavior, and other preliminary concepts and roles of marketing in society
- Familiarize the students regarding various dimensions of retail management and career opportunities available in these fields.

#### **SALIENT FEATURES:**

- To views from relational and service-based schools of marketing
- To understand the dynamics of various environmental factors on marketing so that students can think about a feasible marketing plan (process)
- To understand the utility of STP of marketing (i.e. segmentation, targeting, positioning)
- To have an elementary knowledge of marketing mix, consumer behavior, and other preliminary concepts and roles of marketing in society.
- This course will empower the students to gain insights into what marketing practitioners actually do and the decisions they have to make in day to day marketing. This course is an effort to teach marketing in more creative and visual way with the coverage of advances in new technology and the social web and how to take advantage of these in marketing context. This course will also recognize the need to go further than the traditional 4P's approach and reflect on newer perspective, covering both the classical and modern theories of marketing.

## **LIST OF EQUIPMENT AND MATERIALS:**

The list given below is suggestive and an exhaustive list should be prepared by the skill teacher. Only basic tools, equipment and accessories should be procured by the Institution so that the routine tasks can be performed by the students regularly for practice and acquiring adequate practical experience.

### **Material Required for:**

1. Chart paper and Sketch pens

### Teaching/Training Aids:

1. Computer
2. LCD Projector

## **CAREER OPPORTUNITIES:**

This basic course of marketing will teach the students to learn how to analyse consumer demand and promote products to consumers. This course will allow students to work in many different areas of sales and marketing. While all teach marketing concept, this course is tailored for particular objective in order to most effectively prepare the students for their marketing career, which can range from marketing executive to other upper ladder in marketing domain

## **VERTICAL MOBILITY:**

This course will assist the participating students to further update their career by vertically moving either to B.Com BBA, BBA (marketing) and Diploma in sales and marketing and other marketing oriented applied undergraduate courses of different university or they may also move to their corporate career by starting at M-1 level of corporate ladder in role of marketing executives to different sector. After completing these marketing courses after 12<sup>th</sup>. students can land into a wide range of job opportunities in high and reputed profile such as marketing manager , brand manager, marketing research analyst etc.

## **CURRICULUM:**

This course is a planned sequence of instructions consisting of Units meant for developing employability and Skills competencies of students of Class XI opting for Skills subject along with other subjects.

**MARKETING (SUBJECT CODE-812)**  
**CURRICULUM FOR CLASS–XI (SESSION 2025-26)**  
**Total Marks: 100 (Theory-60 + Practical-40)**

	UNITS	NO. OF HOURS for Theory and Practical	MAX. MARKS for Theory and Practical
<b>Part A</b>	<b>Employability Skills</b>		
	Unit 1 : Communication Skills-III	13	2
	Unit 2 : Self-Management Skills-III	07	2
	Unit 3 : ICT Skills-III	13	2
	Unit 4 : Entrepreneurial Skills-III	10	2
	Unit 5 : Green Skills-III	07	2
	<b>Total</b>	<b>50</b>	<b>10</b>
<b>Part B</b>	<b>Subject Specific Skills</b>		
	Unit 1: Introduction to Marketing	25	10
	Unit 2: Marketing Environment	25	10
	Unit 3: Marketing Segmentation, Targeting & Positioning	40	10
	Unit 4: Fundamentals of Marketing Mix	25	10
	Unit 5: Consumer Behaviour	35	10
	<b>Total</b>	<b>150</b>	<b>50</b>
<b>Part C</b>	<b>Practical Work</b>		
	Project		10
	Viva		10
	Practical File		10
	Demonstration of skill competency via Lab Activities	60	10
	<b>Total</b>		<b>40</b>
	<b>GRAND TOTAL</b>	<b>260</b>	<b>100</b>

**NOTE: The detailed Curriculum/ Topics to be covered under Part A: Employability Skills can be downloaded from CBSE website.**

**PART B SUBJECT SPECIFIC SKILL-CLASS 11**

<b>UNIT</b>	<b>SESSION/ TOPIC</b>	<b>ACTIVITY/ PRACTICAL</b>
1. Introduction to marketing	Concept of marketing, Meaning /definition, Marketing philosophies Selling Vs Marketing, Objectives, scope and importance	Visit in group to different marketing organisations in nearby localities and making a report to find marketing activities performed by the wholesaler, producers retailers and distributors etc.
2. Marketing Environment	Meaning, importance of marketing environment. Internal and external environment determinants .Meaning of ETOP and environmental scanning. Micro and macro environment and its impact on business	Developing case studies of Growth of companies like Patanjali, Adani etc. Role of macro environmental factor in their growth. Listing of micro and macro environmental factor Affecting business. Role of political and regulatory environment
3. Segmentation targeting and positioning	Meaning of segmentation , Basis of segmentation and its importance. Understanding targeting, types of targeting. Positioning : meaning and basis of positioning	Case study of NANO car by TATA and case study of Positioning of Wagon R by MARUTI in SUV market

<p>4. Fundamentals of Marketing Mix</p>	<p>Introduction of marketing mix characteristics of marketing mix. Identify different marketing mix of Product / service Marketing mix for consumer goods and services. 4 P'S to 4 C's</p>	<p>Develop marketing mix for different products. Visit different organisation and find the stages involved in developing marketing mix. Prepare list of 5 products in each categories on the basis of usage, durability and tangibility. Preparing</p>
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		marketing mix of prominent consumer goods and service providers
5 Consumer behaviour	Meaning of consumer behaviour. Importance of consumer behaviour. Factors influencing consumer behaviour. Stages of consumer behaviour	Undertaking role play of different buyeys in buying process by students. Collecting information about various factors influencing consumer behaviour in a shopping mall

## PRACTICAL GUIDELINES FOR CLASS - XI

### Assessment of performance:

The two internal examiners, assigned for the conduct and assessment of Practical Examinations each in **Senior Secondary School Curriculum (Under NSQF)**. Question for the viva examinations should be conducted by both the examiners. Question to be more of General nature, project work or the curriculum. Investigatory Project especially those that show considerable amount of effort and originality, on the part of the student, should get suitable high marks, while project of a routine or stereotyped nature should only receive MEDIOCRE marks.

### Procedure for Record of Marks in the Practical answer-books:

The examiner will indicate separately marks of practical examination on the title page of the answer-books under the following heads:-

#### **Project -10 marks**

Projects for the final practical is given below .Student may be assigned

#### **Viva based on Project – 10 marks**

The teacher conducting the final practical examination may ask verbal questions related to the project, if any, done by the student. Alternatively, if no project has been assigned to the students, viva may be based on questions of practical nature from the field of subject as per the Curriculum

#### **Practical File -10 Marks**

Students to make a power point presentation / assignment / practical file / report. Instructor shall assign them any outlet to study the elements in retailing.

Suggested list of Practical –

1. Prepare a practical file by collecting print advertisements and analysing the message conveyed in marketing of goods, services people, ideas, experience, events, places, properties, organisations and information. Suggest an alternative mode of communication to the firm and create an advertisement for the same.
2. Visit in a group to different marketing organisations in your locality (distributors, wholesalers, retailers). Make a detailed project report to find the marketing activities of each of them respectively. Also identify different activities followed in selling and marketing.
3. Prepare a project report on macro environmental scanning of a firm or an industry of your choice.
4. Identify a firm of your choice and prepare a detailed file on its micro environment.

5. Prepare a project report by visiting your nearby market and find how many SHREE ANNA/Millets) brands are available? Which brand is targeting which segment of the market and why? Also discuss targeting and positioning strategy of the brand. Suggest alternative strategies and justify.
6. Prepare a detailed report of the marketing mix of a prominent consumer good and a service provider, for its multiple brands. Or marketing mix of solar panels/chargers to sustain environment. Suggest alternative sources of energy and new products which protect and promote sustainability of environment.
7. Interview your friends, parents, relatives for a recent purchase made by them of environmental friendly products. Prepare a detailed project report on the same
8. In today's context, take example of at least 10 industries working in different sectors for their ETOP profit.
  - How the price crude oil and politics play a role in the establishment and survival of own industry.

### **Selling Vs. Marketing:**

- Why is selling a part of marketing?
- Suggest with suitable example of different companies with their brands.
- How is the marketing concept applied in those different companies.
- Compare the concept of selling with marketing.

### **Concept/ Philosophies of Marketing**

- Collection of name of different companies with their product.
- Classify their products and identify the marketing concept/ Philosophy used by the company to be in the market.

### **Demonstration of skill competency in Lab Activities -10 marks**

#### **Guidelines for Project Preparation:**

The final project work should encompass chapters on:

- a) Introduction,
- b) Identification of core and advance issues,
- c) Learning and understanding and
- d) Observation during the project period.

# CBSE | DEPARTMENT OF SKILL EDUCATION CURRICULUM FOR SESSION 2026-2027

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## MARKETING (SUBJECT CODE-812) JOB ROLE: MARKETING EXECUTIVE

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### CLASS - XII

#### **COURSE OVERVIEW:**

This is the basic course in Marketing where students will get the exposure of Marketing. The subject gives them a vast and wide insight of the traditional and contemporary aspects in Marketing. The input of basic fundamentals, coupled with the practical knowledge will be given to the students to help them in understanding of contemporary marketing tactics and strategies.

#### **OBJECTIVES OF THE COURSE:**

Followings are the main objectives of this course.

- To understand the classical marketing perspectives and contrasts these with newer views from relational and service-based schools of marketing
- To understand the dynamics of various environmental factors on marketing so that students can think about a feasible marketing plan (process)
- To understand the utility of STP of marketing (i.e. segmentation, targeting, positioning)
- To have an elementary knowledge of marketing mix, consumer behavior, and other preliminary concepts and roles of marketing in society
- Familiarize the students regarding various dimensions of retail management and career opportunities available in these fields.

#### **SALIENT FEATURES:**

- To views from relational and service-based schools of marketing
- To understand the dynamics of various environmental factors on marketing so that students can think about a feasible marketing plan (process)
- To understand the utility of STP of marketing (i.e. segmentation, targeting, positioning)
- To have an elementary knowledge of marketing mix, consumer behavior, and other preliminary concepts and roles of marketing in society.
- This course will empower the students to gain insights into what marketing practitioners actually do and the decisions they have to make in day to day marketing. This course is an effort to teach marketing in more creative and visual way with the coverage of advances in new technology and the social web and how to take advantage of these in marketing context. This course will also recognize the need to go further than the traditional 4P's approach and reflect on newer perspective, covering both the classical and modern theories of marketing.

## **LIST OF EQUIPMENT AND MATERIALS:**

The list given below is suggestive and an exhaustive list should be prepared by the skill teacher. Only basic tools, equipment and accessories should be procured by the Institution so that the routine tasks can be performed by the students regularly for practice and acquiring adequate practical experience.

### **Material Required for:**

1. Chart paper and Sketch pens

### Teaching/Training Aids:

1. Computer
2. LCD Projector

## **CAREER OPPORTUNITIES:**

This basic course of marketing will teach the students to learn how to analyse consumer demand and promote products to consumers. This course will allow students to work in many different areas of sales and marketing. While all teach marketing concept, this course is tailored for particular objective in order to most effectively prepare the students for their marketing career, which can range from marketing executive to other upper ladder in marketing domain

## **VERTICAL MOBILITY:**

This course will assist the participating students to further update their career by vertically moving either to B.Com BBA, BBA (marketing) and Diploma in sales and marketing and other marketing oriented applied undergraduate courses of different university or they may also move to their corporate career by starting at M-1 level of corporate ladder in role of marketing executives to different sector. After completing these marketing courses after 12<sup>th</sup>. students can land into a wide range of job opportunities in high and reputed profile such as marketing manager , brand manager, marketing research analyst etc.

## **CURRICULUM:**

This course is a planned sequence of instructions consisting of Units meant for developing employability and Skills competencies of students of Class XII opting for Skills subject along with other subjects.

**MARKETING (SUBJECT CODE- 812)**  
**CURRICULUM FOR CLASS–XII (SESSION 2026-2027)**

**Total Marks: 100 (Theory-60 + Practical-40)**

	UNITS	NO. OF HOURS for Theory and Practical 220	MAX. MARKS for Theory and Practical 100
<b>Part A</b>	<b>Employability Skills</b>		
	Unit 1 : Communication Skills-IV	13	2
	Unit 2 : Self-Management Skills-IV	07	2
	Unit 3 : ICT Skills-IV	13	2
	Unit 4 : Entrepreneurial Skills-IV	10	2
	Unit 5 : Green Skills-IV	07	2
	<b>Total</b>	<b>50</b>	<b>10</b>
<b>Part B</b>	<b>Subject Specific Skills</b>		
	Unit 1: Product	30	10
	Unit 2: Price Decision	30	10
	Unit 3: Place Decision: Channels of Distribution	30	10
	Unit 4: Promotion	30	10
	Unit 5: Emerging Trends in Marketing	30	10
	<b>Total</b>	<b>150</b>	<b>50</b>
<b>Part C</b>	<b>Practical Work</b>		
	Project	60	10
	Viva		10
	Practical File		10
	Demonstration of skill competency via Lab Activities		10
	<b>Total</b>		<b>60</b>
	<b>GRAND TOTAL</b>	<b>260</b>	<b>100</b>

## **DETAILED CURRICULUM/TOPICS:**

### **Part-A: EMPLOYABILITY SKILLS**

<b>S. No.</b>	<b>Units</b>	<b>Duration in Hours</b>
1.	Unit 1: Communication Skills-IV	13
2.	Unit 2: Self-management Skills-IV	07
3.	Unit 3: Information and Communication Technology Skills-IV	13
4.	Unit 4: Entrepreneurial Skills-IV	10
5.	Unit 5: Green Skills-IV	07
	<b>TOTAL DURATION</b>	<b>50</b>

**Detailed Curriculum/ Topics to be covered under  
Part A: Employability Skills can be downloaded from CBSE website.**

### **Part-B – SUBJECT SPECIFIC SKILLS**

<b>S. No.</b>	<b>Units</b>	<b>Duration in Hours</b>
1.	Unit 1: Product	30
2.	Unit 2: Price Decision	30
3.	Unit 3: Place Decision: Channels of Distribution	30
4.	Unit 4: Promotion	30
5.	Unit 5: Emerging Trends in Marketing	30
	<b>TOTAL DURATION</b>	<b>150</b>

UNIT	SESSION/ TOPIC	ACTIVITY/PRACTICAL
1. PRODUCT	<b>PRODUCT LIFE CYCLE</b> <b>PACKAGING</b>	1. While developing a product in practical students will understand the different stages of <b>PLC</b> . 2. Prepare a list of products (own an existing product) to compare and observe how they have moved through different stages of PLC. 3. To develop a package of any FMCG to understand the importance and levels of packaging
2. PRICE	<b>OBJECTIVES OF PRICING</b>  <b>DIFFERENTIAL PRICING</b>  <b>SKIMMING PRICING</b>	An activity to understand the objectives of pricing. Taking today's example students will compare the price and availability of masks, sanitizers etc. on and after 24th MARCH 2020 till date Why is the price of three layer masks prescribed by doctors is available for more than 100rs? However market is flooded with masks @ of 10rs each
3. PLACE	<b>FUNCTIONS PERFORMED BY CHANNELS OF DISTRIBUTION</b>	Students will be divided in group/(s) 1st group performing transactional functions other logistical functions and other providing facilitating functions

**4. PROMOTION**

**ADVANTAGES AND LIMITATIONS OF YELLOW PAGES, MOBILES AND TELEPHONES AND CINEMA ADVERTISING**

**(TOPIC)- Modes of Advertisement**

A comparative table to be made by the students to analyse why they dislike tele-marketing as a consumer on one hand and on the other hand if they are the sellers what advantages will be reaped by them?

**Activity –**

- Brochures- Brochures can contain a great deal of information.
- Direct mail – Customized eMail sent directly to suit their nature and needs.
- E-mail messages -- E- mail vs. voice mail.)
- Magazines – Magazine ads Newsletters -- This can be powerful means to conveying the nature of your organization and its services.

		<ul style="list-style-type: none"> <li>• Radio announcements-- A major advantage of radio ads is they are usually cheaper than television ads, and many people still listen to the radio</li> <li>Telemarketing -- The use of telemarketing is on the rise. (See Telemarketing.)</li> <li>• Television ads -- Many people don't even consider television ads because of the impression that the ads are very expensive.</li> <li>• Web pages -- You probably would not have seen this means of advertising on a list of advertising methods.)</li> <li>• Yellow Pages --The Yellow Pages can be very effective advertising</li> </ul>
<p><b>5. EMERGING TRENDS IN MARKETING</b></p>	<p>Understanding service marketing . Types of services , service qualities  Online marketing , social media marketing , their meaning , advantages and disadvantages . Identifying various social media platforms used for social media marketing</p>	<p>A PPT will be made by students showing online and social media marketing meaning, advantages and disadvantages when they are going to spread an awareness of their own developed product in their market.</p>

## **PRACTICAL GUIDELINES FOR CLASS - XII**

### **Assessment of performance:**

Two examiners, assigned for the conduct and assessment of Practical Examinations each in **Senior Secondary School Curriculum (Under NSQF) of which one Examiner Is EXTERNAL appointed by CBSE and the other Examiner should be from the home school.** Question for the viva examinations should be conducted by internal as well as external examiner. Question to be more of General nature, project work or the curriculum. Investigatory Project especially those that show considerable amount of effort and originality, on the part of the student, should get suitable high marks, while project of a routine or stereotyped nature should only receive MEDIOCRE marks.

### **Project -10 marks**

Projects for the final practical is given below. Student may be assigned

### **Viva based on Project -10 marks**

The teacher conducting the final practical examination may ask verbal questions related to the project, if any, done by the student. Alternatively, if no project has been assigned to the students, viva may be based on questions of practical nature from the field of subject as per the Curriculum **Practical File -10 Marks**

Students to make a power point presentation / assignment / practical file / report.

Instructor shall assign them any outlet to study the elements in retailing.

Suggested list of Practical –

1. Create a detailed practical file highlighting the movement of few (8-10) products through different stages of product life cycle. Diagrammatic representation and creative inputs are welcome. Encourage the students to take products from Aviation industries, semi conductors Arms and ammunitions for self-reliant india, railway coaches, and IT sectors
2. Collect various 20 to 25 packages for fast moving consumer goods. Create a practical file demonstrating environmental friendly packaging and labeling strategies adopted by various firms keeping in mind sustainable development goals
3. Create a project report on pricing policy adoption by different manufacturing and service firms. Collect various (20-25) packages for fast moving consumer goods. Create a practical

4. Create a project by visiting different marketing organisations in your locality (retailers, wholesalers, distributor etc.). Take 5 products of your choice and find out which type of channel was involved before it reaches your hand. Also discuss functions of various intermediaries.
5. Create a project on promotion mix practices followed by Indian firms.
6. Prepare a project report on emerging trends on marketing including social media platforms , use of web pages and websites
7. Develop your own product.

<b>TANGIBLE</b>	<b>INTANGIBLE</b>
Good	
Name of your product	
Develop Brand for your product	
Logo for us your product	
Describe its components	
Core product	
Associated feature	
Label for your product	
Packaging for your product	
With front Labeling	
With side Labeling	
With back Labeling	
Levels of Packaging	
Modes of Transportation	
Classify it Consumer + Industries Features Features	
Unique Characteristic, if any	
In which Stage your product is? Why	
Marketing Strategy adopted during this stage and why?	
Importance of Labeling in the current content	

8. Why is price the most crucial element of marketing mix?
9. Determination of price of any product. (Good or Service); Own OR already existing in the market

10. Following Consideration:-
  - a. Objectives of pricing.
  - b. Internal & external factors.
  - c. Analysis of market situations.
  - d. Methods of pricing. (Supporting a numerical example.)
11. A ppt can be made on:
  - Describing direct and indirect channels of distribution.
  - Understanding the role of distribution channel intermediaries
  - Understanding the functions of intermediaries.
12. Which channel is suitable for consumer durable/ non-durable/ FMCG/ Industrial Goods & Why?
13. Decision of promotion with the elements of promotional mix.
14. Factors in the selection of promotional mix.
15. Comparative analysis of various modes of promotion.
16. Emerging trends in marketing.
17. Analysis on the criteria on service quality assessment.
18. Develop your own web page for adult digital marketing.
19. Facebook, twitter (Social Media Marketing).
20. Comparative analysis on the above.

### **Demonstration of skill competency in Lab Activities -10 marks**

#### **Guidelines for Project Preparation:**

The final project work should encompass chapters on:

- a) Introduction,
- b) Identification of core and advance issues,
- c) Learning and understanding and
- d) Observation during the project period.