
Rationale

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 rigour and depth of disciplinary approach as well as the comprehension level of learners. Due care has also been taken that the syllabus is not heavy and is at the same time, comparable to the international standards. Salient features of the syllabus include:

Objectives

- Emphasis on basic conceptual understanding of the content.
- Emphasis on use of SI units, symbols, nomenclature of physical quantities and formulations as per international standards.
- Providing logical sequencing of units of the subject matter and proper placement of concepts with their linkage for better learning.
- Reducing the curriculum load by eliminating overlapping of concepts/ content within the discipline and other disciplines.
- Promotion of process-skills, problem-solving abilities and applications of Physics concepts. Besides, the syllabus also attempts to strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject.
- Expose the learners to different processes used in Physics-related industrial and technological applications.
- Develop process-skills and experimental, observational, manipulative, decision making and investigatory skills in the learners.
- Promote problem solving abilities and creative thinking in learners.
- Develop conceptual competence in the learners and make them realize and appreciate the interface of Physics with other disciplines.

Class XII

One Paper Time: 3 Hours, Marks: 70

<i>Unit</i>	<i>Topics</i>	<i>Marks</i>
I	Electrostatics	08
II	Current Electricity	07
III	Magnetic effect of current & Magnetism	08
IV	Electromagnetic Induction and Alternating current	08
V	Electromagnetic Waves	08
VI	Optics	14
VII	Dual Nature of Matter	04
VIII	Atoms and Nuclei	06
IX	Electronic Devices	07
X	Communication Systems	05
		70

UNIT I: Electrostatics

(Periods 25)

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).

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with dielectric medium between the plates, energy stored in a capacitor. Van de Graaff generator.

UNIT II: Current electricity

(Periods 22)

Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity. Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; 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 laws and simple applications. Wheatstone bridge, metre bridge.

Potentiometer - principle and its applications to measure potential difference and for comparing emf of two cells; measurement of small resistances and internal resistance of a cell.

UNIT III: Magnetic effects of current and magnetism

(Periods 25)

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, Force between two parallel current-carrying conductors-definition of ampere, straight and toroidal solenoids.

Force on a current-carrying conductor in a uniform magnetic field. Torque experienced by a current loop in uniform magnetic field; moving coil galvanometer-its current sensitivity and conversion to ammeter and voltmeter.

Force on a moving charge in uniform magnetic and electric fields. Cyclotron.

Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements.

Para-, dia- and ferro - magnetic substances, with examples. Electromagnets and factors affecting their strengths. Permanent magnets.

UNIT IV: Electromagnetic induction and alternating currents

(Periods 20)

Electromagnetic induction; Faraday's law, induced emf and current; Lenz's Law, Eddy currents. Self and mutual inductance.

Need for displacement current.

Alternating currents, peak and rms value of alternating current/voltage; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits, wattless current.

AC generator and transformer.

UNIT V: Electromagnetic waves ***(Periods 4)***

Displacement current, Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

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

UNIT VI: Optics ***(Periods 30)***

Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lensmaker's formula. Magnification, power of a lens, combination of thin lenses in contact. Refraction and dispersion of light through a prism.

Scattering of light - blue colour of the sky and reddish appearance of the sun at sunrise and sunset.

Optical instruments: Human eye, image formation and accommodation, correction of eye defects (myopia, hypermetropia, presbyopia and astigmatism) using lenses. Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers. Resolving power of microscopes and astronomical telescopes.

Wave optics: wave front and Huygens' principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygens' principle. Interference, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Polarisation, plane polarised light; Brewster's law, uses of plane polarised light and Polaroids.

UNIT VII: Dual nature of matter and radiation ***(Periods 8)***

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

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

UNIT VIII: Atoms and Nuclei ***(Periods 18)***

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum.

Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear reactor, nuclear fusion.

UNIT IX: Electronic devices

(Periods 18)

Semiconductors; semiconductor diode – I-V characteristics in forward and reverse bias, diode as a rectifier; I-V characteristics of LED, photodiode, solar cell, and Zener diode; Zener diode as a voltage regulator. Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.

UNIT X: Communication systems

(Periods 10)

Elements of a communication system (block diagram only); bandwidth of signals (speech, TV and digital data); bandwidth of transmission medium. Propagation of electromagnetic waves in the atmosphere, sky and space wave propagation. Need for modulation. Production and detection of an amplitude-modulated wave.

Practical

Every student will perform 10 experiments (5 from each section) & 8 activities (4 from each section) during the academic year. Two demonstration experiments must be performed by the teacher with participation of students. The students will maintain a record of these demonstration experiments.

SECTION A

Experiments

- To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.
- To find resistance of a given wire using metre bridge and hence determine the specific resistance of its material.
- To verify the laws of combination (series/parallel) of resistances using a metre bridge.
- To compare the emf of two given primary cells using potentiometer.
- To determine the internal resistance of given primary cell using potentiometer.
- To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
- To convert the given galvanometer (of known resistance and figure of merit) into an ammeter and voltmeter of desired range and to verify the same.
- To find the frequency of the a.c. mains with a sonometer.

Activities

- To measure the resistance and impedance of an inductor with or without iron core.
- To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
- To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.
- To assemble the components of a given electrical circuit.
- To study the variation in potential drop with length of a wire for a steady current.
- 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

- To find the value of v for different values of u in case of a concave mirror and to find the focal length.
- To find the focal length of a convex lens by plotting graphs between u and v or between $1/u$ and $1/v$.
- To find the focal length of a convex mirror, using a convex lens.
- To find the focal length of a concave lens, using a convex lens.
- To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
- To determine refractive index of a glass slab using a travelling microscope.
- To find refractive index of a liquid by using (i) concave mirror, (ii) convex lens and plane mirror.
- To draw the I-V characteristic curve of a p-n junction in forward bias and reverse bias.
- To draw the characteristic curve of a zener diode and to determine its reverse breaks down voltage.
- To study the characteristics of a common - emitter npn or pnp transistor and to find out the values of current and voltage gains.

Activities

- To study effect of intensity of light (by varying distance of the source) on an L.D.R.
- To identify a diode, an LED, a transistor, and IC, a resistor and a capacitor from mixed collection of such items.
- Use of multimeter to (i) identify base of transistor. (ii) Distinguish between npn and pnp type transistors. (iii) See the unidirectional flow of current in case of a diode and an LED. (iv) Check whether a given electronic component (e.g. diode, transistor or I C) is in working order.
- To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
- To observe polarization of light using two Polaroids.
- To observe diffraction of light due to a thin slit.
- To study the nature and size of the image formed by (i) convex lens (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/ mirror).
- To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

B. Evaluation scheme for practical examination

Topics	Marks
One experiment from any one section	8
Two activities (one from each section) (4+4)	8
Practical record (experiments and activities)	6
Record of demonstration experiments and Viva based on these experiments	3
Viva on experiments and activities	5
	30

Recommended text books

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- 1 Physics Part-I, Textbook for XII, Published by NCERT
 - 2 Physics Part-II, Textbook for XII, Published by NCERT