HP Board Class 12 Physics Syllabus

17.PHYSICS

Senior secondary stage of school education is a stage of transition from general education to discipline-based focus on curriculum. The present update 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:

- 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 the 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.
- Promoting process-skills, problems-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.

THEORY

One Paper	**Time: 3 Hrs**	**60 Marks**
Unit-I	Electrostatics	07
Unit-II	Current Electricity	07
Unit-III	Magnetic effect of current & Magnetism	07
Unit-IV	Electromagnetic Induction and Alternating Current	07
Unit-V	Electromagnetic Waves	03
Unit-VI	Optics	12
Unit-VII	Dual Nature of Matter	03
Unit-VIII	Atoms and Nuclei	04
Unit-IX	Electronic Devices	06
Unit-X	Communication Systems	04

Total	**60**

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Unit I: Electrostatics

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 plans 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 polarization, capacitor 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. Van de Graaff generator.

Unit II : Current Electricity

Electric current, flow of electric charges in a metallin conductor, drift velocity and 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 cell; measurement of internal resistance of a cell.

Unit III : Magnetic Effect of Current 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 and tropical solenoids.

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

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

Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors-definition of ampere. Torque experienced by a current loop in uniform magnetic field; moving coil galvanometer-its current sensitivity and conversion to ammeter and voltmeter.

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 Current

Electromagnetic induction, Faraday's laws, 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, wattles current.
AC generator and transformer.

Unit V Electromagnetic Waves

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

Reflections of light, spherical mirrors, mirror formula. Refraction of light total internal reflection and its applications, 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 and dispersion of light through a prism.
Scattering of light- blue colour of the sky and reddish appearance of the sun at sun rise 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 (reflection and refraction) and their magnifying powers.

Wave Optics – Wave front and Huygen's principle; reflection and refraction of plane wave at a plane surgace 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, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, plane polarized light, Brewster's Law; uses of plane Polarized light and Polaroid.

Unit VII : Dual Nature of Matter and Radiation

Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observation; Einstein's photoelectric equation-particle nature of light.
Matter waves – wave nature of particles, de-Broglie relation, Davisson Germer experiment.

Unit VIII : Atomic & Nuclei

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 and fusion.

Unit IX : Electronic Devices

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 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

Elements of a communication systems (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.

PRACTICALS

Every student will perform 10 experiments (5 from each section) and 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.

B. Evaluation Scheme for Practical Examination:

• One experiment from any one Section	**7 Marks**
• Two activities (One from each section)	**3 + 3 = 6 Marks**
Practical record (experiments & activities)	**5 Marks**
• Record of demonstration experiments & Viva based on these experiments	**2 Marks**
• Viva on experiments and activities	**5 Marks**
Total	**25 Marks**

SECTION A

EXPERIMENTS

1. To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.
2. To find resistance of a given wire using meter bridge and hence determine the specific resistance of its material.

3. To verify the laws of combination (series/parallel) of resistances using a meter bridge.

4. To compare the emf of two given primary cells using potentiometer.
5. To determine the internal resistance of given primary cell using potentiometer.
6. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
7. To convert the given galvanometer (of known resistance of figure of merit) into an ammeter and voltmeter of desired range and to verify the same.
8. To find the frequency of the a.c. 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 the find the focal length.
2. To find the focal length of a convex lens by plotting graphs between u and v or between l/u and 1/v.
3. To find the focal length of a convex mirror, using a convex lens.
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 the angle of deviation.
6. To determine refraction index of a glass slab using a travelling microscope.
7. To find refractive index of a liquid by using (i) concave mirror, (ii) convex lens and plane mirror.
8. To draw the I-V characteristic curve of a p-n junction in forward bias and reverse bias.
9. To draw the characteristic curves of a zener diode and to determine its reverse break down voltage.
10. To study the characteristics of a common-emitter npn or pnp, transistor and to find out the values of current and voltage gains.

ACTIVITIES

1. To study effect of intensity of light (by varying distance of the source) on an L.D.R.

2. To identify a diode, an LED, a transistor, and IC, a resistor and a capacitor from mixed collection of such items.

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3. **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 components (e.g. diode, transistor or I C) is in working order.
4. To observe refraction and lateral deviation of beam of light incident obliquely o glass slab.
5. To observe polarization of light using two Polaroid.
6. To observe diffraction of light due to a thin slit.
7. 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).
8. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

BOOKS RECOMMENDED:

Physics Part-I
Physics part-II
} Published by NCERT New Delhi.