West Bengal Board Class 12 Physics Syllabus

PHYSICS (PHYS)

CLASS - XII

Full Marks 100

Theory Marks: 70

		Marks
Unit – I	Electrostatics	08
Unit – II	Current Electricity	08
Unit – III	Magnetic effect of current & Magnetism	08
Unit- IV	Electromagnetic induction and alternating current	08
Unit – V	Electromagnetic waves	03
Unit- VI	Optics	14
Unit- VII	Dual Nature of Matter	04
Unit- VIII	Atoms and Nuclei	06
Unit- IX	Electronic Devices	08
Unit- X	Communication Systems	03
	Total-	**70**

Unit – I: Electrostatics

Electric Charge; conservation of charge, Coulomb's law- force between two point charge, forces between multiple charges; superposition principle and continuous 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 Guass 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 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 charge 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. Elementary idea of secondary cells.

Kirchoff'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 internal resistance of a cell.

Unit – III: Magnetic effect of current & 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 toroidal solenoids.

Force on a moving charge in uniform magnetic and electric fields. Cyclotron. Force on a current – carrying in a uniform magnetic field. Force between two parallel current 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 resolving 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 law, induced emf and current; lenz's law, Eddy currents, Self and mutual inductance.

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 circuit, resonance; power in AC circuits, wattless current.

AC generator and transformer.

Unit – V: Electromagnetic waves

Need for displacement current. Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

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

Unit- VI: Optics

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, lens- maker's formula. Newton's relation: Displacement method to find position of image (conjugate points) magnification power of a lens, combination of thin- lenses in contact, combination of a lens and a mirror. Refraction and dispersion of light through a prism.

Scattering of light – blue colour of the sky and reddish appearance of the sun at sunrise and sunset. Elementary idea of roman effect.

Optical instrument: 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.

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 Huygen's principle. Interference, Young's double slit experience 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 polarised light; Brewster's law, uses of plane polarised light and Polaroids.

Unit- VII: Dual Nature of Matter and Radiation

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

Matter waves- wave nature of particles, de Broglie relation. Davission – Germer experiment (experimental details should be omitted; only conclusion should be explained).

Unit- VIII: Atoms & Nuclei

Alpha – particle scattering experiment: Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Continuous and characteristic X – rays. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radio activity 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

Energy bands in solids, conductors, insulators and Semiconductors; semiconductor diode – I-V characteristics of LED, photodiode, solar cell, and Zener diode;

Zener diode as a voltage regular. Junction transistor, transistor action, characteristics of a 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 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 at least 15 experiments (7 from Section A & 8 from Section B). The activities mentioned here should only be for the purpose of demonstration. One Project of three marks is to be carried out by the students.

B. Evaluation Scheme for Practical Examination

Two experiments one from each section	
(1 out of 3 from Section A & 1 out of 3 from Section B)	8+8 Marks
Practical record (experiments & activities)	6 Marks
Project	3 Marks
Viva on experiments & project	5 Marks
	Total 30 Marks

Section A

Experiments

(Any 7 experiments out of the following to be performed by the students)

1. To find resistance of a given wire using metre bridge and hence determine the specific resistance of its materials.
2. To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.
3. To verify the laws of combination (series/parallel) of resistances using a metre bridge.
4. To compare the emf of two given primary cells using potention meter.
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 and 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 (For the purpose of demonstration only)

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 multi meter.
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

(Any 8 experiments out of the following to be performed by the students)

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* 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 incidence and angle of deviation.
6. To determine refractive 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 curve 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 (For the purpose of demonstration only)

1. To identify a diode, an LED, a transistor, and IC, a resistor and a capacitor from mixed collection of such items.
2. Use of multi meter to i) identity base of transistor (ii) distinguish between npn and pnp type transistors. (iii)see the un-directional flow of current in-case of a diode and an ED (iv) check whether a given electronic component (e.g diode, transistor or IC) is in working order.

3. To study effect of intensity of light (by varying distance of the source) on an L.D.R.
4. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
5. To observe polarization of light using two polaroids.
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 distance 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.