CLASS-XII

PHYSICS

Time 3 hrs **Theory :70 marks**

Practical :25 marks

INA : 5 marks

Total : 100 marks

STRUCTURE OF QUESTION PAPER (THEORY)

1. There will be one theory paper comprising of 18 questions.
2. Question No 1 will be carrying 20 objective type questions of one marks each. In objective type questions there will be 10 multiple choice questions [2 questions of internal choice one theory type and one numerical type in choice from unit 6 (optics) and from unit 7 (Dual Nature of matter)], 3 true/false statements, 2 fill in the blanks and 5 one word answers or definitions.
3. Question number 2 to 8 will be carrying two marks each. There will be three questions of internal choice from unit-I, unit-II and unit-IV. Each one will have one theory type question and one numerical type in choice.
4. Question number 9 to 15 will be carrying three marks each. There will be two questions of internal choice from unit-III (Magnetic effects of current and magnetism) and from unit-VI (Optics). Each one will have one theory question and one numerical type in choice.
5. Question number 16 to 18 will be carrying 5 marks each and there will be internal choice in each of all these questions. From unit VI (optics) internal choice questions will have one question from ray optics and choice question from wave optics.
6. Distribution of marks over different dimensions of the paper will be as follows.

LEARNING OUTCOMES	**MARKS**	**PERCENTAGE OF MARKS**
KNOWLEDGE	26	36%
UNDERSTANDING	30	44%
APPLICATION	14	20%
TOTAL	70	100%

7. Use of un-programmable calculator is allowed. The log tables can be used.
8. Total weightage of numberical will be 20% i.e. 14 marks. There will be two numericals of 1 marks, 3 numericals of 2 marks and 2 numericals of 3 marks.

UNIT WISE DISTRIBUTION OF MARKS

Unit No.	Title	Marks
UNIT-I	Electrostatics	09
UNIT-II	Current Electricity	07
UNIT-III	Magnetic effects of current and magnetism	10
UNIT-IV	Electromagnetic Induction & current	07
UNIT-V	Electromagnetic waves	04
UNIT-VI	Optics	14
UNIT-VII	Dual nature of matter	05
UNIT-VIII	Atoms and Nuclei	07
UNIT-IX	Electronics devices	07
Total Marks		**70**

SCHEMATIC DISTRIBUTION OF MARKS

UNIT	Title	1 Mark Question each	2 Marks Question each	3 Marks Question each	5 Marks Question each	Total Marks
1	Electrostatic	2	1 or N	-	1	09
2	Current Electricity	2	1 or N	1	-	07
3	Magnetic effects of current & magnetism	2	-	1 or N	1	10
4	Electromagnetic Induction & Alternating current	2	1 or N	1	-	07
5	Electromagnetic waves	2	1	-	-	04
6	Optics	4 or N	1	1 or N	1	14
7	Dual Nature of matter	2 or N	-	1	-	05
8	Atoms & Nuclei	2	1	1	-	07
9	Electronic devices	2	1	1	-	07
Total Questions		**1(20 sub parts)**	**7**	**7**	**3**	**18**
Total Marks		**20**	**14**	**21**	**15**	**70**

INSTRUCTIONS FOR PAPER SETTER

Note : There will be one theory paper comprising of 18 questions.

1. Question No 1 will be carrying 20 objective type questions of one marks each. There will be 2 questions of internal choice one theory type and one numerical type from unit 6 (Optics) and unit 7(Dual Nature of matter), 10 multiple choice questions, 3 true/false statements, 2 fill in the blanks and 5 one word answers or definitions.
2. Question number 2 to 8 total 7 questions will be carrying two marks each. There will be three questions of internal

choice,from unit-I, unit-II and unit-IV. Each one will have one theory type question and one numerical in choice.

3. Question number 9 to 15 total 7 questions will be carrying three marks each. There will be two questions of internal choice from unit-III (Magnetic effects of current & magnetism) and unit-VI (Optics). Each one will have one theory type question and one numerical type in choice.
4. Question number 16 to 18 will be carrying 5 marks each and there will be internal choice each of all these questions. From Unit-VI (optics) choice question will have one question from ray optics and one from wave optics.
5. Questions paper should cover all the syllabus.
6. No question or topic should be repeated in the question paper.
7. Questions in the paper can be asked only from mentioned PSEB syllabus. Questions from any topic which is not mentioned in the syllabus will be considered as out of syllabus question.
8. All 3 sets must be of equal standard and difficulty level questions.
9. At the end of each question, paper setter must write detailed distribution of marks of each sub-question.
10. Vague, many possible answer questions, confusing answer question etc type of question should not be asked in the paper. One mark questions, answer should be of one word or one line only.
11. Language used should be clearly understood & specific.
12. Time and length limit of paper should be kept in mind while setting the paper.
13. Questions paper should be made according to knowledge, understanding and applications part marks distribution.

THEORY

Unit-1: Electrostatics

Electric Charges; charging by induction, basic properties of electric charge (addition of charges, quantisation of charges and their Conservation)

Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and cotineous charge distribution.

Electrical field, electric field due to a point charge, electric field due to system of charge, physical significance of electric field, electric-field lines; electric dipole, electric field due to a dipole;(on its axis,on equatorial plane)physical significance of dipoles; torque on a dipole in uniform electric field.Electric field due to continuous charge distribution.

Electric flux, statement of Gauss's theorem proof of Gauss's theorem for a charge enclosed in sphere, and its applications to find electric field due to infinitely long straight wire, uniformly charged infinite thin plane sheet and uniformly charged thin spherical shell (Field inside and outside).

Electric potential, potential difference**,** electric potential due to a point charge, potential due to an electric dipole with special cases for axis and equatorial plane and system of charges; equipotential surfaces, its properties, relation between field and potential electrical potential energy of a system of two point charges potential energy in external field and of electric dipole in an electrostatic field.

Conductors and insulators, electrostatics of conductors, free charges and bound charges inside a conductor. Electrostatic shielding its uses, 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.

Unit-II: Current Electricity

Electric current, flow of electric charges in a metallic conductor, drift velocity, drift of electron mobility and their relation with electric current: Ohm's law, electrical resistance. V-1 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 and resistivity.Internal resistance of a cell, potential difference and emf of cell, combination of cells in series and in parallel.

Kirchhoff's laws and simple applications of Wheatstone

bridge, meter 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 Effects of Current and Magnetism

Concept of magnetic field. Oersted's experiment;

Biot-savart law and its application to find mangnetic field on the axis of a current carrying circular loop, Ampere's circuital law (no proof) 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 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 galvanometers- 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; magnetism and Gauss's law; Earth's magnetic field and magnetic elements, magnetisation and magnetic intensity, magnetic properties of materials, Para-, dia-and ferro- magnetic substances with examples, Electromagnets and factors affecting their strengths. Permanent magnets.

Unit-IV: Electromagnetic Induction and Alternating Currents

Electromagnetic induction, Faraday's and henry experiments,magnetic flux,Faraday laws, induced emf and current, Lenz's Law and conservation of energy, motional emf, Eddy currents: Self and mutual inductance.

Alternating current, peak and rms value of alternating current/voltage; reactance and impedances; phasors, ac applied across resistance, ac applied across inductor, as applied across capacitor, ac applied across LCR, LC oscillations, across inductor, ac applied across capacitor ,ac applLC oscillations, (qualitative treatment only), LCR series circuit resonance; power in AC circuit, 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, Radio-microwaves, infra-red, visible, ultraviolet, X-rays, 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 fibers, refraction at spherical surfaces, refraction by lens, lenses, thin lens formula/equation, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact, combination of lens and mirror. Refraction and dispersion of light through a prism. Some natural phenomenon due to sunlight,Scattering of light-blue colour of the sky and reddish appearance of the sun at sunrise and sunset.

Optical instruments:

Microscopes and astronomical tetescopes (reflecting and refracting) and their magnifying powers.

Waves optics :

wave front and Huygens' Principle, reflection and refraction of plane wave at a plane surface using Huygens' Principle, wave fronts. Proof of laws of reflection and refraction using Huygens 'Principle. Interference Young's double hole experiment and expression for fringe width, coherent sources and incoherent addition of waves and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, polarization by scattering and reflection, plane polarised light -Brewster's law, uses of plane polarised light and Polaroids.

Unit-VII: Dual nature of Matter and Radiation

Electron emission, Photoelectric effect, Hertz and Lenard's observations'; experimental study of photoelectric effect, and wave theory of light, Einstein's photoelectric equation, particle nature of light, the photon, 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; Bohar modal of hydrogen atom, expression for radius, velocity and energy of electron in orbit, energy levels, line spectrum of hydrogen atom, atomic spectra,de-Broglie's explanation of Bohr' s second postulate of quantization.

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

Unit-XI: Electronic Devices

Classification of metal insulator and semiconductor, Energy bands in solids (qualitative idea only) conductor, insulators and Semiconductors; intrinsic and extrinsic semiconductors,p-n junction, semiconductor Diode-1-V characteristics in forward and reverse bias, diode as a rectifier, 1-V characteristics of LED, photodiode, solar cell and Zener diode, Zener diode as a voltage regulator.

STRUCTURE OF PAPER (PRACTICAL)

Time: 3 hrs. **Total: 25 Marks**

Two experiment	10
Record of Activities	2
Viva on Activities	3
Record of Experiments	2
Viva of Experiments	3
Investigatory Project	5
TOTAL	25

PRACTICALS SYLLABUS

Experiments

SECTION-A

1. To determine resistance per unit length 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 resistance 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 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 using a sonometer and electromagnet.

SECTION-B

1. To find the value of v for different values of u in case of a concave mirror and find their focal length.
2. To find the focal length of a convex lens by plotting graphs between u and v or between 1/u and I/v.
3. To find the local 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 angle of deviation.
6. To draw the I-V characteristic curve of a p-n junction in forward bias and reverse bias.
7. To draw the characteristic curve of a zener diode and to determine its reverse breakdown voltage.
8. To study the characteristics of a common-emitter npn or pnp transistor and to find out the values of current and voltage gains.
9. To determine the reflective index of a glass slab using a traveling microscope.

10. To find refractive index of a liquid by using (i) Concave mirror. (ii) Convex lens and plane mirror.

Activities Section-A

1. To assemble the components of a given electrical circuit.
2. To draw the diagram of a given open circuit comprising at least a battery, resistor rheostat, key ammeter and volt meter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.
3. To assemble a household circuit comprising three, bulbs, three (on/off) switches, a – fuse and a power source.
4. To study the variation in potential drop with length of a wire for a steady current.
5. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
6. To measure the resistance and impedance of an inductor with or without iron core.
7. To demonstrate
   (i) The use of an improvised fuse that melts with the flow of a certain current through it and
   (ii) Different kinds of fuses used in everyday life.
8. To demonstrate that a current measuring device has finite non-zero resistonce. (measurement of resistance of an ammeter).
9. To demonstrate that a voltage measuring device has non-infinite resistance (measurement of resistance of an voetmeter).
10. To show that earth's magnetic field has both vertical & horizontal components, by using dip needle.
11. To show the magnetic field lines with the help of iron fillings of bar magnet solenoid.
12. To show the production of induced emf. in a coil due to movement of (i) a magnet towards and away from it (ii) similar coil carrying current towards & away from it.
13. To show that there are two kinds of charges and that like charges repel and unlike charges attract each other.
14. To demonstrate that a large emf is induced when direct current is switched off in an inductive circuit.
15. Make a solenoid for study of its magnetic field.

SECTION-B

1. To identify a diode, an LED, a transistor and 1C, a resistor and a capacity from mixed collection of such items.
2. Use of multimeter to (i) identify base of transistor, (ii) distinguish between npn ad 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 IC) is in working order.
3. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass stab.
4. To study the nature arid 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).
5. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.
6. To observe polarization of light using two Polaroids.
7. To observe diffraction of light due to a thin slit.
8. To study effect of intensity of light (by varying distance of the source) on an D.R