PHYSICS

Class-12

Board of Secondary Education Rajasthan, Ajmer

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PHYSICS

Class-12

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PHYSICS

Class-12

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PREFACE

The book is based on latest syllabus prescribed by Board of Secondary Education Rajasthan, Ajmer. The presentation of the study material incorporates latest concepts supported by relevent diagrams and graphs. To create interest in the subject many examples from daily life, relating to the physical concepts are cited.

The book is basically a translation work of the hindi version published by Board of Secondary Education Rajasthan, however certain modifications in the diagrams are made where ever possible, as required.

Inspite of best efforts certain errors and omissions might have crept in. Feedback is solicited from teachers and students for further improvement of the book.

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Syllabus

PHYSICS

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Time : **Max. Marks :**

S.No.	Learning Areas	Marks
1.	Theory question Paper -1	56
2.	Sessional	14
3.	Practical Examination	30
4.	**Total**	**100**

It is compulsory to pass theory and practical examination separately.

S.No.	Lessons	Periods	Marks
1.	Electrostatics	28	7
2.	Current Electricity	18	5
3.	Magnetic effect of electric current	17	11
4.	Magnet and magnetic properties of Materials	11	3
5.	Electromagnetic induction and Alternating current	23	7
6.	Optics	33	9
7.	Photoelectric effect and matter waves	12	4
8.	Atomic and Nuclear Physics	18	6
9.	Electronics	20	6
10.	Electromagnetic waves and Communication and contemporary physics	10	4
	Total	**190**	**56**

Unit : I Electrostatics

1. **Electric field :** Electric charge, type of charge and properties, coulomb's law, force between many charges and principal of superposition, electric field, electric field due to a point charge, electric field due to system of charges, electric field lines and their properties, electric dipole, electric dipole moment, electric field due to electric dipole, toque on electric dipole in uniform electric field.

2. **Gauss's Law and its application:-** Electric flux, continuous charge distribution, Gauss's law and its derivation, to find intensity of electric field using Gauss's law (i) Infinite liner charge distribution (linear). (ii) Infinite uniformaly charged non conducting sheet (iii) Uniformaly charged Infiniteconducting plate. (iv) Uniformaly charged spherical shell. (v) Charged metallic sphere, (vi) Uniformaly charged non conducting and force on charged surface. Energy per unit volume in Electric field, equilibrium charged soap bubble.

3. **Electric Potential:-** Electrostatic potential and potential difference, Electric potential due to a point charge,

Electric potential due to system of charges, Electric potential due to electric dipole, equi potential surface. Relation between electric potential and electric field, calculation of potential due to (i) Due to uniformaly spherical shell (ii) Charged conductor (iii) Charged spherical conductor. Potential energy due to system of charges, work done in rotating an electric dipole in an external electric field and potential energy.

4. **Electric Capacitance**:- Conductor and insulator, Bound and free charges in a conductor. Dielectric material and polarization. Capacity of a conductor, capacity of an isolated spherical charged conductor, Capacitor, capacity of a parallel plate capacitor (i) For air or vacuum between the plates (ii) Partially fillled with dielectric (iii) Capacity with different plates of dielectric with different thickness. Combination of capacitors series and parallel. Energy stored in capacitor, charge redistribution and energy loss, when two charged conductors are joined by a conducting wire.

Unit-2 Current Electricity

1. **Current Electricity:-** Electric current, flow of charges within a metallic conductor, drift velocity and mobility and relation with electric current. Ohm's law and its derivation; electrical resistance ohmic and non-ohmic resistance. Resistivity and effect of temperature on it. Carbon resistors and colour code. Series and parallel combination of resistors. Internal resistance of cell. EMF and terminal voltage for a cell. Combination of cells- series and parallel. Electric energy and electric power.

2. **Electric Circuit :-** Kirchhoff's law and their application. Wheatstone bridge, metre bridge. Potentiometer– principal, standardisation and sensitively, application of potentiometer to find (i) Internal resistance of a primary cell. (ii) Comparing EMF of two cells. (iii) To fine value of small resistance. Calibration of an Ammeter and voltmeter.

Unit-3 Magnetic effects of electric current :-

Orested`s experience and its conclusions. Biot- Savart`s law the direction of magnetic field. Magnetic field due to a straight and infinity long current carrying wire magnetic field due to current carrying current. Comparison of small current loop with magnetic dipole. Helmholtz coil. Force on charge moving in magnetic field Motion of a charge in magnetic field. Principal, construction and limitations of a cyclotron. Force on a current carrying wire in magnetic field. Magnetic force between two parallel currents. Definition of unit of current in SI system ie. 1 ampere. Force and torque on a current loop in uniform magnetic field. (i) Moving coil galvanometer (ii) Pivoted coil galvanometer and conversion into an ammeter and voltmeter. Ampere's law. Application of ampere`s law to find magnetic field due to a infinite loop straight current carrying conductor, long cylindrical conductor magnetic field inside infinite long and straight solenoid. Comparison of a solenoid and a bar magnet. Magnetic field at the axis of toroid.

Unit-4 Magnetism and magnetic properties of materials:-

Natural and artificial magnet, properties of a bar magnet, magnetic field lines, Neutail points, magnetic moment, magnetic intensity, Torque on a bar magnet in uniform magnetic field. Geomagnetism, elements of Geomagnetism, magnetism and Gauss's law. Behaviour of materials in magnetic field. Intensity of magnetisation, magnetic field. Magnetic suscepbility magnetic permeability, relation between different magnetic quantities, paramagnetic, diamagnetic and ferromagnetic materials, magnetic Hysteresis's and B-H curve (hysteresis loop), Selection of magnetic materials for different uses. Curie law and Curie temperature, comparative

study of different magnetic materials.

Unit-5 Electromagnetic induction and alternating current

1. **Electromagnetic induction :-** Magnetic flux, electromagnetic induction, Faraday's law for electromagnetic induction, Lenz's law, induced current and induced charges. Fleming's Right hand Rule, a moving rod in uniform magnetic field. Motion of a rectangular loop in non-uniform magnet field and conservation of energy. Rotation of rod, a disc and coil with uniform angular velocity, in uniform magnetic field and induced EMF. Eddy currents, self and mutual induction.

2. **Alternating Current :-** Direct Current, Alternating current, instantaneous, peak and average value of alternating current, phase relationship between voltage and current in different circuits (i) Pure resistive (ii) Pure inductive (iii) Pure capacitive (iv) Series L-R circuit (v) Series R-C circuit (vi) Series L-C-R circuit series LCR resosance circuit AC circuit, Band width in LCR series ac circuit, Quality factor. Average power in ac circuit, power factor, wattless current and transformer.

Unit-6 Optics :-

1. **Ray Optics :-** Reflection of light, spherical mirror, mirror formula, refraction of light, total internal reflection and its applications, optical fibre. Refraction at a spherical surface, thin lens formula, lens maker's formula, magnification, power of lens combination of thin lenses in contact and resultant power. Refraction through prism, dispersion by a prism, scattering of light, Rainbow, optical instruments, human-eye, refractive errors of vision and theirs correction. Simple and compound microscopes. Astronomical telescope (refracting and reflecting type) and magnifying power.

2. **Wave Optics :-** Nature of light, Huygens's principal, wave front reflection and refraction at a plane surface. Coherent sources and interference of light, conditions for interference. Young's double slit experiment Mathematical analysis of interference, fringe width and its expression, interference by white light. Diffraction, comparison of sound and light diffraction. Diffraction by a single slit and width of central maxima. Difference between interference and diffraction, resolving power of telescope and microscope. Polarized and un polarized light, plane of vibration and plane of polarization. Methods for obtaining polarised light by reflection and Brewster's law polarizetion by scattering, by double refraction – Nicol prism, Dichroism- Polaroid, detection of polarised, un polarized and partially polarised light Malus's law.

Unit-7 Photo-Electric Effect and Matter Waves

Photo electric effect, results of experiment on photoelectric effect and their explanation. Concept of photon. Photo-electric equation of Einstein and explanation of photo electric effect. Dual Nature of light de Broglie hypothesis, matter wave, wave length associated to different particles, Davisson and Germer Experiment and its conclusion, Heisenberg's uncertainity principal.

Unit-8 Atomic and Nuclear Physics

1. Thomson atomic model, Rutherford's atomic model and Bohr Atomic model, line spectrum of hydrogen atom and it explanation. Shortcomings of Bohr's Model explanation of Bohr 2nd postulate using deBroglie wave principle.

2. **Nuclear Physics** :- Structure of Nucleus, size of Nucleus, atomic mass unit, mass defect and Binding energy. Nuclear forces, Radioactivity, Rutherford and Soddy law for radioactivity, half life and mean life. α,

β and γ-rays/particle and their properties, Nuclear energy, Nuclear fission, controlled and uncontrolled Nuclear chain reactions, Nuclear reactor, nuclear fussion.

Unit-9 Electronics

Energy bands in solids, classification as conductor, insulator and semiconductor, Intrinsic and extrinsic semiconductors, majority and minority charge carriers P-N junction diode, forward and reverse bias characteristics, curve Avalanch and Zener diode, P-N junction diode as half wave and full wave rectifier. Special purpose P-N junction diodes. Transistor, transistor working principal, transistor circuit configuration, common base, common emitter, common collector, transistor characteristics in common base and common emitter configuration. Relation between α and β, Transistor as an amplifier (CE configuration) logic gates OR, AND, NOT, NAND, NOR and XOR gates.

UNIT-10 Electromagnetic waves, communication and contemporary Physics

Displacement current, Maxwells equation (Qualitative Analysis) EM waves and their characteristics, EM spectrum, Propagation of EM waves groundwaves, sky waves, space waves, elements of communication, Need of modulation types of modulation, Amplitude modulation.

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Unit-VIII Atomic and Nuclear Physics

Unit-IX Electronics

Unit-X Electromagnetic waves, communication and contemporary Physics