

**Physics**

# Sample Question Papers 2024-25

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Time: 3 hours 15 minutes

Class 12

marks : 70

Note: The first 15 minutes are allotted for the candidates to read the question paper.

Instructions:

- (i) All questions are compulsory.
- (ii) There are 5 sections in this question paper. Section 'A', Section 'B', Section 'C', Section 'D' and Section 'E'
- (iii) Section 'A' is multiple choice question and each question carries 1 mark.
- (iv) Section 'B' is very short answer type question and each question carries 1 mark.
- (v) Section 'C' is of short answer type, each question carries 2 marks.
- (vi) Section 'D' is of short answer II type, each question carrying 3 marks.
- (vii) Section 'E' is long answer type and each question carries 5 marks. All the four questions in this section have internal choice. In such questions, you have to answer only one question from the given choice.
- (viii) The symbols used in the question have their usual meanings.

Section-'A'

(a) The unit of electric flux is

1

(i) Newton/Coulomb

(ii) volt x meter

(iii) volt/meter

(iv) newton metre/Coulomb

(b) The force  $F'$  applied on a charged particle moving with velocity  $y$  in a magnetic field  $B$  is 1

(i)  $q/u \times B$

(ii)  $U \times B / q$

(iii)  $q (U \times B)$

(iv)  $U \times q \times B$

(c) If  $A$  and  $B'$  are the electric vector and magnetic vector of the electromagnetic wave respectively, then the direction of propagation of the electromagnetic wave is along- 1

(i)  $E$

(ii)  $B$

(iii)  $E \cdot B$

(iv)  $E \times B$

(d) Two lenses of 4 diopter and 2 diopter power are placed in contact. The focal length of the combined lens will be- 1

(1) 50 cm

(ii) -50 cm

(iii) 25 cm

(iv) -25 cm

(e) Photons of 6 eV energy are incident on the surface of a metal. Then the maximum energy of the emitted photoelectron is 4 eV. The stopping potential should be - 1

(1) 4 eV

(ii) 2 eV

(iii) 6 eV

(iv) 10 eV

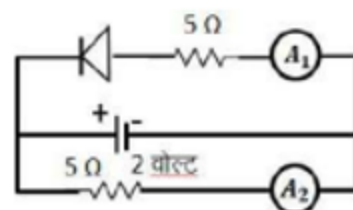
- (f) The impurity added to pure germanium to make it a p-type semiconductor is 1
- (i) phosphorus
- (ii) Antimony
- (iii) aluminium
- (iv) Arsenic

#### Section-'B'

- 2 (a) Write the formula and unit for specific conductivity. 1
- (b) Write an expression for the force applied per unit length on two straight parallel current carrying conductors of infinite length. 1
- (c) A coil of 10 ohm resistance and 10 henry inductance is connected to a 50 volt battery. What is the value of energy stored in the coil? 1
- (d) Write the definition of angle of revolution. 1
- (e) The radius of the first Bohr orbit of hydrogen is  $0.53 \text{ \AA}$ . Find the radius of the third Bohr orbit. 1
- (f) Find the value of the accelerating potential in an electron microscope when the wavelength of the electron is  $1 \text{ \AA}$ . 1

#### Section-'C'

- 3 (a) A thick 6 ohm wire is stretched to double its length. Calculate the new resistance of the wire. 2
- (b) The minimum deviation angle of a prism is  $30^\circ$ . The angle of refraction at the first refracting surface of the prism is  $30^\circ$ . Find the refractive index of the material of the prism. 2
- (c) Define atomic mass unit (a.m.u.). Express its value in kilograms and Mev. 2
- (d) What are the electric currents measured by the ammeters  $A_1$  and  $A_2$  shown in the attached figure? If their resistances are negligible and the p-n junction diode is ideal. 2



#### Section-'D'

4 (a) What is meant by potential gradient? Establish the relation between potential gradient and electric field intensity. 3

(b) Define drift velocity. Establish relation between drift velocity and electric current. 3

(c) A proton, a deuteron and a  $\alpha$ -particle are accelerated through the same potential difference and enter a uniform magnetic field perpendicularly. (i) Compare their kinetic energies. (ii) If the radius of the circular path of the proton is 10 cm, then what will be the radii of the paths of the deuteron and the particle? 3

(d) State Faraday's laws of electromagnetic induction. 3

(e) A screen is placed at a distance of 90 cm from the object. Two images are formed on the screen by placing a convex lens at positions 20 cm apart from each other. Find the focal length of the lens. 3

5 (a) Explain the atomic model of magnetism. If the value of the vertical component of the Earth's magnetic field at a place on the Earth is times the value of the dip component, what will be the value of the angle of inclination at that place? 3

(b) In an alternating circuit, L, C and R are connected in series. Draw a diagram of this circuit. Write the formula for the impedance and resonance frequency of the circuit. If the alternating voltage applied to the circuit is 300 volts, inductive reactance is 50 ohms, capacitive reactance is 50 ohms and ohmic resistance is 10 ohms, then find the impedance of the circuit and the potential difference between the ends of L, C and R. Obtain an expression for the capacitance of a parallel plate capacitor when dielectric is filled between the two plates. 3

Or

The number of turns in the primary and secondary coils of a step-up transformer are 100 and 400 respectively. If 120 volts A.C. is applied to the primary coil, find- (i) transformation ratio (ii) voltage generated in the secondary coil. 3

(c) Explain Maxwell's electromagnetic wave theory. 3

(d) Describe the conditions required for sustaining and destructive interference of waves. 3

(e) Write the laws of photoelectric effect. 3

#### Section E

6 (a) Write Gauss's theorem of electrostatics. With the help of a Intensity of electric field near a straight wire of infinite length uniformly charged. 5

Or

Find an expression for the capacitance of a parallel plate capacitor while both The dielectric between the plates is filled. 5

7 Draw a labelled ray diagram of a compound microscope and find the formula for its magnifying power when the final image is formed at the minimum distance of clear vision. 5

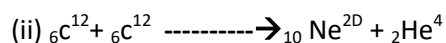
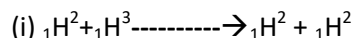
Or

What do you understand by diffraction of light? Explain the diffraction pattern obtained due to diffraction of light through a thin slit. 5

(8) The energy of the electron in the ground state of the hydrogen atom is 13.6 ev. A photon of energy 12.75 ev is absorbed by an electron of the hydrogen atom in the ground state. To what energy level will the hydrogen atom be excited? Calculate the wavelength of the second line of the Lyman series and the second line of the Balmer series. 5

Or

The Q value of a nuclear reaction  $A + b \rightarrow c + d$  is defined by the following equation  $Q = \{m_A + m_B - m_C - m_D\} c^2$  where the given mass is the nuclear rest mass. On the basis of the given data, state whether the following reactions are exothermic or endothermic. 5



(9) Draw the circuit diagram for a p-n junction diode in forward and reverse direction. Explain the characteristic curves obtained for the two states. 5

Or

What is a p-n junction diode? Explain the functioning of a p-n junction diode as a half-wave rectifier by drawing a circuit diagram. Show the waveforms of the input and output voltages. 5