CBSE EXAMINATION PAPER-2025

PHYSICS

(Solved)

Time allowed : 3 hours | Maximum Marks : 50

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **22 questions.** All questions are **compulsory.**

ii. This question paper is divided into **4 sections.**

iii. **Section A** – questions number **1 to 9** are multiple choice questions Each question carries **1 marks.**

iv. **Section B** – questions number **10 to 13** are very short answer Each question carries **2 marks.**

v. **Section C** – questions number **14 to 19** are short answer Each question carries **3 marks.**

vi. **Section D** – questions number **20 to 22** are long answer Each question carries **5 marks.**

vii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

viii. Use of calculator is NOT allowed.

Section A

Question 1.

A particle having charge +q enters a uniform magnetic field B as shown in the figure. The particle will describe:

[1 Marks]

(A) a circular path in XZ plane

(B) a helical path with its axis parallel to Y-axis

(C) a semicircular path in YZ plane

(D) a semicircular path in XY plane

Question 2. Which one out of the following materials is not paramagnetic?

[1 Marks]

(A) Aluminium

(B) Sodium Chloride

(C) Calcium

(D) Copper Chloride

Question 3.

An ammeter connected in series in an ac circuit reads 10 A. The maximum value of current at any instant in the circuit is:

[1 Marks]

(A) $10\sqrt{2}$ A

(B) $10/\sqrt{2}$ A

(C) $10/\sqrt{2}\pi$ A

(D) $10/\pi$ A

Question 4.

The amplitude of electric field in an electromagnetic wave in free space is 1000 Vm^{-1}. The amplitude of the magnetic field in this electromagnetic wave is:

[1 Marks]

(A) $3{\cdot}33 \times 10^{-8}$ T

(B) $3{\cdot}0 \times 10^{-11}$ T

(C) $3{\cdot}0 \times 10^{-3}$ T

(D) $3{\cdot}33 \times 10^{-6}$ T

Question 5. Choose the correct statement:

[1 Marks]

(A) Photons of light show diffraction whereas electrons do not show diffraction.

(B) Electrons have momentum whereas photons do not have momentum.

(C) All electromagnetic radiations do not have photons.

(D) Photons of light and electrons both exhibit dual nature.

Question 6. Which of the following is an electrical conductor at room temperature?

[1 Marks]

(A) Mica

(B) Sn

(C) Si

(D) C

Question 7. A long straight wire is held vertically and carries a steady current in upward direction. The shape of magnetic field lines produced by the current-carrying wire are:

[1 Marks]

(A) horizontal straight lines directed radially out from the wire.

(B) straight lines parallel to the current-carrying wire.

(C) concentric horizontal circles around the wire.

(D) coaxial helixes around the wire.

Question 8.

Assertion (A): In double slit experiment if one slit is closed, diffraction pattern due to the other slit will appear on the screen.

Reason (R): For interference, at least two waves are required.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are false.

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(C) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(D) Assertion (A) is true, but Reason (R) is false.

Question 9.

Assertion (A): For monochromatic incident radiation, the emitted photoelectrons from a given metal have speed ranging from zero to a certain maximum value.

Reason (R): Each metal has a definite work function.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(C) Both Assertion (A) and Reason (R) are false.

(D) Assertion (A) is true, but Reason (R) is false.

Section B

Question 10.

In the given figure, three identical bulbs P, Q and S are connected to a battery.

(i) Compare the brightness of bulbs P and Q with that of bulb S when key K is closed.

(ii) Compare the brightness of the bulbs S and Q when the key K is opened.

Justify your answer in both cases.

[2 Marks]

Question 11. Two cells of emf 10 V each, two resistors of 20 Ω and 10 Ω and a bulb B of 10 Ω resistance are connected together as shown in the figure. Find the current that flows through the bulb.

[2 Marks]

Question 12. Find the angle of diffraction (in degrees) for first secondary maximum of the pattern due to diffraction at a single slit. The width of the slit and wavelength of light used are 0.55 mm and 550 nm, respectively.

[2 Marks]

Question 13. An equiconvex lens is made of glass of refractive index 1.55. If the focal length of the lens is 15.0 cm, calculate the radius of curvature of its surfaces.

[2 Marks]

Section C

Question 14.

(i) Derive an expression for the resistivity of a conductor in terms of number density of free electrons and relaxation time.

(ii) The figure shows the plot of current through a cross-section of wire over two different time intervals. Compare the charges (Q_1 and Q_2) that pass through the cross-section during these time intervals.

[3 Marks]

Question 15.

(a) Write vector form of Biot-Savart law.

(b) Two insulated long straight wires, each carrying 2·0 A current are kept along xx' and yy' axis as shown in the figure. Find the magnitude and direction of resultant magnetic field at point P (4m, 5m).

[3 Marks]

Question 16.

(a) State any three characteristics of electromagnetic waves.

(b) Briefly explain how and where the displacement current exists during the charging of a capacitor.

[3 Marks]

Question 17.

A double slit set-up was initially placed in a tank filled with water and the interference pattern was obtained using a laser light. When water is replaced by a transparent liquid of refractive index n > n_water, what will be the effect on the following ?

(a) Speed, frequency and wavelength of the light of laser beam.

(b) The fringe width, shape of interference fringes and shift in the position of central maximum.

[3 Marks]

Question 18.

(a) Explain briefly the formation of diffusion current and drift current in a p-n junction diode.

(b) What are majority and minority charge carriers of p-type and n-type semiconductors?

[3 Marks]

Question 19.

Two coils '1' and '2' are placed close to each other as shown in the figure. Find the direction of induced current in coil '1' in each of the following situations, justifying your answers :

(a) Coil '2' is moving towards coil '1'.

(b) Coil '2' is moving away from coil '1'.

(c) The resistance connected with coil '2' is increased keeping both the coils stationary.

[3 Marks]

Section D

Question 20.

(i) Show that Gauss's theorem is consistent with Coulomb's law. Using it, derive an expression for the electric field due to a uniformly charged thin spherical shell of radius r at a point at a distance y from the center of the shell such that (I) y > r, and (II) y < r.

(ii) A point charge of +2 nC is kept at the origin of a three-dimensional coordinate system. Find the type and magnitude of the charge which should be kept at (0, 0, -6m) so that the

potential due to the system becomes zero at (0, 0, 2m).

[5 Marks]

Question 21.

(i) An object is placed 30 cm from a thin convex lens of focal length 10 cm. The lens forms a sharp image on a screen. If a thin concave lens is placed in contact with the convex lens, the sharp image on the screen is formed when the screen is moved by 45 cm from its initial position. Calculate the focal length of the concave lens.

(ii) Calculate the angle of minimum deviation of an equilateral prism. The refractive index of the prism is √3. Calculate the angle of incidence for this case of minimum deviation also.

[5 Marks]

Question 22.

(i) A physics teacher wants to demonstrate interference with the help of double slit experiment using a laser beam of 633 nm wavelength. Since the hall is large enough, interference pattern is formed on the wall 5·0 m from the slits. For clear and comfortable view by all the students they want the fringe width 5 mm.

(I) Find the slit separation for obtaining the desired interference pattern.

(II) How far will the first minimum be from the central maximum ?

(ii) A parallel beam of light of wavelength 650 nm passes through a slit of width 0·6 mm. The diffraction pattern is obtained on a screen kept 60 cm away from the slit. Find the distance between first order minima on both sides of the central maximum.

[5 Marks]