CBSE EXAMINATION PAPER-2025

PHYSICS

(Solved)

Time allowed : 3 hours | Maximum Marks : 52

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **27 questions.** All questions are **compulsory.**

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

iii. **Section A** – questions number **1 to 14** are multiple choice questions Each question carries **1 marks.**

iv. **Section B** – questions number **15 to 19** are very short answer Each question carries **2 marks.**

v. **Section C** – questions number **20 to 25** are short answer Each question carries **3 marks.**

vi. **Section D** – questions number **26 to 27** 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. Two horizontal plates, separated by 1 cm, are arranged one above the other. A particle of mass 5 mg and charge 2 nC is released in air between the plates. The potential difference that should be applied to the plates so that the particle remains suspended between them, is:

[1 Marks]

(A) 250 V

(B) 200 V

(C) 100 V

(D) 50 V

Question 2.

The effective resistance between points A and B in the given circuit is:

[1 Marks]

(A) 6 Ω

(B) 8/3 Ω

(C) 2 Ω

(D) 16/3 Ω

Question 3.

An alternating current is given by $I = I_0 \cos(100\pi)t$. The least time the current takes to decrease from its maximum value to zero will be:

[1 Marks]

(A) (1/150) s

(B) (1/100) s

(C) (1/50) s

(D) (1/200) s

Question 4.

A capacitor and an inductor are connected in series across an ac source of voltage of variable frequency. The frequency is increased continuously. The nature of the circuit before and after the resonance will be:

[1 Marks]

(A) inductive only

(B) inductive and capacitive respectively

(C) capacitive only

(D) capacitive and inductive respectively

Question 5.

A metal rod of length 50 cm is held vertically and moved with a velocity of 10 m/s towards east. The horizontal component of the earth's magnetic field at the place is 0.4 G. The emf induced across the ends of the rod is:

[1 Marks]

(A) 0.8 mV

(B) 0.2 mV

(C) 1.6 mV

(D) 0.1 mV

Question 6.

The frequency of a photon of energy 1.326 eV is:

[1 Marks]

(A) 3.20×10^{14} Hz

(B) 4.80×10^{15} Hz

(C) 4.20×10^{15} Hz

(D) 1.18×10^{14} Hz

Question 7. Germanium crystal is doped at room temperature with a minute quantity of boron. The charge carriers in the doped semiconductors will be:

[1 Marks]

(A) electrons only

(B) holes and few electrons

(C) holes only

(D) electrons and few holes

Question 8. Out of the four options given, in which transition will the emitted photon have the maximum wavelength?

[1 Marks]

(A) n = 4 to n = 3

(B) n = 3 to n = 2

(C) n = 2 to n = 1

(D) n = 3 to n = 1

Question 9.

A p-n junction diode is forward biased. As a result,

[1 Marks]

(A) both the potential barrier height and the width of depletion layer increase.

(B) both the potential barrier height and the width of depletion layer decrease.

(C) the potential barrier height decreases and the width of depletion layer increases.

(D) the potential barrier height increases and the width of depletion layer decreases.

Question 10.

Isotones are the nuclides having :

[1 Marks]

(A) same atomic numbers

(B) same mass numbers

(C) same neutron number, but different atomic number

(D) different neutron number, and different mass number

Question 11.

Assertion (A) : A charged particle is moving with velocity v in x-y plane, making an angle θ ($0 < \theta < \pi/2$) with x-axis. If a uniform magnetic field B is applied in the region, along y-axis, the particle will move in a helical path with its axis parallel to x-axis.

Reason (R) : The direction of the magnetic force acting on a charged particle moving in a magnetic field is along the velocity of the particle.

[1 Marks]

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

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

Question 12.

Assertion (A) : A ray of light is incident normally on the face of a prism. The emergent ray will graze along the opposite face of the prism when the critical angle at glass-air interface is equal to the angle of the prism. Reason (R) : The refractive index of a prism depends on angle of the prism.

[1 Marks]

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

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

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

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

Question 13.

Assertion (A) : EM waves do not require a medium for their propagation.

Reason (R) : EM waves are transverse waves.

[1 Marks]

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

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

Question 14.

Assertion (A) : The minimum negative potential applied to the anode in a photoelectric experiment at which photoelectric current becomes zero, is called cut-off voltage.

Reason (R) : The threshold frequency for a metal is the minimum frequency of incident radiation below which emission of photoelectrons does not take place.

[1 Marks]

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

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

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

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

Section B

Question 15.

A cell of emf E and internal resistance r is connected across a resistor of variable resistance R. Show graphically the variation of

(a) the terminal voltage across the cell

(b) the current supplied by the cell,

with R as it is increased from 0 to the maximum value.

[2 Marks]

Question 16.

Using the mirror equation and the formula of magnification, deduce that "the virtual image produced by a convex mirror is always diminished in size and is located between the pole and the focus."

[2 Marks]

Question 17. Draw energy band diagrams of n-type and p-type semiconductors at temperature T > 0 K. Show the donor/acceptor energy levels with the order of difference of their energies from the bands.

[2 Marks]

Question 18. Briefly explain how energy is produced in stars, giving two examples of the nuclear reactions involved.

[2 Marks]

Question 19.

A convex lens of focal length 10 cm, a concave lens of focal length 15 cm and a third lens of unknown focal length are placed coaxially in contact. If the focal length of the combination is +12 cm, find the nature and focal length of the third lens, if all lenses are thin. Will the answer change if the lenses were thick ?

[2 Marks]

Section C

Question 20.

Three cells A, B and C of emfs 2 V, 3 V and 5 V respectively are connected in parallel to each other. Their internal resistances are 5**Ω**, 5**Ω** and 1**Ω** respectively. Calculate the currents flowing through the cells A, B and C.

[3 Marks]

Question 21.

(i) Write Biot-Savart's law in vector form.

(ii) Two identical circular coils A and B, each of radius R, carrying currents I and $\sqrt{3}$ I respectively, are placed concentrically in XY and YZ planes respectively. Find the magnitude and direction of the net magnetic field at their common centre.

[3 Marks]

Question 22.

(a) State Faraday's law of electromagnetic induction and explain the role of negative sign in its expression.

(b) Explain, with an example, thet Lenz's law is consistent with the law of conservation of energy.

[3 Marks]

Question 23.

(a) Differentiate between 'conduction current' and 'displacement current', giving one similarity and one dissimilarity between them.

(b) Explain the existence of electromagnetic waves in free space, using the concept of displacement current.

[3 Marks]

Question 24.

(a) Define 'work function' of a metal. How can its value be determined from a graph between stopping potential and frequency of the incident radiation ? (b) The work function of a metal is 2·4 eV. A stopping potential of 0·6 V is required to reduce the photocurrent to zero, in a photoelectric experiment. Calculate the wavelength of light used.

[3 Marks]

Question 25.

Explain the process of formation of 'depletion layer' and 'potential barrier' in a p-n junction region of a diode, with the help of a suitable diagram. Which feature of junction diode makes it suitable for its use as a rectifier ?

[3 Marks]

Section D

Question 26.

(i) With the help of a labelled diagram, explain the principle of working of a moving coil galvanometer. Write the purpose of using (i) radial magnetic field, and (ii) soft iron core, in it.

(ii) Define current sensitivity of a galvanometer. "Increasing the current sensitivity may not necessarily increase the voltage sensitivity." Given reason.

[5 Marks]

Question 27.

(i) Explain with the help of a labelled ray diagram the formation of final image by an astronomical telescope at infinity. Write the expression for its magnifying power.

(ii) The total magnification produced by a compound microscope is 20. The magnification produced by the eyepiece is 5. When the microscope is focussed on a certain object, the distance between the objective and eyepiece is observed to be 14 cm. Calculate the focal lengths of the objective and the eyepiece. (Given that the least distance of distinct vision = 25 cm)

[5 Marks]