CBSE EXAMINATION PAPER-2025

PHYSICS

(Solved)

Time allowed : 3 hours | Maximum Marks : 45

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 26** are short answer Each question carries **3 marks.**

vi. **Section D** – questions number **27 to 27** are case based questions

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.

The figure shows the voltage (V) versus the current (I) graphs for a wire at two temperatures T_1 and T_2. One can conclude that:

[1 Marks]

(A) $T_1 < T_2$

(B) $T_1 = T_2 / 3$

(C) $T_2 = 2T_1$

(D) $T_1 > T_2$

Question 2.

If R_s and R_p are the equivalent resistances of n resistors, each of value R, in series and parallel combinations respectively, then the value of $(R_s - R_p)$ is:

[1 Marks]

(A)

(B)

(C)

(D)

Question 3.

A piece of a diamagnetic material, free to move when placed in a uniform magnetic field:

[1 Marks]

(A) moves opposite to the field

(B) does not move at all

(C) moves perpendicular to the field

(D) moves along the field

Question 4.

A proton and an α-particle enter with the same velocity v in a uniform magnetic field B such that $v \perp B$. The ratio of the radii of their paths is:

[1 Marks]

(A) 1/2

(B) 1/4

(C) 4

(D) 2

Question 5.

The work function of a material is 2.21 eV. Which of the following cannot produce photoelectrons from it?

[1 Marks]

(A) Violet light

(B) Green light

(C) Blue light

(D) Red light

Question 6.

Assertion (A): In a reflecting telescope, the image does not have chromatic aberration.

Reason (R): Chromatic aberration occurs only due to refraction of light through an optical medium.

[1 Marks]

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

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

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

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

Question 7.

The value of magnetic field at point O in the given figure is :

[1 Marks]

(A)

(B)

(C)

(D)

Question 8.

A galvanometer can be converted into an ammeter of desired range by connecting a :

[1 Marks]

(A) small resistance in series

(B) large resistance in series

(C) large resistance in parallel

(D) small resistance in parallel

Question 9.

A vertically held bar magnet is dropped along the axis of a copper ring having a cut as shown in the diagram. The acceleration of the falling magnet is :

[1 Marks]

(A) zero

(B) g

(C) greater than g

(D) less than g

Question 10.

An ac source is connected to a resistor and an inductor in series. The voltage across the resistor and inductor are 8 V and 6 V respectively. The voltage of the source is :

[1 Marks]

(A) 10 V

(B) 12 V

(C) 14 V

(D) 16 V

Question 11.

Inside a nucleus, the nuclear forces between proton and proton, proton and neutron, neutron and neutron are F_{pp}, F_{pn} and F_{nn} respectively. Then :

[1 Marks]

(A) $F_{pp} = F_{pn} = F_{nn}$

(B) $F_{pp} > F_{pn} > F_{nn}$

(C) $F_{pn} > F_{nn} > F_{pp}$

(D) $F_{nn} > F_{pp} > F_{pn}$

Question 12.

Assertion (A) : A hole is an apparent free particle with effective positive electronic charge.

Reason (R) : A hole is not necessarily a vacancy left behind by an electron in the valence band.

[1 Marks]

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

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

Question 13.

Assertion (A) : X-rays are produced when slow moving electrons are stopped by a metal target of high atomic number.

Reason (R) : X-rays consist of low-energy photons.

[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 14.

Assertion (A) : The binding energy per nucleon is practically constant for mass number in the range (30 < A < 170).

Reason (R) : Nuclear forces between the nucleons for mass numbers in the range (30 < A < 170) are not short-range.

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

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

Section B

Question 15. Find the equivalent resistance between points A and B for the network shown in the figure.

[2 Marks]

Question 16. A laser beam of frequency 3.0×10^{14} Hz produces average power of 9 mW. Find (i) the energy of photon of the beam, and (ii) the number of photons emitted per second on an average by the source.

[2 Marks]

Question 17.

A right angled isosceles glass prism ABC is kept in contact with an equilateral triangular prism DBC as shown in the figure. Both prisms are made of the same glass of refractive index 1·6. Trace the path of the ray MN incident normally on face AB as it passes through the combination.

[2 Marks]

Question 18.

In an n-type semiconductor electron-hole combination is a continuous process at room temperature. Yet the electron concentration is always greater than the hole concentration in it. Explain.

[2 Marks]

Question 19.

A point source of light in air is kept at a distance of 12 cm in front of a convex spherical surface of glass of refractive index 1·5 and radius of curvature 30 cm. Find the nature and position of the image formed.

[2 Marks]

Section C

Question 20.

What is the difference between 'emf' and 'terminal voltage' of a cell ?

Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 are connected in parallel. Derive an expression for the emf and internal resistance of the equivalent cell.

[3 Marks]

Question 21.

A rectangular loop carries a current of 1 A. A straight long wire carrying 2 A current is kept near the loop in the same plane as shown in the figure.

Find (i) the torque acting on the loop, and (ii) the magnitude and direction of the net force on the loop.

[3 Marks]

Question 22. Name the electromagnetic wave used (i) in radar, (ii) in eye surgery and (iii) as a diagnostic tool in medicine. Write their wavelength range also.

[3 Marks]

Question 23. Draw a ray diagram showing the image formation when a concave mirror produces a real, inverted and magnified image of an object and hence obtain the mirror formula.

[3 Marks]

Question 24. How is the necessary force provided to an electron to keep it moving in a circular orbit according to the Bohr model of hydrogen atom? Derive an expression for the total energy of an electron moving in an orbit of radius r in the hydrogen atom. Give the significance of negative sign in this expression.

[3 Marks]

Question 25.

(a) Consider the so-called 'D-T reaction' (Deuterium-Tritium reaction). In a thermonuclear fusion reactor, the following nuclear reaction occurs:

(b) Show that the nuclear density is independent of mass number.

[3 Marks]

Question 26.

Define 'self-inductance' of a coil. Derive an expression for self-inductance of a long solenoid of cross-sectional area A and length l, having n turns per unit length.

[3 Marks]

Section D

Question 27.

Extrinsic semiconductors are made by doping pure or intrinsic semiconductors with suitable impurity. There are two type of dopants used in doping, Si or Ge, and using them p-type and n-type semiconductors can be obtained. A p-n junction is the basic building block of many semiconductor devices. Two important processes occur during the formation of a p-n junction : diffusion and drift. When such a junction is formed, a 'depletion layer' is created consisting of immobile ion-cores. This is responsible for a junction potential barrier. The width of a depletion layer and the height of potential barrier changes when a junction is forward-biased or reverse-biased. A semiconductor diode is basically a p-n junction with metallic contacts provided at the ends for application of an external voltage. Using diodes, alternating voltages can be rectified.

(1)

Which of the following is a donor impurity atom for Ge ?

(A) Boron (B) Antimony

(C) Aluminium (D) Indium

[1 Marks]

(2)

When a pentavalent atom occupies the position of an atom in the crystal lattice of Si, four of its electrons form covalent bonds with four silicon neighbours, while the fifth remains bound to the parent atom. The energy required to set this electron free is about :

A) 0.5 eV (B)0.1 eV

(C) 0.05 eV (D) 0.01 eV

[1 Marks]

(3)

During the formation of a p-n junction:

(A) a layer of negative charge on n-side and a layer of positive charge on p-side appear.

(B) a layer of positive charge on n-side and a layer of negative charge on p-side appear.

(C) the electrons on p-side of the junction move to n-side initially.

(D) initially diffusion current is small and drift current is large.

[1 Marks]

(4)

(a) In reverse-biased p-n junction :

(A) the drift current is of the order of few mA.

(B) the applied voltage mostly drops across the depletion region.

(C) the depletion region width decreases.

(D) the current increases with increase in applied voltage.

[1 Marks]

(5)

The output frequency of a full-wave rectifier with 50 Hz as input frequency is :

(A) 25 Hz (B) 50 Hz

(C) 100 Hz (D) 200 Hz

[1 Marks]