

Name of Student: _____

Roll No. _____

PRE BOARD - January 2024

Class - 12

Subject - Physics

Time Allowed: 3 hours

Maximum Marks: 70

General Instructions:

Read the following instructions carefully and strictly follow them.

- (i) This question paper is divided into five sections A, B, C, D and E.
- (ii) This question paper contains 35 questions. All questions are compulsory.
- (iii) In Section A - Question No. 1 to 18 are Multiple Choice (MCQ) type questions carrying 1 mark each.
- (iv) In Section B - Question No. 19 to 25 are very Short Answer (VSA) type questions carrying 2 marks each.
- (v) In Section C - Question No. 26 to 30 are Short Answer (SA) type questions carrying 3 marks each.
- (vi) In Section D - Question No. 31 to 33 are Long Answer (LA) type questions carrying 5 marks each.
- (vii) In Section E - Question No. 34 and 35 are Case Based questions carrying 4 marks each.
- (viii) There is no overall choice. However, an internal choice has been provided in two questions in Section B, two questions in Section C, all questions in Section D and two questions in Section E.
- (ix) Use of calculators is not allowed.

Section - A

Question No. 1 to 18 are Multiple Choice (MCQ) type questions, carrying 1 mark each. (18 × 1 = 18)

1. With the increase of area of cross - section of a conductor, its resistivity:
 - (a) increases
 - (b) decreases
 - (c) may increase or decrease
 - (d) does not change
2. Torque acting on a dipole in electric field is given by
 - (a) pE
 - (b) $pE \sin \theta$
 - (c) $pE \cos \theta$
 - (d) 0
3. Magnetic Susceptibility of diamagnetic substance is
 - (a) Small & negative
 - (b) small & positive
 - (c) Large and positive
 - (d) none of these
4. Which phenomenon illustrates particle nature of light waves?
 - (a) Interference
 - (b) Diffraction
 - (c) Polarization
 - (d) None of these
5. Which of the following has highest frequency?
 - (a) X-rays
 - (b) Long radio waves
 - (c) Ultraviolet rays
 - (d) Gamma rays
6. The ratio of the intensities of two light waves is 16:9. The ratio of maximum and minimum Intensities in their interference pattern will
 - (a) 49:3
 - (b) 49:1
 - (c) 25:7
 - (d) 256:81
7. The least distance of distinct vision for a normal human eye is
 - (a) 25 cm
 - (b) 54 cm
 - (c) 1 Dioptre
 - (d) None of these
8. Prism works on the principle of
 - (a) Reflection
 - (b) Refraction
 - (c) Dispersion
 - (d) Diffraction
9. In the following nuclear reaction, what is X?

$${}_{92}\text{U}^{238} \rightarrow {}_x\text{Th}^{234} + {}_2\text{He}^4$$
 - (a) 92
 - (b) 2
 - (c) 90
 - (d) 4
10. Two light waves of equal amplitude and wavelength are superimposed. The amplitude of the resultant wave will be maximum when the phase difference between them is
 - (a) Zero
 - (b) $\pi/2$
 - (c) π
 - (d) $\pi/4$

11. The de-Broglie wavelength associated with a particle of momentum p is given as
 (a) p/h (b) h/p (c) hp (d) None of these
12. At absolute zero, Germanium act as
 (a) Insulator (b) Metal
 (c) Non-metal (d) Semi-conductor
13. The energy gap is maximum in
 (a) Superconductor (b) Metal
 (c) Non-metal (d) Semi-conductor
14. In glass, the velocity of light is minimum for
 (a) Red (b) Violet (c) Yellow (d) Green

For Question 15 to 18 two statements are given

One labelled as **Assertion (A)** and the other labelled as **Reason (R)**. Select the correct answer to these questions from the codes

(a), (b), (c) and (d) are given below:

- (a) If both assertion and reason are true and reason is the correct explanation of assertion.
 (b) If both assertion and reason are true but reason is not the correct explanation of assertion.
 (c) If assertion is true but reason is false.
 (d) If both assertion and reason are False.

15. **Assertion:** In a uniform Electric Field, electrons move in the opposite direction of Electric Field.

Reason: This is because of the negative charge of an electron.

16. **Assertion:** The whole charge of a conductor cannot be transferred to another isolated conductor.

Reason: The total transfer of charge from one to another is not possible.
 17. **Assertion:** Total flux through a closed surface is zero if net charge enclosed by the surface is zero.

Reason: Gauss Law is true for any closed Surface, no matter what its shape or size.

18. **Assertion:** In young's double slit experiment, all fringes are of equal width.

Reason: The fringe width depends upon wavelength of light (λ) used, distance of screen from plane of slits (D) and slits separation (d).

SECTION-B (VERY SHORT ANSWER TYPE QUESTIONS)

Each question carries 2 marks.

19. The force of attraction between a positively charged particle and a negatively charged particle is F , when distance between them is made one fourth, what will be the value of this force?

OR

20. What are the number of electrons in $1 \mu C$?
21. Explain the significance of negative energy of an electron in an orbit?
22. A circular coil of radius r carrying current I . What is magnetic field at the centre of circular coil?
23. Draw the phasor diagram for a.c. circuit containing capacitor only.
24. State two properties of Electromagnetic waves.
25. Define power of a lens and give its S.I. unit.
26. What will be de-Broglie wavelength associated with an electron moving under $100V$ potential difference?

OR

27. How will be photoelectric current change on decreasing the wavelength of incident radiation for a given photosensitive material?

SECTION-C (SHORT ANSWER TYPE QUESTIONS)

Each question carries 3 marks.

28. State and prove Ampere's Circuital law.

OR

State and explain Biot Savart Law.

29. Draw a graph showing effect of frequency of incident radiation on stopping potential.
30. Define mass defect and nuclear Binding Energy for a nucleus ${}_Z^AX^A$, write the value of mass defect and nuclear Binding Energy.
31. What are the drawbacks and limitations of Bohr's atomic Model?
32. Explain diode as a full wave rectifier.

OR

33. Explain the formation of p-n junction.

Section-D (LONG ANSWER TYPE QUESTIONS)

Each question carries 5 marks.

31. Obtain an expression for electrical resistance of a conductor or deduce Ohm's law.

OR

What is Wheatstone bridge? What do you mean by balanced condition of Wheatstone bridge? Using Kirchhoff's law derive the balanced condition of Wheatstone bridge.

32. Obtain an expression for force per unit length between two parallel current carrying conductors and hence define one ampere. How parallel and anti-parallel currents behave?

OR

✓ Explain Domain Theory of ferromagnetism. How ferromagnetism depends upon temperature?

33. Explain the working of reflection telescope by drawing diagram.

OR

What is total internal reflection? Explain it with two examples.

Section-E (CASE STUDY QUESTIONS)

Each question carries 4 marks.

34. When a conductor does not have a current through it, its conduction electrons move randomly, with no net motion in any direction. When the current flows through the conductor, these electrons actually still move randomly, but now they tend to drift with the drift speed v_d . The drift speed is very less as compared to speeds in random thermal motion.

Answer the following questions based on above:

- (a) A steady current I flows through a metallic conductor whose area of cross-section (A) increases continuously from one end to the other, the drift velocity of free electron (v_d) as a function of A will be.....
- (b) For Ohm's law is obeyed, then what is the relation between electric field (E) and drift velocity (v_d)?
- (c) When a current flows in a conductor, what is the order of magnitude of drift velocity of electrons through it?
- (d) Two nichrome wires of equal lengths but having radii in the ratio 1:3 are connected in series across an electric cell. The drift velocities of free electrons through them will be in the ratio of.....

OR

What is the path of electrons (I) in the absence (II) in the presence of electric field?

35. A galvanometer is a device which is used to detect presence of current in a conductor. But it cannot be used directly as an ammeter. It has a very large resistance. If connected in series like an ammeter, it affects the value of current in a circuit. But it can be converted into an ammeter. Similarly, a galvanometer can be used as a voltmeter also. In both cases, a shunt resistance is connected with the galvanometer.

Answer the following questions based on the above:

- (a) To convert a galvanometer of resistance R_G into voltmeter a shunt resistance R is connected.....
- (b) To convert a galvanometer of resistance R_G into ammeter a shunt resistance R is connected.....
- (c) Why is galvanometer not used directly as ammeter?
- (d) A galvanometer with coil of resistance 120Ω shows full scale deflection for current of 2.5 mA . To convert it into ammeter of range $0-7.5\text{A}$. Find the value of shunt resistance.

Or

What is the reading of current measured by ammeter?