

SAMPLE PAPER-01
PHYSICS (Theory)
(Questions)
Class – XII

Time allowed: 3 hours

Maximum Marks: 70

General Instructions:

- a) All questions are compulsory.
- b) Questions 1 to 5 are one mark questions.
- c) Questions 6 to 10 are two marks questions.
- d) Questions 11 to 22 are three marks questions.
- e) Question 23 is four marks question.
- f) Question 24 to 26 are five marks questions.
- g) There is no overall choice in the question paper, but internal choice is there.
- h) Use of calculator is not permitted.

1. A man inside an insulated metallic cage does not receive a shock when the cage is highly charged. Why?
2. Write the names of three ferromagnetic substances.
3. How X-rays are produced?
4. When light is incident on a rarer medium from a denser medium, write the relation between the critical angle and refractive indices of the two media.
5. What are the three basic units of a communication system?
6. Equipotential surfaces are perpendicular to field lines why?
7. A circular coil of 50 turns and radius 20 cm carries a current of 12 A. find the magnetic moment associated with it.
8. Find the wavelength of electromagnetic waves of frequency 5×10^{19} Hz in free space. Give its two applications.
9. Determine the speed of electron in the $n = 3$ orbit of He^+ . Is the non-relativistic approximation valid?
10. Why a common emitter transistor amplifier is preferred over a common base transistor amplifier?
11. What do you mean by a capacitor? Derive an expression for the capacitance of a parallel plate capacitor.
12. What do you mean by superconductors? Give three applications of superconductors.
13. State and explain Biot Savart's law. Give its features also.
14. Explain the Rayleigh's law of scattering. Why the colour of sky appears to be blue?
15. (a) What is the principle of electron microscope?
(b) A photon and electron have got same de Broglie wavelength (10^{-10} m), which has greater kinetic energy? Explain.
16. Give reasons for the following:
 - (a) Lighter elements are better moderators for a nuclear reactor than heavier elements.
 - (b) In a natural uranium reactor, heavy water is a preferred moderator to ordinary water.
 - (c) Cadmium rods are provided in a reactor.

17. What do you mean by doping? Give three methods of doping.
18. In a silicon transistor, a change of 7.89 mA in the emitter current produces a voltage of 7.8 mA in the collector current. What voltage in the base current is necessary to produce the equivalent change in the collector current?
19. Define the root mean square value of alternating current and derive its expression.
20. Discuss the energy losses of a transformer.
21. How X rays are produced? Give four uses of X rays.
22. A magnetic field in a plane electromagnetic wave is given by,

$$B_y = 3 \times 10^{-7} \sin \left[(1.5 \text{ rad / m}) x + (5 \times 10^8 \text{ rad / s}) t \right] \text{ tesla} .$$
 (a) What is the wavelength and frequency of the wave?
 (b) Write down the expression for the electric field. (x in metre and t in second).
23. In the birthday party of Vishal, he gave big slinkies as a return gifts to all of his friends. In the next day, in the class of Physics, the teacher explained the concept of production of magnetic fields using current carrying coils and also said that they can make permanent magnets, using such coils by passing high currents through them. Ram, the friend of Vishal asked his father about the coils, and their shape. His father asked him to bring the slinky that his friend gave and explained the uses of toroid and solenoid.
 (i) What values did Ram's father exhibit towards his son?
 (ii) What is the difference in the fields produced by the solenoid and toroid?
24. (a) Derive the expression for the torque on an electric dipole placed in a uniform electric field.
 (b) A pendulum bob of mass 80 mg carrying a charge of $2 \times 10^{-8} \text{ C}$ is at rest in a horizontal uniform electric field of $2 \times 10^4 \text{ V/m}$. Find the tension in the thread of the pendulum and the angle it makes with the vertical.
25. (a) Write the laws of electromagnetic induction.
 (b) An express train takes 16 hours to cover the distance of 960 km. The rails are separated by 130 cm and the vertical component of the earth's magnetic field is $4 \times 10^{-5} \text{ T}$. (i) Find the induced emf across the width of the train. (ii) If the leakage resistance between the rails is 100 ohm, find the retarding force on the train due to the magnetic field.
26. (a) A paper is divided into squares each of size 1 mm^2 is being viewed at a distance of 9 cm through a magnifying glass of focal length 10 cm held close to the eye. (i) What is the magnification produced by the lens? How much is the area of each square in the virtual image? (ii) What is the angular magnification of the lens? (iii) Is the magnification in (i) equal to the magnifying power in (ii) Explain.
 (b) (i) At what distance should the lens be held in the question above, in order to view the squares distinctly with the maximum possible magnifying power? (ii) What is the magnification in this case? (iii) Is the magnification equal to magnifying power in this case? Explain.