



<b>Date:</b>	<b>SAMPLE PAPER-5</b>	<b>Subject:PHYSICS</b>
<b>Class: XII</b>	<b>Name of the student:</b>	<b>Max. Marks:70</b>

**General Instructions:**

- All questions are compulsory.
- Questions 1 to 5 are one mark questions.
- Questions 6 to 10 are two marks questions.
- Questions 11 to 22 are three marks questions.
- Question 23 is value based question carrying four marks.
- Question 24 to 26 are five marks questions.
- There is no overall choice in the question paper. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choices in such questions.
- Use of calculator is not permitted. However you may use log tables if necessary.
- You may use the following values of physical constants wherever necessary:

$$c = 3 \times 10^8 \text{ m/s}$$

$$h = 6.63 \times 10^{-34} \text{ Js}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ Tm/A}$$

$$1/4\pi\epsilon_0 = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$m_p = 1.675 \times 10^{-27} \text{ kg}$$

$$m_n = 1.673 \times 10^{-27} \text{ kg}$$

1. Draw the circuit symbol for pnp transistor.
2. Two electric bulbs whose resistances are in the ratio 1:2 are connected in parallel to a source of constant voltage. What will be the ratio of power dissipation in these wires?
3. Why is the energy gap also called as forbidden gap?
4. Two beams, one of red light
5. Write an expression for the flux  $\Delta\Phi$  of the magnetic field B through an area element  $\Delta$ .
6. What is the angle between the directions of electric field at any i)axial point and ii)equatorial point due to an electric dipole? Sketch the electric lines of force for two point charges  $q_1$  and  $q_2$  for  $q_1=q_2$  and  $q_1>q_2$  separated by a distance d.
7. Define i)Repeater ii)Attenuation.
8. Draw a labeled diagram of Newtonian telescope

OR

State four advantages of reflecting telescopes over refracting telescopes.

9. Discuss how OR gate is realized from the NAND gate.

10. State Huygen's principle and use it to prove the law of reflection for a wavefront.

11. i) Define power of a lens with its SI unit.

ii) You are given three lenses L1, L2 and L3 each of focal length 20cm. An object is kept at 40cm in front of L1. The final real image is formed at the focus of L3. Find separations between L1, L2 and L3.

12. Find expressions for equivalent emf and equivalent internal resistance for series combination of cells.

13. Name the constituent radiation of electromagnetic spectrum which

i) is used in study of crystal structure ii) is absorbed from sunlight by ozone layer iii) is used in satellite communication iv) produces intense heating effect v) used in radar vi) for food preservation.

14. Show that current leads voltage by  $\pi/2$  for ac current applied across a capacitor. Also show that the average power loss is zero.

OR

A series LCR circuit is connected to a 220V variable frequency ac supply. If  $L=10\text{mH}$ ,  $C=400/\pi^2 \mu\text{F}$  and  $R=55\text{ohm}$ , find i) frequency of the source for which the average power absorbed by the circuit is maximum ii) calculate the value of maximum current amplitude.

15. Explain ionospheric mode of communication and mention the range of frequencies that can be transmitted using this mode.

16. Define interference of light and mention the condition essential for interference to take place. Derive the condition for formation of maxima and minima of an interference pattern.

17. Find ratio of De-Broglie wavelengths associated with i) protons accelerated through a potential of 100V and ii)  $\alpha$  particles accelerated through a potential of 64V

18. What are stationary orbits according to Bohr's postulates? The energy of the hydrogen atom in its ground state is  $-13.6\text{eV}$ . Determine the energy of the energy level whose quantum number is 4.

19. Discuss the working of transistor as an amplifier.

20. A solenoid 50cm long has 2 layers of windings of 350 turns each. The radius of the lowest layer is 2cm. If the current carried is 6A, estimate the magnitude of magnetic flux density i) near the centre of the solenoid on its axis ii) near the ends on its axis iii) outside the solenoid near the centre.

21. Calculate the Binding energy per nucleon for  ${}_{20}\text{Ca}^{40}$ .

$$m({}_{20}\text{Ca}^{40})=39.962589\text{u}, m(\text{n})=1.0086654\text{u}, m(\text{p})=1.007825\text{u}, 1\text{u}=931\text{MeV}/c^2$$

22. What is drift velocity? Derive the relation between current and drift velocity.

23. On the festival of Uttarayan, Suresh was flying kites in the afternoon. His mother saw him and told him wear sunglasses to protect his eyes as staring at the sun for a long period was harmful and could damage eyesight.

- i) What are the values shown by Suresh's mother?
- ii) Why she advised him to wear sunglasses?
- iii) Which phenomenon is responsible for reduction in intensity of light on wearing glasses. Explain with help of diagrams.

24. (a) State Biot Savart's law and find the expression for the magnetic field at a point due to a straight current carrying conductor.
- (b) How many turns should be in a closely wound circular coil of radius 0.4 m in order for a current of 3A to produce a magnetic field of  $1.6 \times 10^{-4} \text{T}$  at its centre?

OR

- (a) Distinguish the magnetic properties of a dia, para and ferromagnetic substances in terms of i) susceptibility ii) magnetic permeability and iii) coercivity. Give one example of each of these materials.
- (b) Draw the field lines due to an external magnetic field near a i) ferromagnetic ii) paramagnetic substance.

25. (a) Draw a labeled circuit arrangement showing the windings of primary and secondary coil in a transformer. Explain the underlying principle and working of a step-down transformer. Write any two sources of energy loss in this device.
- (b) How much current is drawn by the primary coil of a transformer which steps down 220V to 22V to operate device with an impedance of 30 ohm?

OR

State Faraday's and Lenz's law of electromagnetic induction. Explain three methods of producing induced emf with diagrams. What is instantaneous value of induced emf when the plane of the coil makes an angle of  $45^\circ$  with the magnetic field lines.

26. (a) Show mathematically that the electric field intensity due to a short dipole at a distance  $d$  along its axis is twice the intensity at the same distance along the equatorial axis.
- (b) Two equal charges of  $-10^{-16} \text{C}$  each are kept 20cm apart in air. Calculate i) electric field at a point midway between them ii) force acting on charge of  $-10^{-16} \text{C}$  kept at point midway between them.

OR

- (a) Deduce an expression for the capacitance of a parallel plate capacitor when a conducting slab is inserted between the plates. Assume that the slab thickness to be less than the plate separation.
- (b) A 600pF capacitor is charged by a 200V supply. It is then disconnected from the supply and is connected to another uncharged 600pF capacitor. How much electrostatic energy is lost in the process?

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