Sample Question Paper
Subject: Physics
Subject Code: 042
Class: XII
Academic Session: 2024-25
Maximum Marks: 70
Time Allowed: 3 hours

General Instructions:

1. All questions are compulsory.
2. The question paper consists of five sections – A, B, C, D and E.
3. Section A contains 16 multiple choice questions (MCQs) and 4 Assertion-Reasoning based questions of 1 mark each. Section B contains 5 questions of 2 marks each. Section C contains 7 questions of 3 marks each. Section D contains 2 Case Study-Based Questions (CSBQ) of 4 marks each. Section E contains 3 long answer questions of 5 marks each.
4. There is an internal choice in one question of Section B, one question of Section C, one question in each CSBQ of Section D, and all questions of Section E.
5. Wherever necessary, neat and labelled diagrams should be drawn.
6. Use of calculators is not allowed.
7. Use the following values of physical constants wherever necessary:
   * Charge on electron (e) = 1.6 × 10 {¹ y C
   * Mass of electron (m ‘) = 9.1 × 10 {³¹ kg
   * Permittivity of free space (;R ’ Ò ,ãƒR r »›" ;" â »’ Ò »
   * Speed of light in vacuum (c) = 3 × 10 x m/s

Section A (16 marks)

(12 MCQs and 4 Assertion-Reasoning based questions of 1 mark each)

1. The SI unit of electric flux is:
   (a) N m² C {¹ (b) N C {¹ m {² (c) N m C {¹ (d) N m {² C {¹

2. Two point charges +q and -q are placed at (-a, 0) and (a, 0) respectively. The electric field at (0, a) will be:
   (a) Along the positive x-axis (b) Along the negative x-axis
   (c) Along the positive y-axis (d) Along the negative y-axis

3. ... (Continue with 11 more MCQs based on Class XII syllabus topics) ...

4. **Assertion:** A capacitor stores energy in the electric field between its plates.
   Reason: The energy stored is proportional to the square of the voltage across the capacitor.

5. **Assertion:** The magnetic field due to an infinitely long straight wire is inversely proportional to the distance from the wire.
Reason: Ampere's Law relates the line integral of the magnetic field around a closed loop to the current enclosed by the loop.

6. ... (Continue with 2 more Assertion-Reasoning questions) ...

Section B (10 marks)

(5 questions of 2 marks each; one with internal choice)

7. State Gauss's theorem in electrostatics. Give one application of Gauss's theorem.

8. Define drift velocity and mobility of charge carriers in a conductor. What is their relationship with electric current?

9. A parallel plate capacitor has a capacitance of 10 μF when air is between the plates. If a dielectric material with dielectric constant 3 is inserted between the plates, what will be the new capacitance?

10. **OR** Explain the principle of a moving coil galvanometer. How can it be converted into an ammeter?

11. Derive an expression for the force between two parallel current-carrying conductors.

Section C (21 marks)

(7 questions of 3 marks each; one with internal choice)

12. Derive an expression for the electric potential at a point due to a point charge.

13. Explain the concept of electric polarization in a dielectric material. How does it affect the capacitance of a capacitor?

14. State Kirchhoff’s laws. Use these laws to find the currents in the given circuit diagram. (Diagram of a simple circuit with multiple resistors and a battery)

15. **OR** Explain the working of a Wheatstone bridge. How is it used to determine the unknown resistance of a wire?

16. ... (Continue with 3 more questions based on the Class XII syllabus) ...

Section D (8 marks)

(2 Case Study-Based Questions (CSBQ) of 4 marks each; each with internal choice)

17. **Case Study 1:** (A case study on electromagnetic induction with questions on Faraday's law, Lenz's law, self-induction, and mutual induction. Include a diagram of a simple transformer.)

(a) State Faraday's law of electromagnetic induction.
(b) Explain Lenz's law with an example.
(c) Define self-inductance and mutual inductance.
(d) **OR** Explain the working of a transformer and derive the transformer equation.

18. **Case Study 2:** (A case study on optical instruments like microscopes and telescopes. Include ray diagrams for both types.)

(a) Describe the construction and working of a simple microscope.
(b) Derive the expression for magnifying power of a simple microscope.
(c) Describe the construction and working of an astronomical telescope.
(d) **OR** Derive the expression for the magnifying power of an astronomical telescope in normal adjustment.

Section E (15 marks)

(3 long answer questions of 5 marks each; all with internal choice)

19. Describe the photoelectric effect. Explain Einstein's photoelectric equation and its significance.

20. **OR** Explain de Broglie's hypothesis of matter waves and derive the expression for de Broglie wavelength.

21. ... (Continue with two more long answer questions with internal choices, covering topics from Class XII syllabus like semiconductor devices, atoms and nuclei, etc.) ...

This is a sample question paper and the actual question paper may vary slightly. Remember to consult your textbook and class notes for detailed information on each topic.