CLASS XII – PHYSICS

MODEL QUESTION PAPER

SET – 3

Time Allowed: 3 Hours **Maximum Marks: 70**

General Instructions:

1. All questions are compulsory.
2. Use of calculator is not permitted.
3. Draw neat and labelled diagrams wherever required.
4. Internal choices are provided in some questions.

Question Paper Design

- **Total Questions:** 33
- **Section A:** 16 Questions (12 MCQs + 4 Assertion–Reason) × 1 = 16
- **Section B:** 5 Questions × 2 = 10
- **Section C:** 7 Questions × 3 = 21
- **Section D:** 2 Case Study Based × 4 = 8
- **Section E:** 3 Questions × 5 = 15

SECTION A (1 × 16 = 16 Marks)

Q1–Q12: Multiple Choice Questions

1. Coulomb's law is valid for charges placed in:
   (a) Moving frame
   (b) Rest frame
   (c) Accelerating frame
   (d) Rotating frame

2. The energy stored in a capacitor is:
   (a) ½ CV
   (b) ½ CV^2
   (c) CV^2
   (d) C^2V

3. The magnetic force on a moving charge is maximum when angle between velocity and magnetic field is:
   (a) 0°
   (b) 30°
   (c) 60°
   (d) 90°

4. The time period of AC supply in India is:
   (a) 0.01 s
   (b) 0.02 s
   (c) 0.1 s
   (d) 1 s

5. The speed of electromagnetic waves in vacuum is:
   (a) 3×10^6 m/s
   (b) 3×10^8 m/s
   (c) 3×10^{10} m/s
   (d) 3×10^4 m/s

6. In Young's double slit experiment, if slit separation increases, fringe width:
   (a) Increases
   (b) Decreases
   (c) Remains same
   (d) Becomes zero

7. The unit of electric potential is:
   (a) Joule
   (b) Coulomb
   (c) Volt
   (d) Watt

8. In photoelectric effect, if frequency equals threshold frequency:
   (a) KE is maximum
   (b) KE is zero
   (c) Current is zero
   (d) No emission

9. The half-life of a substance is independent of:
   (a) Temperature
   (b) Pressure
   (c) Amount of substance
   (d) All of these

10. The force between two parallel currents is:
   (a) Electrostatic
   (b) Magnetic
   (c) Gravitational
   (d) Nuclear

11. The ratio of RMS value to peak value of AC current is:
   (a) $\sqrt{2}$
   (b) $1/\sqrt{2}$
   (c) 1/2
   (d) 2

12. Bohr's radius is directly proportional to:
   (a) n
   (b) n^2
   (c) 1/n
   (d) $1/n^2$

Q13–Q16: Assertion–Reason Type

13.

Assertion (A): Electric field lines never intersect.
Reason (R): Electric field has unique direction at every point.

14.

Assertion (A): Increasing temperature increases resistance of metals.
Reason (R): Collision frequency of electrons increases.

15.

Assertion (A): In LC circuit, energy oscillates between electric and magnetic fields.
Reason (R): Total energy remains constant.

16.

Assertion (A): Binding energy curve explains nuclear stability.
Reason (R): Higher binding energy per nucleon means more stable nucleus.

SECTION B (2 × 5 = 10 Marks)

17. Define electric field intensity and write its expression.
18. What is Lorentz force? Write formula.
19. Define self-inductance.
20. State Snell's law of refraction.
21. What is pair production?

SECTION C (3 × 7 = 21 Marks)

22. Derive expression for electric potential due to point charge.
23. Explain Wheatstone bridge and write balance condition.
24. Derive expression for magnetic field at centre of circular loop.
25. Explain construction and working of a simple microscope.
26. Derive expression for impedance in series LCR circuit.
27. Derive expression for kinetic energy of photoelectrons.
28. Explain mass defect and binding energy.

SECTION D (Case Study Based) (4 × 2 = 8 Marks)

29. Case Study: LCR Circuit

A series LCR circuit is connected to AC source.

(a) Define resonance.
(b) Write expression for resonant frequency.
(c) What is power factor at resonance?
(d) What happens to impedance at resonance?

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30. Case Study: Dual Nature of Radiation

Light shows both wave and particle nature.

(a) State de-Broglie hypothesis.
(b) Write formula for wavelength.
(c) Define work function.
(d) What is stopping potential?