CLASS XII – PHYSICS

MODEL QUESTION PAPER

SET – 4

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 properly 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. The force between two charges becomes four times when:
   (a) Distance is doubled
   (b) Distance is halved
   (c) Distance becomes four times
   (d) Charges are halved

2. The capacitance of an isolated sphere depends on:
   (a) Charge
   (b) Potential
   (c) Radius
   (d) Material only

3. Magnetic field at the centre of a circular coil is proportional to:
   (a) 1/r
   (b) r
   (c) r^2
   (d) $1/r^2$

4. In electromagnetic induction, induced emf is proportional to:
   (a) Magnetic field
   (b) Rate of change of flux
   (c) Area only
   (d) Current

5. In AC circuit containing only capacitor, current:
   (a) Lags voltage by 90°
   (b) Leads voltage by 90°
   (c) In phase
   (d) Opposite phase

6. The refractive index of medium is maximum for:
   (a) Red light
   (b) Violet light
   (c) Green light
   (d) Yellow light

7. The energy of electron in nth orbit of hydrogen atom is proportional to:
   (a) n
   (b) 1/n
   (c) $1/n^2$
   (d) n^2

8. The device used to convert AC into DC is:
   (a) Transformer
   (b) Rectifier
   (c) Inductor
   (d) Capacitor

9. The dimensional formula of permittivity is:
   (a) $[M^{-1}L^{-3}T^4A^2]$

(b) $[MLT^{-2}A^{-1}]$
(c) $[ML^2T^{-2}]$
(d) $[M^{-1}L^3T^{-2}A^2]$

10. In nuclear fission, mass defect is converted into:
    (a) Momentum
    (b) Charge
    (c) Energy
    (d) Force

11. The time period of LC circuit is:
    (a) $2\pi\sqrt{(LC)}$
    (b) $1/\sqrt{(LC)}$
    (c) $\sqrt{(LC)}$
    (d) $\pi\sqrt{(LC)}$

12. Electric field due to infinite line charge varies as:
    (a) r
    (b) 1/r
    (c) $1/r^2$
    (d) r^2

Q13–Q16: Assertion–Reason Type

13.

Assertion (A): Electric flux through closed surface can be zero.
Reason (R): If net charge enclosed is zero.

14.

Assertion (A): Transformer cannot work on DC supply.
Reason (R): DC does not produce changing magnetic flux.

15.

Assertion (A): In photoelectric effect, number of electrons emitted depends on intensity.
Reason (R): Intensity affects frequency.

16.

Assertion (A): Heavy nuclei are unstable.
Reason (R): Binding energy per nucleon is less for heavy nuclei.

SECTION B (2 × 5 = 10 Marks)

17. Define electric potential difference.
18. State Biot–Savart law.
19. What is power factor in AC circuit?
20. Define magnifying power of compound microscope.
21. What is nuclear fusion?

SECTION C (3 × 7 = 21 Marks)

22. Derive expression for electric field due to dipole on axial line.
23. Explain charging and discharging of capacitor through resistor.
24. Derive expression for force between two parallel current carrying conductors.
25. Explain interference and write conditions for constructive interference.
26. Derive expression for resonant frequency in LCR circuit.
27. Explain Bohr's postulates and derive radius of nth orbit.
28. Derive expression for decay law of radioactivity.

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

29. Case Study: Capacitor

A parallel plate capacitor is connected to battery.

(a) What happens to charge if plate separation increases?
(b) Define dielectric constant.
(c) Write formula for capacitance.
(d) What happens to energy stored if voltage increases?

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30. Case Study: Electromagnetic Waves

EM waves travel in vacuum.

(a) Write relation between E and B.
(b) Define wavelength.

(c) What type of waves are EM waves?
(d) Write speed formula of EM waves.