JEE MAIN Sample Paper Physics

Duration: 1 Hour **Maximum Marks: 100**

Instructions

1. This paper contains TWO sections: Section A and Section B.
2. Section A contains 20 Multiple Choice Questions (MCQs).
3. Section B contains 5 Numerical Value Questions.
4. All questions are compulsory.
5. Each correct answer carries **+4 marks**.
6. Each incorrect answer carries **-1 mark**.
7. No negative marking for unattempted questions.

Section A — Multiple Choice Questions

Q1. Particle moves in xy-plane with $\vec{v} = (a\hat{i} + bx\hat{j})$. Trajectory: *[2024]*

(A) $y = \frac{b}{2a}x^2$
(B) $y = \frac{a}{2b}x^2$
(C) $y = \frac{b}{a}x$
(D) $y = \frac{2b}{a}x^2$

Q2. Diatomic gas heated at constant pressure. Fraction of heat used for internal energy: *[2023]*

(A) 5/7
(B) 3/5
(C) 2/5
(D) 2/7

Q3. Gravitational potential at surface V_0. Potential at height R: *[2022]*

(A) $V_0/2$
(B) $2V_0$
(C) $V_0/4$
(D) $V_0/\sqrt{2}$

Q4. Monochromatic light 600 nm enters medium n=1.5. Wavelength in medium: *[2025]*

(A) 400 nm
(B) 900 nm
(C) 300 nm
(D) 600 nm

Q5. Binding energy of satellite mass m orbit radius r: *[2021]*

(A) $GMm/2r$
(B) GMm/r
(C) $-GMm/2r$
(D) $2GMm/r$

Q6. Magnetic needle in non-uniform field experiences: *[2024]*

(A) Torque but not force
(B) Force but not torque
(C) Both force and torque
(D) Neither

Q7. Speeds of electron in 1st and 2nd hydrogen orbits: *[2023]*

(A) 1:2

(B) 2:1

(C) 1:4

(D) 4:1

Q8. Coil area 100 cm^2, 500 turns, B=0.1 T $\rightarrow$ 0 in 0.1 s. Induced emf: *[2022]*

(A) 5 V

(B) 0.5 V

(C) 50 V

(D) 0.05 V

Q9. Two capacitors 10 F, 20 F in series across 120 V. Voltage across 10 F: *[2025]*

(A) 40 V

(B) 80 V

(C) 60 V

(D) 120 V

Q10. Logic gate equivalent (2 NOT $\rightarrow$ OR): *[2024]*

(A) AND

(B) NAND

(C) NOR

(D) XOR

Q11. Wire length L, radius r, resistance R. Wire L/2, radius 2r: resistance: *[2021]*

(A) R/8

(B) R/4

(C) R/2

(D) R/16

Q12. Photon wavelength 4000 Å. Energy: *[2023]*

(A) 2.0 eV

(B) 3.1 eV

(C) 4.5 eV

(D) 1.5 eV

Q13. SHM $x = 10\sin(20t + 0.5)$. Phase constant: *[2022]*

(A) 0.5 rad

(B) 20 rad

(C) 10 rad

(D) 0 rad

Q14. de-Broglie wavelength , KE K $\rightarrow$ K/4. New wavelength: *[2025]*

(A) /2

(B) 2

(C) 4

(D) /2

Q15. Convex lens +5 D, concave -3 D. Focal length combination: *[2021]*

(A) 50 cm

(B) 20 cm

(C) 10 cm

(D) 33.3 cm

Q16. Radioactive nuclei reduces to 1/16 in 40 days. Half-life: *[2024]*

(A) 20 days

(B) 10 days

(C) 5 days

(D) 2.5 days

Q17. Intensity of wave proportional to: *[2023]*

(A) Square of amplitude

(B) Square root of amplitude

(C) Amplitude

(D) Reciprocal of amplitude

Q18. Purely inductive AC circuit, current: *[2022]*

(A) Leads voltage /2

(B) Lags voltage /2

(C) In phase

(D) Lags voltage

Q19. Threshold frequency 10^1 Hz, light 2×10^1 Hz, h=6.6×10^3 Js. Max KE photoelectrons: *[2025]*

(A) 6.6×10^1 J

(B) 3.3×10^1 J

(C) 13.2×10^1 J

(D) 0

Q20. Ball projected velocity v at angle . Range max when : *[2024]*

(A) 30°

(B) 45°

(C) 60°

(D) 90°

Section B — Numerical Value Questions

Q21. Block mass 2 kg, force 20 N at 60° over 10 m. Work X J: *[2024]*

Q22. Capillary rise 10 cm radius r, new radius $r/2$, height X cm: *[2023]*

Q23. Ratio of intensities 9:1. Max/min intensity X : 1: *[2025]*

Q24. Solenoid length 0.5 m, 500 turns, current 2 A. Magnetic field $X\pi \times 10^{-4}$ T: *[2022]*

Q25. Black body temp 300 K → 600 K. Ratio final/initial emissive power X: *[2024]*

Answer Key

Section A

1.(A)	2.(A)	3.(A)	4.(A)	5.(A)
6.(C)	7.(B)	8.(A)	9.(B)	10.(B)
11.(A)	12.(B)	13.(A)	14.(B)	15.(A)
16.(B)	17.(A)	18.(B)	19.(A)	20.(B)

Section B

21. 100	22. 20	23. 4	24. 8	25. 16