

JEE (Main) – Physics Sample Question Paper

Subject	Physics
Total Number of Questions	25
Maximum Marks	100
Time Allowed	60 Minutes

Marking Scheme (As per JEE Main Pattern)

Each question carries **4 (four) marks**.

1 (one) mark will be deducted for each incorrect answer.

No marks will be deducted for unattempted questions.

Only one option is correct for each question.

Important Instructions

1. This Question Paper consists of **25 Multiple Choice Questions** from **Physics** only.
2. All questions are compulsory.
3. Rough work should be done only in the space provided in the Question Paper.
4. Calculators, mobile phones, smart watches, or any electronic devices are strictly prohibited.

Name of the Candidate (Capital Letters)	
Roll Number	
Examination Centre Name	
Candidate's Signature	Date

Invigilator's Signature

PHYSICS

1. A nucleus at rest disintegrates into two smaller nuclei with their masses in the ratio of 2:1. After disintegration they will move
- A) In opposite directions with speed in the ratio of 1:2 respectively B) In opposite directions with speed in the ratio of 2:1 respectively
- C) In the same direction with same speed. D) In opposite directions with the same speed.
2. A body of mass 2 kg begins to move under the action of a time-dependent force given by $\vec{F} = (6t \hat{i} + 6t^2 \hat{j})$ N. The power developed by the force at the time t is given by:
- A) $(6t^4 + 9t^5)$ W B) $(3t^3 + 6t^5)$ W
- C) $(9t^5 + 6t^3)$ W D) $(9t^3 + 6t^5)$ W
3. Given below are two statements: Statement I : In a vernier callipers, one vernier scale division is always smaller than one main scale division. Statement II : The vernier constant is given by one main scale division multiplied by the number of vernier scale divisions. In light of the above statements, choose the correct answer from the options given below.
- A) Both Statement I and Statement II are false. B) Statement I is true but Statement II is false.
- C) Both Statement I and Statement II are true. D) Statement I is false but Statement II is true.
4. What is the relative decrease in focal length of a lens for an increase in optical power by 0.1 D from 2.5 D? ('D' stands for dioptre).
- A) 0.04 B) 0.40
- C) 0.1 D) 0.01
5. A hydrogen atom in ground state is given an energy of 10.2 eV. How many spectral lines will be emitted due to transition of electrons ?
- A) 6 B) 3
- C) 10 D) 1
6. A gun fires a lead bullet of temperature 300 K into a wooden block. The bullet having melting temperature of 600 K penetrates into the block and melts down. If the total heat required for the process is 625 J, then the mass of the bullet is _____ grams. Given Data: Latent heat of fusion of lead = 2.5×10^4 J kg⁻¹ and specific heat capacity of lead = 125 J kg⁻¹ K⁻¹.
- A) 20 B) 15
- C) 10 D) 5
7. A proton and a deuteron ($q = +e$, $m = 2.0u$) having the same kinetic energies enter a region of uniform magnetic field \vec{B} , moving perpendicular to \vec{B} . The ratio of the radius r_d of the deuteron path to the radius r_p of the proton path is:
- A) 1 : 1 B) 1 : $\sqrt{2}$
- C) $\sqrt{2}$: 1 D) 1 : 2
8. If the percentage errors in measuring the length and the diameter of a wire are 0.1% each. The percentage error in measuring its resistance will be:
- A) 0.002 B) 0.003
- C) 0.001 D) 0.00144

9. A long straight wire of circular cross-section (radius a) is carrying a steady current I . The current I is uniformly distributed across this cross-section. The magnetic field is:
- A) Zero in the region $r < a$ and inversely proportional to r in the region $r > a$ B) Inversely proportional to r in the region $r < a$ and uniform throughout in the region $r > a$
- C) Directly proportional to r in the region $r < a$ and inversely proportional to r in the region $r > a$ D) Uniform in the region $r < a$ and inversely proportional to distance r from the axis, in the region $r > a$
10. In a plane EM wave, the electric field oscillates sinusoidally at a frequency of 5×10^{10} Hz and an amplitude of 50 Vm^{-1} . The total average energy density of the electromagnetic field of the wave is: [Use $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$]
- A) $1.106 \times 10^{-8} \text{ Jm}^{-3}$ B) $4.425 \times 10^{-8} \text{ Jm}^{-3}$
- C) $2.212 \times 10^{-8} \text{ Jm}^{-3}$ D) $2.212 \times 10^{-10} \text{ Jm}^{-3}$
11. Two charges q and $3q$ are separated by a distance r in air. At a distance x from charge q , the resultant electric field is zero. The value of x is:
- A) $\frac{1+\sqrt{3}}{r}$ B) $\frac{r}{3(1+\sqrt{3})}$
- C) $\frac{r}{1+\sqrt{3}}$ D) $r(1 + \sqrt{3})$
12. An air bubble of radius 0.1 cm lies at a depth of 20 cm below the free surface of a liquid of density 1000 kg/m^3 . If the pressure inside the bubble is 2100 N/m^2 greater than the atmospheric pressure, then the surface tension of the liquid in SI units is (use $g = 10 \text{ m/s}^2$).
- A) 0.02 B) 0.1
- C) 0.25 D) 0.05
13. An AC voltage $V = 20 \sin 200\pi t$ is applied to a series LCR circuit which drives a current $I = 10 \sin\left(200\pi t + \frac{\pi}{3}\right)$. The average power dissipated is:
- A) 21.6 W B) 200 W
- C) 173.2 W D) 50 W
14. A uniform rod of mass 250 g having length 100 cm is balanced on a sharp edge at the 40 cm mark. A mass of 400 g is suspended at the 10 cm mark. To maintain the balance of the rod, the mass to be suspended at the 90 cm mark is:
- A) 300 g B) 200 g
- C) 290 g D) 190 g
15. A force $F = \alpha + \beta x^2$ acts on an object in the x-direction. The work done by the force is 5 J when the object is displaced by 1 m. If the constant $\alpha = 1 \text{ N}$, then β will be:
- A) 15 N/m^2 B) 10 N/m^2
- C) 12 N/m^2 D) 8 N/m^2
16. The excess pressure inside a soap bubble is thrice the excess pressure inside a second soap bubble. The ratio between the volume of the first and the second bubble is :
- A) 1 : 9 B) 1 : 3
- C) 1 : 81 D) 1 : 27

25. The relation between time t and distance x is $t = \alpha x^2 + \beta x$, where α and β are constants. The relation between acceleration a and velocity v is:

A) $a = -2\alpha v^3$

B) $a = -5\alpha v^5$

C) $a = -3\alpha v^2$

D) $a = -4\alpha v^4$

JEE MAIN PHYSICS ANSWER KEY

1. (A)	2. (D)	3. (B)	4. (A)	5. (D)
6. (C)	7. (C)	8. (B)	9. (C)	10. (A)
11. (C)	12. (D)	13. (D)	14. (D)	15. (C)
16. (D)	17. (C)	18. (B)	19. (C)	20. (B)
21. (D)	22. (D)	23. (C)	24. (D)	25. (A)