

JEE MAIN QUESTION PAPER 27 JANUARY 2024

PHYSICS:

1. A body of mass 1000 kg has a velocity of 6 m/s. If an extra 2000 kg mass is embedded in it, then what will be the velocity of the combined mass?

Answer. 5m/s

2. If the electron revolves in the 3rd Bohr's orbit of the Hydrogen sphere and has a radius R, then what will be its radius in the 4th orbit in terms of R?

Answer. $16R/9$

3. A wire of length L and resistance R is cut into 5 equal parts and those parts are connected in parallel, then R_{eq} across it will be equivalent to?

Answer. $R/25$

4. 4 objects of mass 1 kg are kept on vertices of a square of side 2 metres and an axis is passing perpendicular to the plane through one of the vertices, then calculate the Moment of Inertia about this axis.

Answer. 16 Kg-m^2

5. Two infinite current-carrying wires having current I in opposite directions are present 20 cm away from each other. Find the magnetic field in S.I units at the midpoint P.

Answer. $(10\mu_0 I)/\pi$

6. If the diameter of the earth becomes half while keeping mass constant, then the acceleration due to gravity at the surface of the earth becomes?

Answer. Twice

7. Two masses $m_1 = 4 \text{ gm}$ and $m_2 = 25 \text{ gm}$ have the same kinetic energy, then find the ratio of linear momentum.

Answer. 2:5

8. A charge $Q=10^{-6} \text{ C}$ is placed at the origin. Find the potential difference between two points A and B whose position vectors are $(\sqrt{3}\mathbf{i} + \sqrt{3}\mathbf{j}) \text{ m}$ and $\sqrt{6}\mathbf{j}$ respectively.

Answer. Zero

9. Statement 1: Linear momentum and moment of force have the same dimensions.

Statement 2: Planck's constant and angular momentum have the same dimension.

i. Statement 1 is correct while statement 2 is false

ii. Statement 1 is false while Statement 2 is correct

iii. Both statements are correct

iv. Both statements are false

Answer. ii.

10. A prism has a refractive index $\cot(A/2)$, where A is the refractive angle of the prism. The minimum deviation due to this prism is?

Answer. $\pi-2A$

11. A particle performing simple harmonic motion is such that its amplitude is 4m and speed of particle at mean position is 10m/s. Find the distance of particle from mean position where velocity becomes 5m/s.

Answer. $2\sqrt{3}m$

12. A particle performing simple harmonic motion according to $x = A \sin \omega t$. Then its kinetic energy (KE), potential energy (PE) and speed (v) at position $x = A/2$ are?

Answer. $KE = (KA^2)/8$; $PE = 3KA^2/8$; $v = A/3 \sqrt{k/m}$

13. What should be the elevation of the outer track of the train to move in a circular path of radius R? The Width of the track is w ($\ll R$) and the speed of the train is v. Neglect friction.

Answer. $V^2 w / Rg$

14. Out of air and liquid, which substance is more viscous?

Answer. Liquid

15. A metallic frame of a given dimension has an area vector at 60° with an external magnetic field $B = 4T$. The frame is taken out from the field in 10 seconds. Find the average EMF induced in the frame.

Answer. 1V

16. A ring has a uniformly distributed charge of $2\pi C$ and a radius of 3 cm. A charge of $10^{-6} C$ is placed at the centre of the ring. Tension developed in the ring is $10^x N$. Find x.

Answer. $10^7 N$

17. Two slabs of the same thickness of 6 cm each are placed on a table, over one another with Slab A having $\mu = 7/3$ and Slab B having $\mu = 5/3$. The apparent depth of the table surface is N cm. Find N. (Round off to nearest integer)

Answer. 6

18. Spherometer is used to measure:

Answer. Radius of Curvature of a lens