JEE Main 2024 Physics Question Paper April 6 Shift 2

Time Allowed :3 Hours	Maximum Marks :300	Total Questions :90

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 90 questions, out of which 75 are to attempted. The maximum marks are 300.
3. There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage.
4. Each part (subject) has two sections.
   (i) Section-A: This section contains 20 multiple choice questions which have only one correct answer. Each question carries 4 marks for correct answer and –1 mark for wrong answer.
   (ii) Section-B: This section contains 10 questions. In Section-B, attempt any five questions out of 10. The answer to each of the questions is a numerical value. Each question carries 4 marks for correct answer and –1 mark for wrong answer. For Section-B, the answer should be rounded off to the nearest integer

Physics

1. Energy supplied to 1 mole of monoatomic gas is 48 J and changes its temperature by 2°C. Find the work done by gas.

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2. If a car is moving on a banked road of radius $R = 300\,\text{m}$ and angle of banking $30°$, then find the safe speed of the car.

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3. If displacement in terms of time is given by $x^2 = 1 + t^2$ and acceleration is a function of x as x^{-n}, then find the value of n.

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4. There is a block of weight 200N which is hanged from a chain of mass 10 kg which is connected with a tree from top. Find the tension at the topmost point of

the chain.

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5. Find the refractive index of a convex lens whose R_1 and R_2 are 15 cm and 30 cm respectively, and its focus is 20 cm.

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6. If kinetic energy of a particle increases by 36%, what is the percentage change in momentum of the particle?

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7. Light of wavelength $\lambda = 300\,\text{nm}$ incident on a metal surface whose work function $\phi = 2.4\,\text{eV}$, find the stopping potential.

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8. If three particles are thrown from the same height, the 1st vertically up with speed u, the 2nd vertically down with speed u and the 3rd is released from rest. If time taken by the first particle, second particle, and third particle is t_1, t_2 and t_3 respectively, find the relation between t_1, t_2, and t_3.

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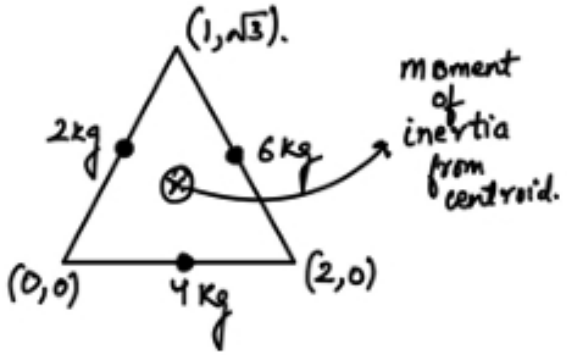
9. Find the moment of inertia about an axis passing through the centroid and perpendicular to the plane of the triangle.



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10. What are the dimensional formulas of specific heat and latent heat?

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11. If the weight of an object at the surface of Earth is 300 N, then find the weight of the object at a depth $R/4$ from the surface of the Earth.

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12. A helium gas having total number of moles = 10 is kept in an insulated container, and the temperature of gas is given as T. Find the total internal energy of the He gas.

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13. An EM wave is travelling along the x-axis, the equation of electric field is $E = 600\sin(kx - \omega t)$. Find the intensity of the EM wave.

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14. Two identical conducting shells having the same charge are placed at a finite distance. The force applied by one conductor on another is 16 N. Now an uncharged identical conducting shell is introduced such that it touches one by one the conducting shells respectively. Find the final Coulomb force acting between the conducting spheres.

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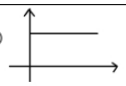
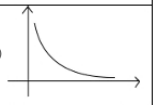
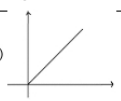
15. Match the following

List-1	List-2
(A) y axis represents magnetic field. x axis represents distance from centre of axis of wire [x < a] (a = radius of wire)	(I) 
(B) y axis represents magnetic field. x axis represents distance from centre of axis of wire [x > a] (a = radius of wire)	(II) 
(C) y axis represents magnetic field. x axis represents distance from centre of solenoid	(III) 
(D) y axis represents magnetic susceptibility. x axis represents intensity of magnetisation	(IV) 

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16. A bulb is glowing with power equal to 110 W and potential difference 220 V. Find the number of electrons flowing per unit second.

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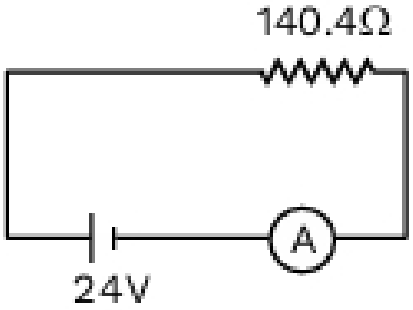
17. For the given circuit, find the ammeter reading, if the shunt resistance is $10\,\Omega$ and resistance of the coil of galvanometer is $240\,\Omega$.



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18. If the maximum current is drawn from an LRC circuit of $R = 100\,\Omega$, $C = 2.5\,\mathbf{nF}$, and $L = 100\,\mathbf{H}$, then find the frequency in rad/sec.

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19. Find out the value of the maximum wavelength of hydrogen in the Paschen series in the Bohr model.

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20. Two waves of intensity $I_1 = 4I$ and $I_2 = I$ produce interference, find the ratio of maximum and minimum intensity.

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21. The time period of SHM is 3.14 with amplitude 0.06 m and the maximum velocity of the particle is $k \times 10^{-2}\,\mathbf{m/s}$. Find the value of k.
