JEE Main 2024 Physics Question Paper April 8 Shift 1

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

Physics

1. If the resultant is $A\sqrt{x}$, then find x.
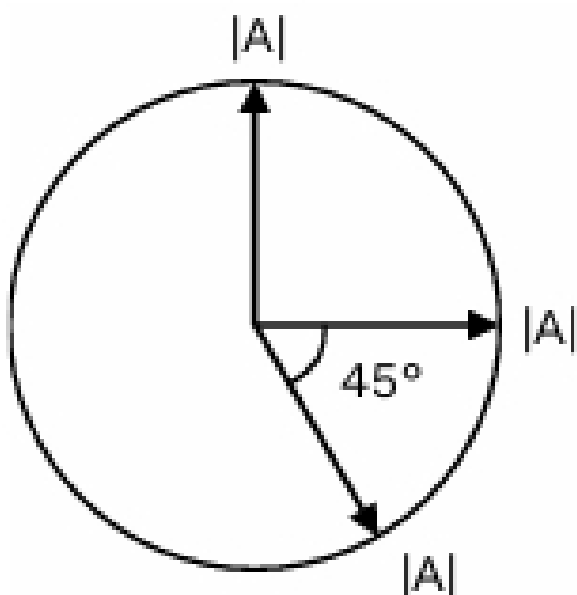
2. Initially a mass of 5 kg is at rest, after some time it breaks into two parts of mass m_1 and m_2, the mass m_1 is moving with velocity v_1, and mass m_2 is moving with velocity v_2 and both velocities are in opposite directions. Find the ratio of their kinetic energies.

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3. If the proton and electron have the same de-Broglie wavelength, then what will be the ratio of their kinetic energies?

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4. If a light ray is passing from denser medium (refractive index μ_1) to rarer medium (refractive index μ_2) and having critical angle 45°, then find the value of $\frac{\mu_1}{\mu_2}$.

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5. A ball of mass 400 gram moving with initial velocity of 20 m/s is brought to rest in 0.1 seconds by the person catching the ball, then calculate the force experienced by him.

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6. What will be the ratio of molar specific heat at constant volume for monoatomic and diatomic gas?

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7. The ratio of frequency of 7th overtone for a closed and open organ pipe is $\frac{\alpha-1}{\alpha}$. Then find the value of α.

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8. Resistance of a wire at 0°C is 10 whereas at 100°C is 10.2. Find the temperature (in Kelvin) of wire when its resistance is 10.95.

**9.** Find the value of terminal voltage in the given circuit:

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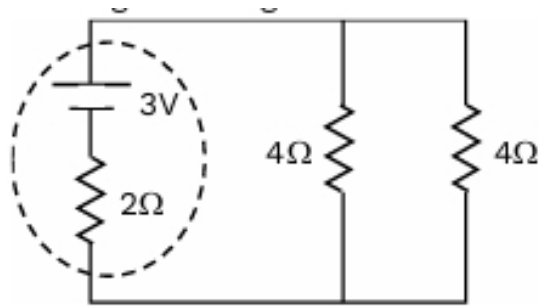
10. The length of second's hand and minute hand of the clock are **75 cm** and **60 cm** respectively. Then find the distance (in cm) between the tips of second and minute hand after half hour.

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11. Which equation best describes Bernoulli's theorem?

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12. If the kinetic energy of masses $m_1 = 0.4\,\text{kg}$, $m_2 = 1.2\,\text{kg}$, $m_3 = 1.6\,\text{kg}$ are same, find the ratio of their linear momentum.

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13. From a uniform rectangular plate PQVW of mass 10 Kg, section RSUT (as shown in the figure) is removed. If the coordinates of COM of the remaining plate is (X, Y), then the value of $\frac{X}{Y}$ is:

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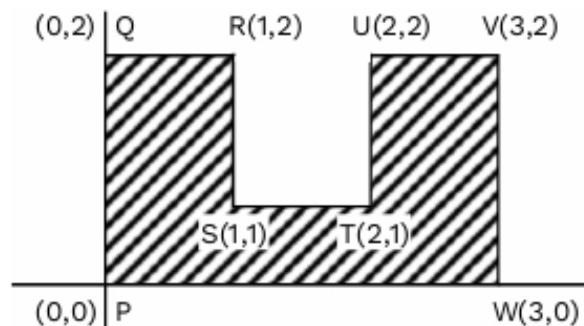
14. If the two planets of masses m_1 and m_2 revolving around the sun in orbits of radius r_1 and r_2 have their angular momentum in the ratio 1 : 3, then the ratio of their time period will be:

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15. Two spheres of radius r_1 and r_2 having charges Q_1 and Q_2 respectively are connected by a conducting wire. Find the correct relation if no charge flows through the wire.

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16. In a series LCR circuit, the value of resistance is halved. If the circuit is in resonance then the new current amplitude I_2 will satisfy: I_2 is the new current amplitude and I_1 is the old current amplitude.

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17. A loop having 30 turns of area $3.6 \times 10^{-3}\,\mathrm{m}^2$ and net resistance $= 100$ is placed in the uniform magnetic field of magnitude $5\,\mu T$. The work done by the external agent if the loop is pulled out of the magnetic field region in 1 second. (If given resistance 100)

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18. An electron is moving in a region of uniform magnetic field and electric field. The kinetic energy of electron is 5 eV and the magnitude of magnetic field is 3 μT. If the direction of magnetic field is perpendicular to the plane of motion of electron, then the value of electric field if the electron moves undeviated.

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19. Radiation of intensity 360 W/cm² is incident normally on the perfectly absorbing surface and the force experienced by the surface is $1.2 \times 10^{-4}\,\mathrm{N}$. Find the area of the surface.

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20. Find output:
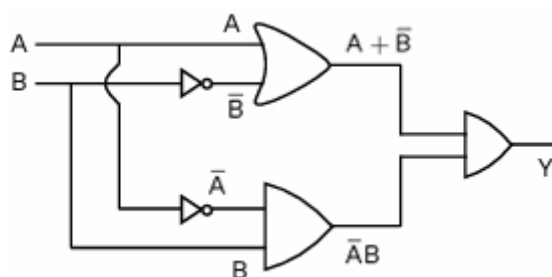
**21. If a numerical value is given by $n = a \times 10^b$, then choose the correct option.**

(1) If $a \geq 5$, then magnitude of n is in order of b
(2) If $10 \geq a > 5$, then magnitude of n is in order of b
(3) If $a \leq 5$, then magnitude of n is in order of b
(4) If $b \geq 5$, then magnitude of n is in order of a

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22. In a nuclear reaction, Q-value is 18×10^8 J. Find the mass defect.

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23. Diameter of the sphere is measured using vernier calipers. The least count of the vernier caliper is 0.1 mm, main scale reading is 2 cm and vernier scale reading is 2 cm. If the mass of the sphere is 8 kg, then find the density of the material of the sphere.

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24. Find out the magnitude of the work done on the gas when 1 mole of an ideal gas undergoes compression from 9 litres to 1 litre through a reversible isothermal process. (in Joule) (Nearest integer).

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25. In the given adjustment, find the distance of center of mass of the system from the origin.

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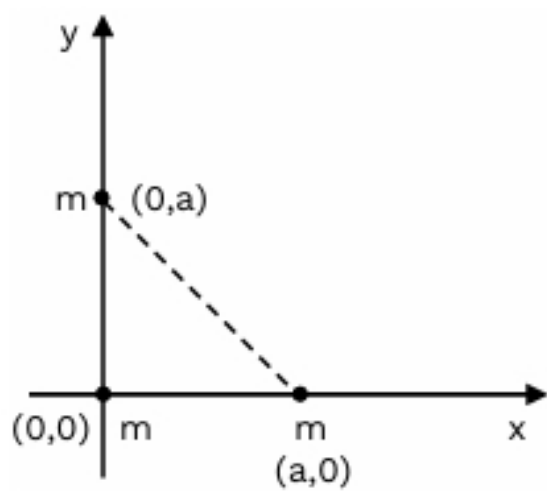
26. Find the relation between $\frac{V_A}{V_D}$ and $\frac{V_B}{V_C}$ in the process shown below: