PHYSICS

BOOKS - NTA MOCK TESTS

JEE MOCK TEST 12

Physics Single Choice

1. The electron in a hydrogen atom makes a transition from $n = n_1$ to $n = n_2$ state. The time period of the electron in the initial state

(n_1) is eight times that in the final state (n_2).

The possible values of n_1 and n_2 are

A. $n_1 = 8, n_2 = 2$

B. $n_1 = 4, n_2 = 2$

C. $n_1 = 3, n_2 = 1$

D. $n_1 = 4, n_2 = 1$

Answer: B

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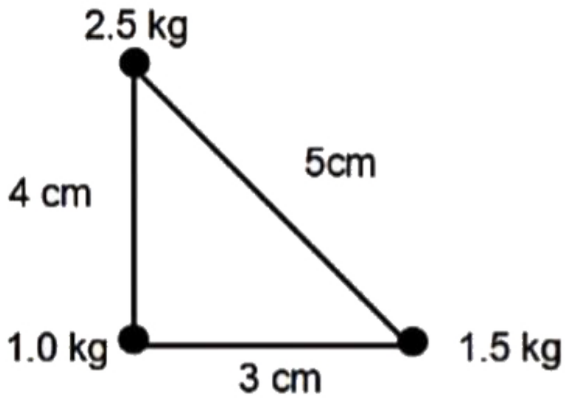
2. Three points masses 1.0 kg , 1.5 kg and 2.5 kg are placed at the vertices of a right-angle triangle of sides 4.0 cm, 3.0 cm and 5.0 cm, as shown in the figure. The centre of mass of the system is



A. 0.6 cm right and 2.0 cm above 1 kg mass

B. 2.0 cm right and 0.9 cm above 1 kg mass

C. 0.9 cm right and 2.0 cm above 1 kg mass

D. 1.5 cm right and 1.2 cm above 1 kg mass

Answer: C

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3. A magnetic needle free to rotate in a horizontal plane is placed at the centre of a circular current-carrying coil whose axis is perpendicular to the magnetic meridian at

that place. It is also known that the magnetic declination at this place is zero and in this condition, the magnetic needle is pointing towards conditions, the magnetic needle is pointing towards the north-west. Now, if we reverse the direction of current in the coil, then the magnetic needle will

A. point north - west

B. point north-east

C. point south-east

D. point south-west

Answer: B

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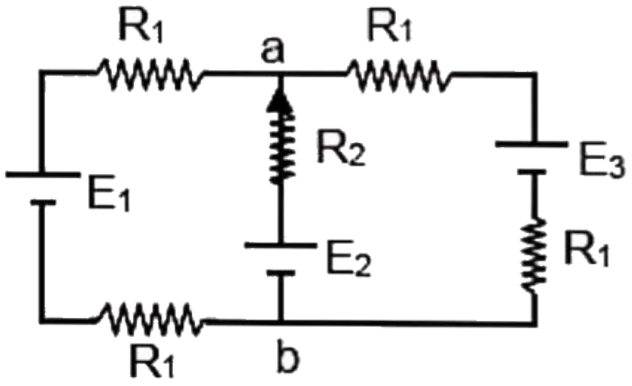
4. In the given network of ideal cells and resistors, $R_1 = 1.0\Omega, R_2 = 2.0\Omega, E_1 = 2V$ and $E_2 = E_3 = 4V$. The potential difference between the point a and b is



A. $\frac{8}{3}V$

B. $\frac{10}{3}V$

C. $\frac{9}{4}V$

D. $\frac{13}{4}V$

Answer: B

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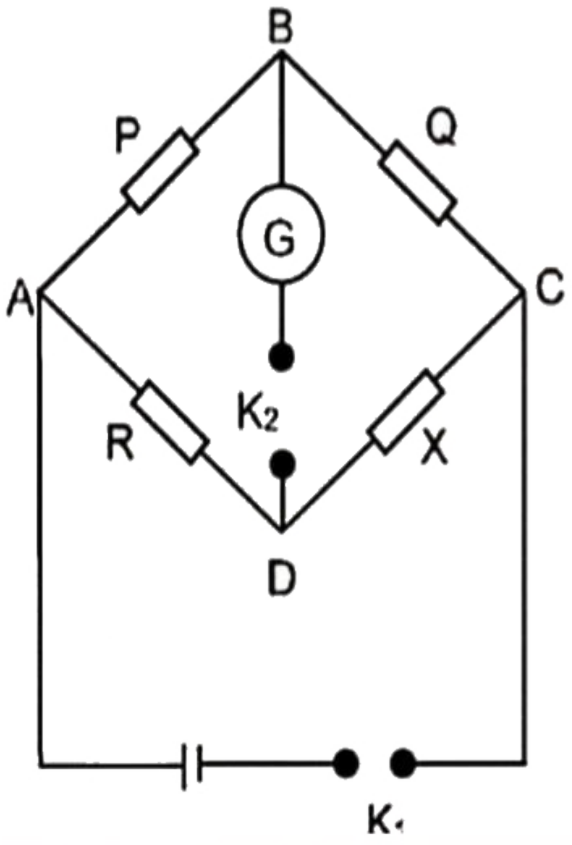
5. The figure below shows a wheatstone bridge with resistors P and Q having almost equal resistance. When R = 400Ω , the bridge is in

balanced condition. If on interchanging P and Q, the bridge is again balanced for $R = 405\Omega$, then the value of X is



A. 404.5Ω

B. 402.5Ω

C. 403.5Ω

D. 401.5Ω

Answer: B

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6. A circular coil, carrying a constant current i s kept in the x - y plane. The magnetic flux through the entire x - y plane exluding the area of the circular coil is given by ϕ and the

magetic flux through the area of the circular coil area is given by ϕ_0, then

A. $\phi > -\phi_0$

B. $\phi < \phi_0$

C. $\phi = -\phi_0$

D. $\phi = \phi_0$

Answer: C

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7. A neutral sphere of radius r and density ρ is placed in a uniform electric field E that exists on the earth's surface in the vertically upward direction. If atomic number and the mass number of the material of the sphere are Z and A respectively, then the fraction of electrons that should be removed from the sphere for it to remain in equilibrium is [Assume that the sphere is able to hold the necessary charge without any leakage. Here N_A - Avogadro number]

A. $\frac{n}{n_{\text{total}}} = \frac{\rho g A}{eEN_A Z}$

B. $\frac{n}{n_{\text{total}}} = \frac{4gA}{\pi eEN_A Z}$

C. $\frac{n}{n_{\text{total}}} = \frac{gA}{eEN_A Z}$

D. $\frac{n}{n_{\text{total}}} = \frac{\pi \rho g A}{3eEN_A Z}$

Answer: C

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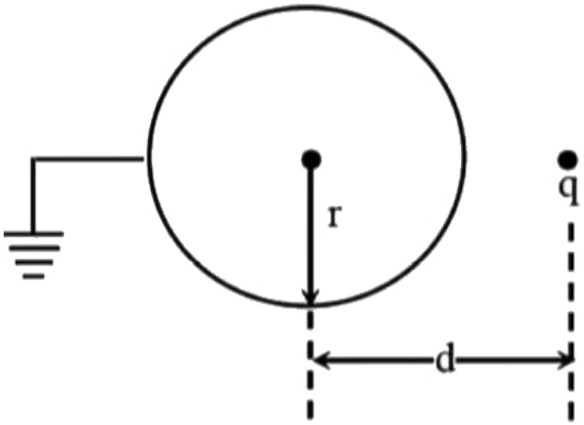
8. A point charge q is placed at some distance d away from the centre of a grounded conducting sphere of radius r, as shown in the

figure. The charge that flows the earth to the sphere is



A. $-\frac{qr}{d-r}$

B. $-\frac{qd}{d-r}$

C. $-\frac{qr}{d}$

D. $-\frac{qd}{r}$

Answer: C

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9. A small planet is is revolving around a very massive star in a circular orbit of radius r with a period of revolution. T is the gravitational force between the planet and the star is proportional to $r^{-5/2}$,then T will be proportional to

A. $r^{3/2}$

B. $r^{5/3}$

C. $r^{7/4}$

D. r^3

Answer: C

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10. A liquid A of mass 100 g at $100^\circ C$ is added to 50 g of a liquid B at temperature $75^\circ C$, the temperature of the mixture becomes $90^\circ C$. Now if 100 g of liquid A is $100^\circ C$ is added to

50 g of liquid B at $50^\circ C$, temperature of the mixture will be

A. $80^\circ C$

B. $60^\circ C$

C. $70^\circ C$

D. 85°

Answer: A

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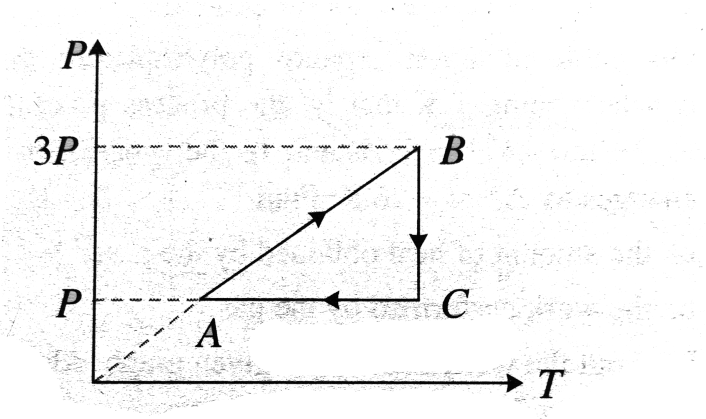
11. A fixed mass of oxygen gas performs a cyclic process ABCA as shown. Find the efficiency of the process.



A. $\dfrac{3\ln 3 - 2}{5 + 3\ln 3}$

B. $\dfrac{3\ln 4 - 2}{4 + 5\ln 3}$

C. $\dfrac{3\ln 4 - 3}{4 + 5\ln 3}$

D. $\frac{3\ln 3 - 1}{6 + 3\ln 4}$

Answer: A

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12. An electron of mass 0.90×10^{-30} kg under the action of a magnetic field moves in a circle of 2.0 cm radius at a speed $3.0 \times 10^{6} ms^{-1}$. If a proton of mass $1.8 \times 10^{-27} kg$ was to move in a circle of the same radius in the same magnetic field, then its speed will be

A. $1.5 \times 10^3 m/s$

B. $3 \times 10^6 m/s$

C. $6 \times 10^4 m/s$

D. $2 \times 10^8 m/s$

Answer: A

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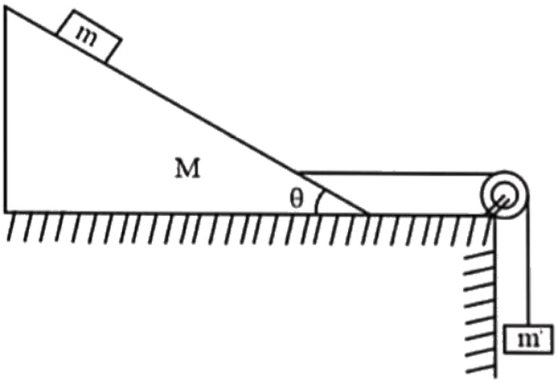
13. A hanging block of mass m' prevents the smaller block of mass m from slipping over a movable triangular block of mass M. All the

surface are frictionless and the strings and the pulleys are light. Value of mass m' in terms of m, M and θ is



A. $\left[\frac{m+M}{\cot\theta-1}\right]$

B. $\left[\frac{m-M}{\cot\theta+1}\right]$

C. $\left[\frac{m-M}{\cot\theta-2}\right]$

D. $\left[\frac{m+M}{\cot\theta-2}\right]$

Answer: A

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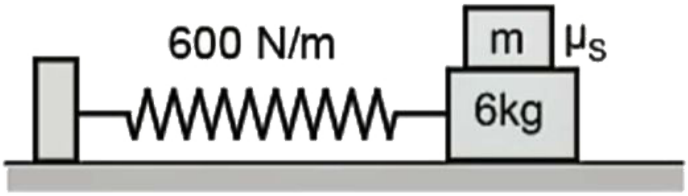
14. A block of mass m is placed on the top of a 6kg cart such that the time period of the system is 0.75 s assuming there is no slipping. If the cart is displaced by 50 mm from its equilibrium position and released, then the coefficient of static friction μ_s between block and cart is just sufficient to prevent the block from sliding. The value of m and μ_s

respectively are (Take $g = 9.8m/s^2$)



A. $1.63kg, 0.251$

B. $2.55kg, 0.385$

C. $3.42kg, 0.632$

D. $4.28kg, 0.876$

Answer: B

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15. A large tank filled with water to a height h is to be emptied through a small hole at the bottom. The ratio of times taken for the level of water to fall from h to $\frac{h}{2}$ and from $\frac{h}{2}$ to zero is

A. $\sqrt{2}$

B. $\frac{1}{\sqrt{2}}$

C. $\sqrt{2}-1$

D. $\frac{1}{\sqrt{2}-1}$

Answer: C

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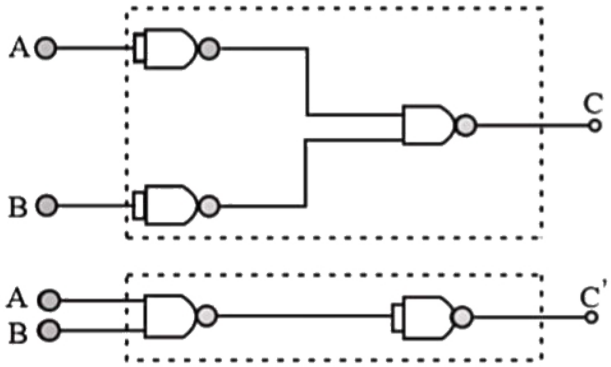
16. The combination of NAND gates shown here in the figure give output C and C'. C and C' are equivalent to



A. OR gate and AND gate respectively

B. AND gate and NOT gate respectively

C. AND gate and OR gate respectively

D. OR gate and NOT gate respectively

Answer: A

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17. In a photoelectric effect measurement, the stopping potential for a given metal is found to be V_0 volt, when radiation of wavelength λ_0

is used. If radiation of wavelength $2\lambda_0$ is used with the same metal, then the stopping potential (in V) will be

A. $\frac{V_0}{2}$

B. $2V_0$

C. $V_0 + \frac{hc}{2e\lambda_0}$

D. $V_0 - \frac{hc}{2e\lambda_0}$

Answer: D

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18. A student measures that distance traversed in free fall of a body, initially at rest in given time. He uses this data to estimate g, the acceleration due to gravity. If the maximum percentage error in measurement of the distance and the time are e_1 and e_2, respectively, the percentage error in the estimation of g is

A. $e_2 - e_1$

B. $e_1 + 2e_2$

C. $e_1 + e_2$

D. $e_1 - 2e_2$

Answer: B

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19. If a transverse pulse is created at the topmost point of a uniform rope suspended vertically, then

A. speed of pulse remains constant

B. speed of the pulse decreases with constant rate as pulse moves downward.

C. speed of the pulse decreases with increasing rate as pulse moves downward.

D. speed of the pules increases with constant rate as pulse moves downward.

Answer: B

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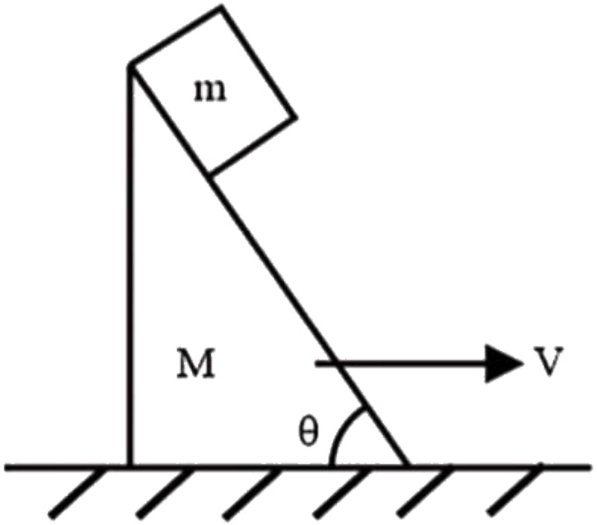
20. A block of mass m is stationary with respect to the wedge of mass M moving with uniform speed v on horizontal surface. Work done by friction force on the block in t seconds is



A. zero

B. $-\frac{mgvt}{2}\sin 2\theta$

C. $-(mgvt)2$

D. $-\frac{mgvt}{2}\sin\theta$

Answer: B

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Physics Subjective Numerical

1. The maximum kinetic energy of photoelectrons emitted from a metal surface increses from 0.4 eV to 1.2 eV when the frequency of the incident radiation is increased by 40% . What is the work function (in eV) of the metal surface?

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2. A very light, rectangular wire-frame of dimensions $7cm \times 5cm$ hangs just above the

free surface of a liquid of surface tension T, with its plane parallel to the free surface. The wire -frame is just brought in contact with the liquid surface and then, lifted up. If the force required to lift the wire-frame is 3.36 N, then what is the value of T in $\left(Nm^{-1}\right)$?

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3. A prism of refractive index $\sqrt{\frac{3}{2}}$ and refracting angle is 45° is placed in air. One of the two refracting surface of the prism is

silvered and a ray of monochromatic light enters the prism from the other face at an angle θ. If the ray retraces its path, then what is the value of θ (in degree)?

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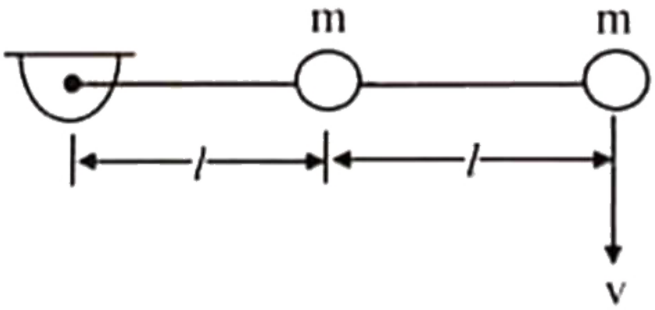
4. Two beads each of mass m are fixed on a light rigid rod of length 2l which is free to rotate in a horizontal plane. The bead on the far end is given some velocity v as shown in the figure. If K_{cm} represents the kinetic energy

of the centre of mass of the system and K_R represents the rotational kinetic energy of the system, then what is the value of $\frac{K_{cm}}{K_R}$?



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5. Unpolarized light of intensity 32 Wm^{-3} passes through three polarizers such that the

transmission axis of the last polarizer is crossed with the first. If the intensity of the emerging light is $3Wm^{-2}$, what is the angle between the transmission axces of the first two polarizers ? At what angle will the transmitted intensity be maximum ?

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