PHYSICS

BOOKS - NTA MOCK TESTS

JEE MOCK TEST 10

Physics

1. If a galvanometer has full scale deflection current I_g and resistance G. A shunt resistance R_A is used to convert it into an ammeter of

range I_o and a resistance R_V is connected in series to convert it into a voltmeter of range V_0 such that $V_0 = I_0 G$ then $R_A R_V$ and $\frac{R_A}{R_V}$ respectively are:

A. $R_A R_V = G^2 \left(\frac{I_0 - I_g}{I_g} \right)$ and $\frac{R_A}{R_V} = \left(\frac{I_g}{I_0 - I_g} \right)^2$

B. $R_A R_V = G^2$ and $\frac{R_A}{R_v} = \frac{I_g}{(I_0 - I_g)}$

C. $R_A R_v = G^2$ and $\frac{R_A}{R_v} = \left(\frac{I_g}{I_0 - I_g} \right)^2$

D. $R_A R_V = G^2 \left(\frac{I_g}{I_0 - I_g} \right)$ and $\frac{R_A}{R_V} = \left(\frac{I_0 - I_g}{I_g} \right)^2$

Answer: C

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2. A resistance R whose value is varied from 1Ω to 5Ω is connected to a cell of internal resistance 3Ω. The power consumed by R.

A. increases continuously

B. decreases continuously

C. first decreases then increases

D. first increases then decreases

Answer: D

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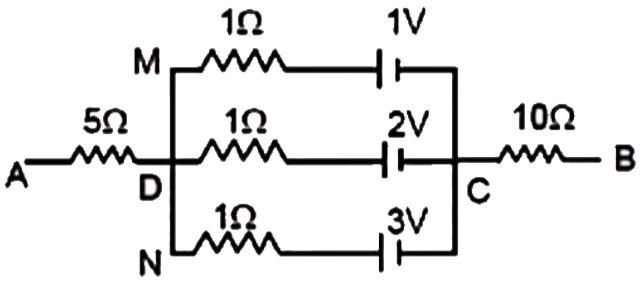
3. The potential difference between the points A and B in the given circuit is



A. 1V

B. 3V

C. 6V

D. 2V

Answer: D

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4. An $L-C-R$ series circuit with 100Ω resistance is connected to an AC source of $200V$ and angular frequency $300rad/s$. When only the capacitance is removed, the current lags behind the voltage by 60°. When only the

inductance is removed the current leads the voltage by 60°. Calculate the current and the power dissipated in the $L-C-R$ circuit

A. 3A, 300 W

B. 5A, 100 W

C. 4A, 200 W

D. 2A, 400 W

Answer: D

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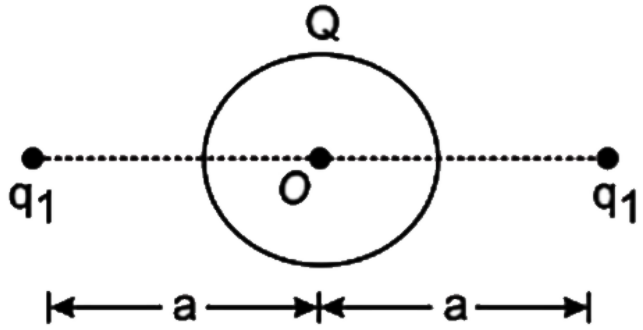
5. In between two point charges a conducting spherical shell having charge Q is placed as shown in the diagram. Assuming all charges to be positive, mark out the correct statement.



A. the charge on outer surface of shell is uniformly distributed

B. the charge on outer surface of shell is non - uniformly distributed

C. the information is insufficient to find the nature of charge distribution on the outer surface

D. none of these

Answer: B

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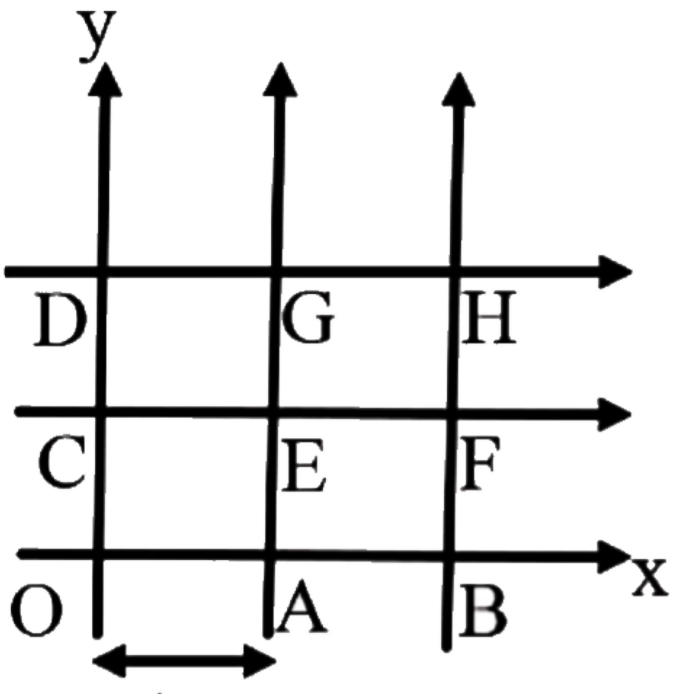
6. The grid represents a region in space containing a uniform electric field (each square of size $1m \times 1m$). If potentials at point O, A, B, C, D, E, F, G, H are respectively $0, -1, -2, 1, 2, 0, -1, 1$ and 0 volts find

the electric field intensity.



A. $\left(\hat{i}+\hat{j}\right)V/m$

B. $\left(\hat{i}-\hat{j}\right)V/m$

C. $\left(-\hat{i}+\hat{j}\right)V/m$

D. $\left(-\hat{i}-\hat{j}\right)V/m$

Answer: B

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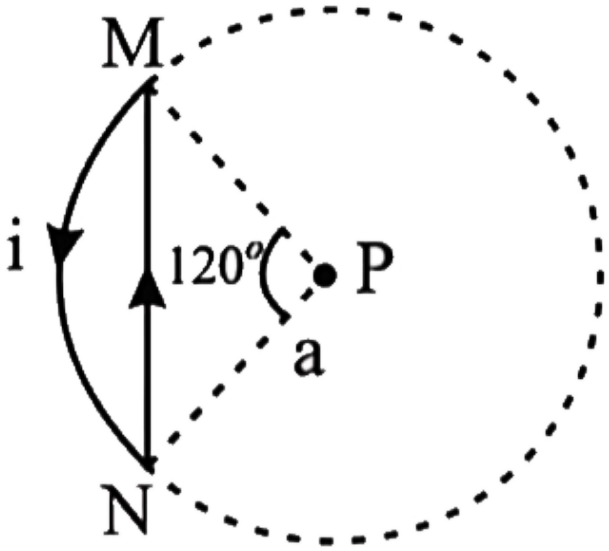
7. A wire loop carrying current I is placed in the $x - y$ plane as shown in the figure. If an external uniform magnetic field $\overrightarrow{B} = B\hat{i}$ is switched on, then the torque acting on the

loop is



A. $iBa^2\left(\frac{\pi}{3}-\frac{\sqrt{3}}{4}\right)\hat{j}$

B. $iBa^2\left(\frac{3}{\pi}-\frac{\sqrt{3}}{4}\right)\hat{j}$

C. $iBa^2\left(\frac{\pi}{3}-\frac{\sqrt{3}}{2}\right)\hat{j}$

D. $iBa^2\left(\frac{3}{\pi}-\frac{\sqrt{3}}{2}\right)\hat{j}$

Answer: A

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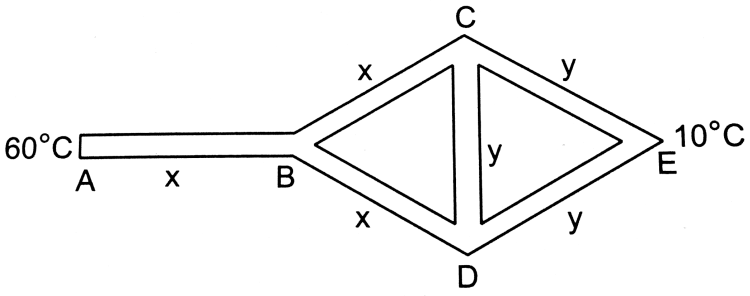
8. Three rods of material x and three of material y are connected as shown in figure. All the rods are identical in length and cross sectional area. If the end A is maintained at $60^\circ C$ and the junction E at $10^\circ C$, calculate the temperature of the junction B. The thermal conductivity of x is $800 Wm^{-1}.^\circ C^{-1}$

and that of y is $400Wm^{-1}.^{\circ}C^{-1}$.



A. $10^{\circ}C$

B. $20^{\circ}C$

C. $30^{\circ}C$

D. $40^{\circ}C$

Answer: B

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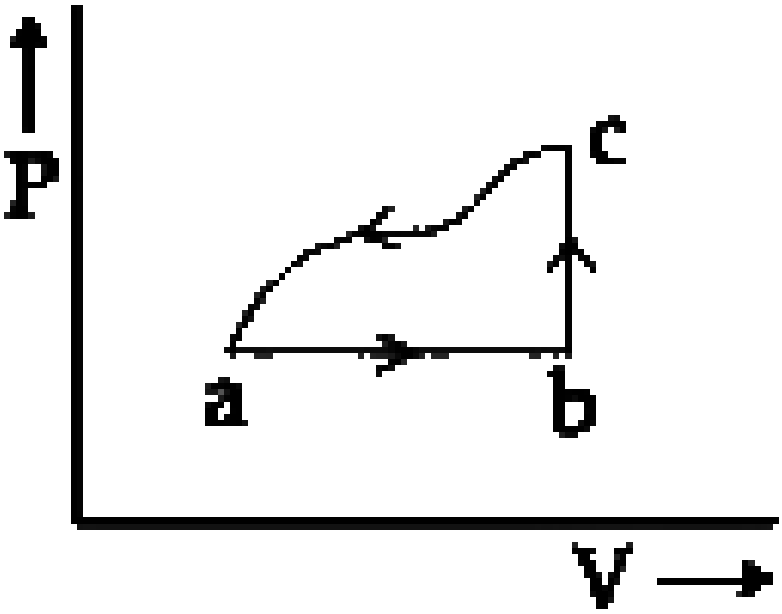

9.

A sample of an ideal gas is taken through the cyclic process abca and shown in the figure. The change in the internal energy of the gas along the path ca is $-180J$. The gas aborbs 250J of heat along the path ab and 60 J along

the path bc. the work done by the along the path abc is:

A. 130 J

B. 140 J

C. 120 J

D. 100 J

Answer: A

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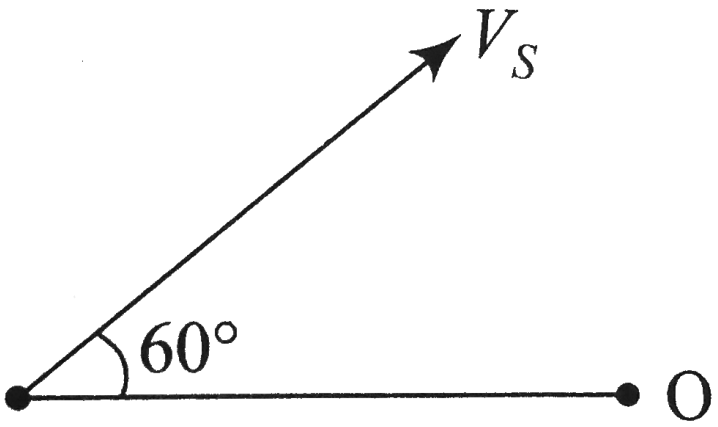

10.

A source of sound S emitting waves of frequency $100Hz$ and an observer O are located at some distance from each other. The source is moving with a speed of $19.4ms^{-1}$ at an angle of 60° with the source observer line as shown in the figure. The observer is at rest. The apparent frequency observed by the observer (velocity of sound in air $330ms^{-1}$) is

A. 103 Hz

B. 106 Hz

C. 96 Hz

D. 100 Hz

Answer: A

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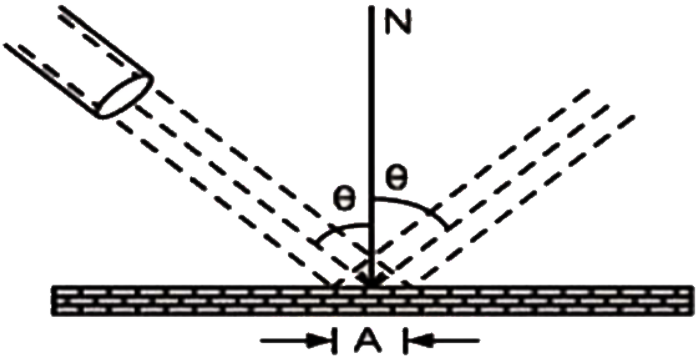
11. A nozzle throws a stream of gas against a wall with a velocity v much larger than the thermal agitation of the molecules. After

collision of the molecules with wall the magnitude of their velocity remains same. Also assume that the force exerted on the wall by the molecule is perpendicular to wall. (This is not strictly true for a rough wall.) Find the pressure exerted on the wall. (n = number of molecules per unit volume, m = mass of a gas molecule)



A. $2nmv^2 \cos^2 \theta$

B. $3nmv^2 \cos^2 \theta$

C. $nmv^2 \cos^2 \theta$

D. $2nmv^2 \sin^2 \theta$

Answer: A

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12. If the velocity of light (c) , gravitational constant (G) and Planck's constant (h) are

chosen as fundamental units, then the dimensions of mass in new system is

A. $h^{-\frac{1}{2}}G^{\frac{1}{2}}C^{\circ}$

B. $h^{\frac{1}{2}}C^{\frac{1}{2}}G^{-\frac{1}{2}}$

C. $h^{-\frac{1}{2}}C^{\frac{1}{2}}G^{-\frac{1}{2}}$

D. $h^{-\frac{1}{2}}C^{-\frac{1}{2}}G^{-\frac{1}{2}}$

Answer: B

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13. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as $a_c = k^2rt^2$, where k is a constant. The power delivered to the particle by the forces acting on it is :

A. $2\pi mk^2r^2$

B. mk^2r^2t

C. $\frac{\left(mK^4r^2t^5\right)}{3}$

D. Zero

Answer: B

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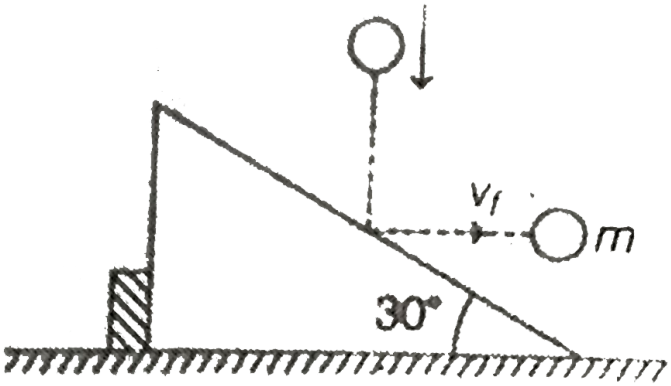
14. As shown in the figure a body of mass m moving vertically with speed 3 m/s hits a smooth fixed inclined plane and rebounds with a velocity v_f in the horizontal direction . If angle of plane with horizontal is 30° , the

velocity v_f will be



A. 3 m/s

B. $\sqrt{3}m/s$

C. $1/\sqrt{3}m/s$

D. This is not possible

Answer: B

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15. A planet revolves about the sun in an elliptical orbit of semi-major axis $2 \times 10^{12} m$. The areal velocity of the planet when it is nearest to the sun is $4.4 \times 10^{16} m / s$. The least distance between the planet and the sun is $1.8 \times 10^{12} m / s$. The minimum speed of the planet in km / s is $10K$. determine the value of K.

A. 4

B. 3

C. 1

D. 2

Answer: A

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16. A simple pendulum of length l is suspended from the celing of a cart which is sliding without friction on as inclined plane of

inclination theta . What will be the time period of the pendulum?

A. $2\pi\sqrt{\frac{l}{g\cos\theta}}$

B. $2\pi\sqrt{\frac{3l}{g\cos\theta}}$

C. $4\pi\sqrt{\frac{2l}{g\cos\theta}}$

D. $3\pi\sqrt{\frac{4l}{2g\cos\theta}}$

Answer: A

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17. A concrete sphere of radius R has cavity of radius r which is packed with sawdust. The specific gravities of concrete and sawdust are respectively $2.4 \text{ and } 0.3$ for this sphere to float with its entire volume submerged under water. Ratio of mass of concrete to mass of swadust will be

A. 8

B. 4

C. 3

D. Zero

Answer: B

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18. K_α wavelength emitted by an atom of atomic number Z=11 is λ. Find the atomic number for an atom that emits K_α radiation with wavelength 4λ.

(a) Z=6 (b) Z=4

(c) Z=11 (d) Z=44.

A. Z = 6

B. Z = 4

C. Z = 11

D. Z = 44

Answer: A

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19. ATV tower has a height of 100m. How much population is covered by TV broadcast. If the

average population density around the tower is $1000km^{-2}$? (radius of earth $=6.4 \times 10^6 m$)

A. 6×10^6

B. 2×10^6

C. 12×10^6

D. 4×10^6

Answer: D

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20. For a common-emitter transistor amplifier, the current gain is 60. If the emitter current is 6.6 mA then its base current is

A. 6.492 mA

B. 0.108 mA

C. 0.11 mA

D. 0.343 mA

Answer: B

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21. A tube A of radius r is connected to two other tubes B and C with the help of a junction valve. The tubes B and C have radii $\frac{r}{2}$ and $\frac{r}{3}$ and the flow velocity in each is v and 3v respectively. If the flow velocity in tube A is $\frac{n}{m}v$, when n and m are integers, then what is the value of $n+m$?

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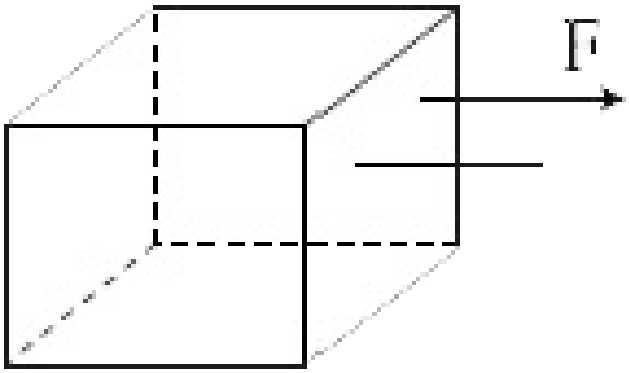
22.



Consider a uniform cubical box of side a on a rough floor that is to be moved by applying minimum possible force F at a point b above its centre of mass (see figure). It the coefficient of friction is $\mu = 0.4$, the maximum possible value of $100 \times \frac{b}{a}$ for box not to topple before moving is _____.

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23. A metal has a work function ϕ_0 and its corresponding threshold wavelength is λ_0. If the threshold wavelength for a metal whose work function is $\frac{\phi_0}{3}$ is $n\lambda_0$, then what is the value of n ?

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24. A plano convex lens of radius of curvature 30 cm and refractive index 1.5 is kept in air.

Find its focal length (in cm).

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25. YDSE is conducted using light of wavelength 6000Å to observe an interference pattern. When a film of some material 3.0×10^{-3} cm thick was placed over one of the slits, the fringe pattern shifted by a distance equal to 10 fringe widths. What is the refractive index of the material of the film ?

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