PHYSICS

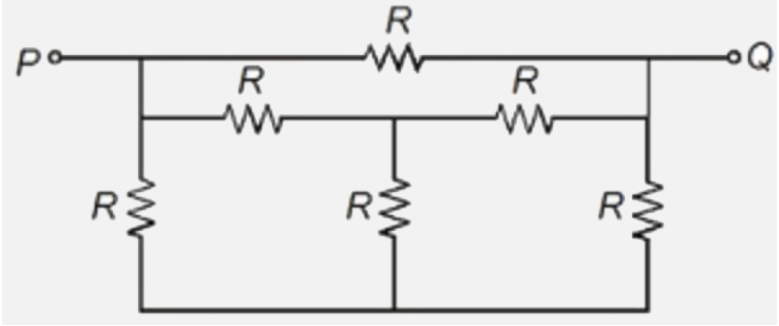
BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 101

Physics

1. The effective resistance between points P and Q of the electrical circuit shown in the

figure is



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

B. R

C. $\frac{3R}{2}$

D. 2R

Answer: A

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2. Consider the two following statements I and II, and identify the correct choice given in the answers

1. In photovoltaic cells, the photoelectric current produced is not proportional to the intensity of incident light.

2. In gas-filled photoemissive cells, the velocity of photoelectrons depends on the wavelength of the incident radiation.

A. Both 1 and 2 are true

B. Both 1 and 2 are false

C. 1 is true but 2 is false

D. 1 is false but 2 is true

Answer: D

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3. A mass m on the surface of the Earth is shifted to a target equal to the radius of the Earth. If R is the radius and M is the mass of the Earth, then work done in this process is

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

B. mgR

C. 2 mgR

D. $\frac{mgR}{4}$

Answer: A

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4. A gas is undergoing an adiabatic process. At a certain stage, the volume and absolute temperature of the gas are V_0, T_0 and the

magnitude of the slope of the V-T curve is m. molar specific heat of the gas at constant pressure is [Assume the volume of the gas is taken on the y-axis and absolute temperature of the gas taken on x-axis]

A. $\frac{mRT_0}{V_0}$

B. $\frac{MRT_0}{2V_0}$

C. $\frac{(V_0 + mT_0)R}{V_0}$

D. $\frac{(V_0 + mT_0)R}{2V_0}$

Answer: C

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5. Two metallic spheres S_1 and S_2 are made of the same material and have got identical surface finish. The mass of S_1 is thrice that of S_2. Both the spheres are heated to the same high temperature and placed in the same room having lower temperature but are thermally insulated from each other. the ratio of the initial rate of cooling of S_1 to that of S_2 is

A. $\frac{1}{3}$

B. $\frac{1}{\sqrt{3}}$

C. $\sqrt{3}$

D. $\left(\frac{1}{3}\right)^{1/3}$

Answer: D

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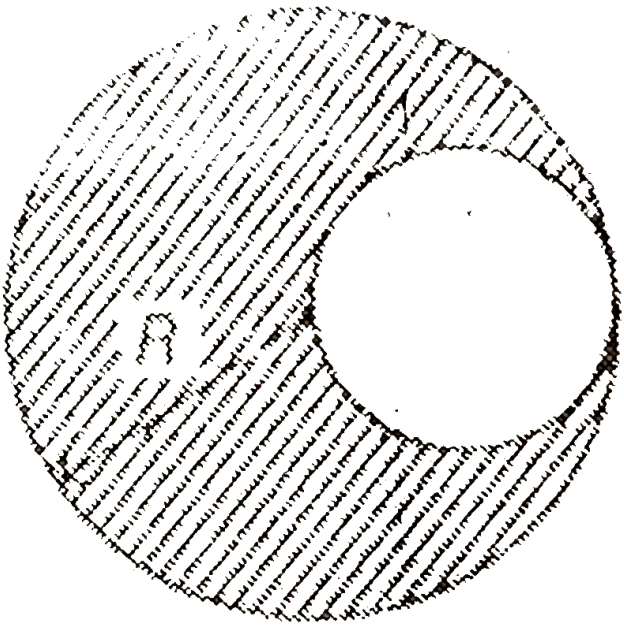
6. A spherical hole is made in a solid sphere of radius R. The mass of the sphere before hollowing was M. The gravitational field at the centre of the hole due to the remaining mass

is



A. ZERO

B. $\frac{GM}{8R^2}$

C. $\frac{GM}{2R^2}$

D. $\frac{GM}{R^2}$

Answer: C

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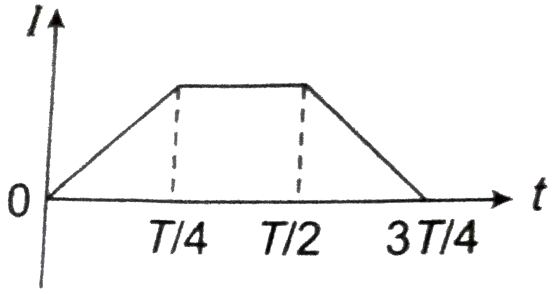
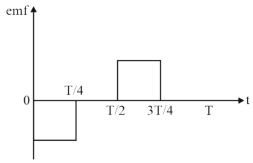
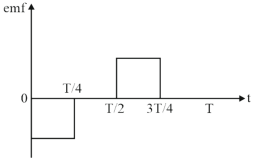
7. The current i in a coil varies with time as shown in the figure. The variation of induced emf with time would be



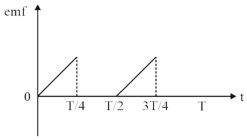
A.



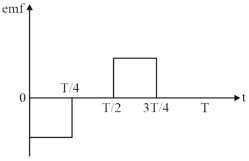
B.



C.



D.



Answer: A

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8. An electric charge $+q$ moves with velocity $\overrightarrow{v} = 3\hat{i} + 4\hat{j} + \hat{k}$,in an electromagnetic field given by:

$\overrightarrow{E} = 3\hat{i} + \hat{j} + 2\hat{k}$ and $\overrightarrow{B} = \hat{i} + \hat{j} + 3\hat{k}$.The y -component of the force experienced by $+q$ is:

A. -7q

B. 5q

C. -3q

D. 2q

Answer: A

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9. The amplification factor of a triode is 50. If the grid potential is decreased by 0.20 V, what increase, in plate potential will keep the plate current unchanged ?

A. 5 V

B. 10 V

C. 0.2 V

D. 50 V

Answer: B

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10. An ideal gas is enclosed in a vertical cylindrical container and supports a freely moving piston of mass M. The piston and the cylinder have an equal cross-sectional area A. Atmospheric pressure is p_0 and when the piston is in equilibrium, the volume of the gas is V_0. The piston is now displaced slightly from its equilibrium position. Assuming that the

system, is completely isolated from, its surroundings, what is the frequency of oscillation.

A. $f = \frac{1}{2\pi}\sqrt{\frac{\gamma(p_0A^2 + MgA)}{V_0M}}$

B. $f = \frac{1}{2\pi}\sqrt{\frac{1}{\gamma}\frac{(p_0A^2 + MgA)}{V_0M}}$

C. $f = \frac{1}{2\pi}\sqrt{\frac{(p_0A^2 + MgA)}{V_0M}}$

D. $f = \frac{1}{2\pi}\sqrt{\frac{A(p_0A^2 + MgA)}{V_0M}}$

Answer: A

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11. When U^{235} is bombarded with one neutron, the fission occurs and the products are three neutrons, ,$_{36}\ Kr^{94}$ and.

A. $_{56}Ba^{141}$

B. $_{54}Xe^{139}$

C. $_{56}Ba^{139}$

D. $_{58}I^{142}$

Answer: C

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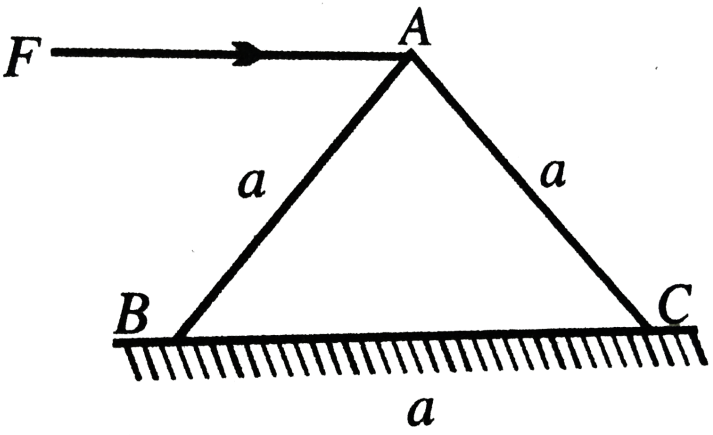
12. A horizontal force F is applied at the top of an equilateral triangular block having mass m. The minimum coefficient of friction required to topple the block before translation will be



A. $\frac{2}{\sqrt{3}}$

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

C. $\frac{1}{\sqrt{3}}$

D. None of these

Answer: C

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13. A string fixed at both ends has consecutive standing wave modes for which the distances between adjacent nodes are 18 cm and 16 cm respectively. The minimum possible length of the string is:

A. 144 cm

B. 204 cm

C. 288 cm

D. 72 cm

Answer: A

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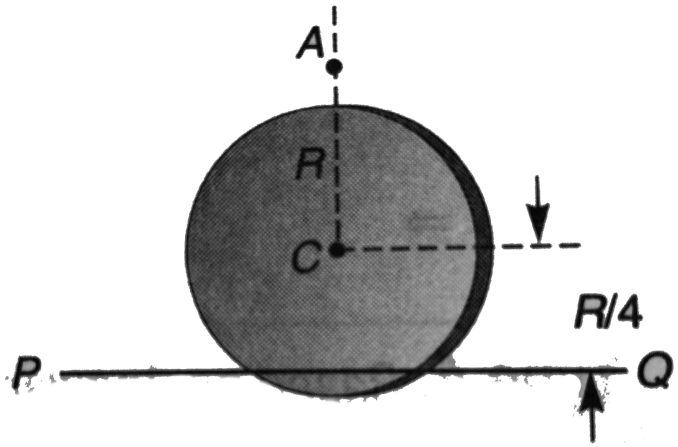

14.

A uniform circular disc has radius R and mass m. A particle, also of mass m, if fixed at a point A on the edge of the disc as shown in the figure. The disc can rotate freely about a horizontal chord PQ that is at a distance $R/4$ from the centre C of the disc. The line AC is perpendicular to PQ. Initially the disc is held

vertical with the point A at its highest position. it is then allowed to fall, so that it starts rotation about PQ. Find the linear speed of the particle as it reaches its lowest position.

A. $-\sqrt{2gR}$

B. $\sqrt{3gR}$

C. $-\sqrt{4gR}$

D. $\sqrt{5gR}$

Answer: D

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15. Four particles, each of mass m and charge q, are held at the vertices of a square of side 'a'. They are released at t = 0 and move under mutual repulsive forces speed of any particle when its distance from the centre of square doubles is

A. $\left[\frac{1}{4\pi\varepsilon_0}\frac{q^2}{ma}\left(1+\frac{1}{2\sqrt{2}}\right)\right]^{1/2}$

B. $\left[\frac{1}{4\pi\varepsilon_0}\frac{q^2}{ma}\right]^{1/2}$

C. $\left[\frac{1}{4\pi\varepsilon_0}\frac{q^2}{ma^2}\right]^{1/2}$

D. $\left[\frac{1}{4\pi\varepsilon_0}\frac{q^2}{ma^2}\left(1+\frac{1}{2\sqrt{2}}\right)\right]^{1/2}$

Answer: A

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16. A point object moves on a circular path such that distance covered by it is given by function $S=\left(\frac{t^2}{2}+2t\right)$ meter (t in second). The ratio of the magnitude of acceleration at $t=2s$ and $t=5s$. is $1:2$ then the radius of the circle is

A. 1 m

B. $3\sqrt{51}m$

C. $\sqrt{51}m$

D. 3 m

Answer: B

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17. If speed (V),acceleration (A) and force (F) are considered as fundamental units, the dimesnion of Young 's modulus will be :

A. $[V^{-2}A^2F^2]$

B. $[V^{-2}A^2F^{-2}]$

C. $[V^{-4}A^{-2}F]$

D. $[V^{-4}A^2F]$

Answer: D

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18. The energy that should be added to an electron to reduce its de-Broglie wavelength from 1 nm to 0.5 nm is

A. four times the initial energy.

B. equal to the initial energy.

C. twice the initial energy.

D. thrice the initial energy.

Answer: D

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19. A spherical drop of water has $1mm$ radius. If the surface tension of water is $70 \times 10^{-3} N/m$, then the difference of

pressure between inside and outside of the spherical drop is:

A. $35Nm^{-2}$

B. $70Nm^{-2}$

C. $140Nm^{-2}$

D. Zero

Answer: C

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20. Find the centre of mass x_{CM} of the shaded portion of the disc of radius $R = 24cm$.

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21. A standerd cell emf $1.08V$ is balance by the potential difference across $91cm$ of a meter long wire applied by a cell of emf $2V$ through a series resistor of resistance 2Ω. The internal resistance of the cell is zero. Find the

resistance per unit length of the potentiometer wire.

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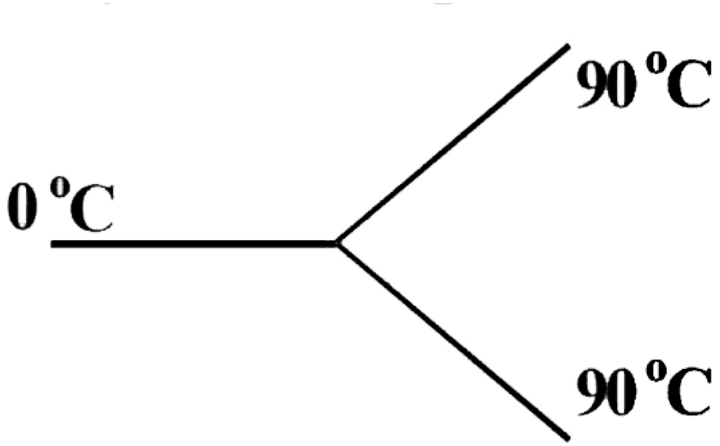
22. Three rods made of same material and having the same cross-section have been joined as shown. In the figure.Each rod is of the same length. The left and right ends are kept at $0^\circ C$ and $90^\circ C$ respectively. The temperature of the junction of the three rods

will be



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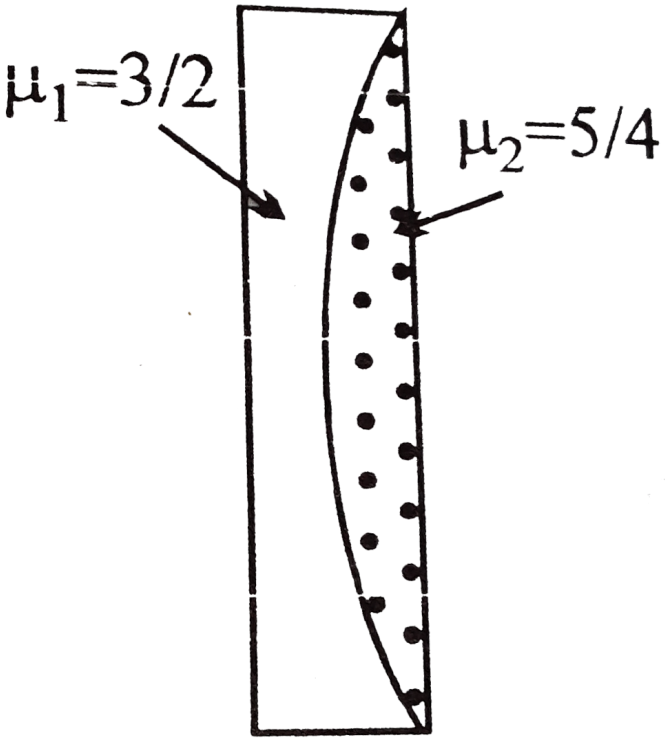
23. A thin plano-convax lens fits exactly into a plano concave lens with their plane surface parallel to each other as shown in the figure. the radius of the curvature of the curved

surface $R = 30cm$ The lens are made of different material having refractive index $\mu_1 = \frac{3}{2}$ and $\mu_2 = \frac{5}{4}$ as shown in the figure



(i) if plane surface of the plano -convex lens is silvered, then calculate the equivalent focal length of this system and also calculate the

nature of this equivalent mirror .

(ii) An object having transverse length $5cm$ is placed on the axis of equivalent mirror(in part1) at a distance $15cm$ from the equivalent mirror along principal axis. Find the transverse magnification produced by equivalents mirror.

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24. A beam of light consisting of two wavelengths, 650 nm and 520 nm is used to obtain interference fringes in Young's double-

slit experiment. What is the least distance (in m) from a central maximum where the bright fringes due to both the wavelengths coincide ? The distance between the slits is 3 mm and the distance between the plane of the slits and the screen is 150 cm.

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