PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 27

Physics

1. A vibraiton magnetometer consits of two idential bar magnets placed one over the other such that they are mutually perpendicular and bisect each other. The time period of oscillations of combination in a

horizontal magnetic field is $4s$. If one of the magnets is removed, then the period of oscillations of the other in teh same field is

A. 5.78s

B. 3.36 s

C. 4.36s

D. 5.36s

Answer: B

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2. The resistance of a wire is 5Ω at $50^\circ C$ and 6Ω at $100^\circ C$. The resistance of the wire at $0^\circ C$ will be

A. 3Ω

B. 2Ω

C. 1Ω

D. 4Ω

Answer: D

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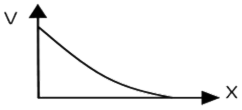
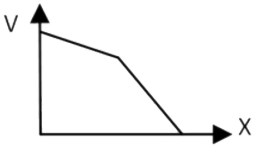
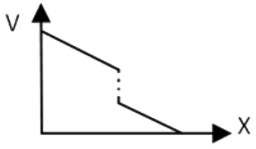
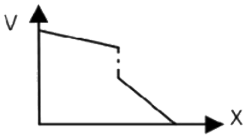
3. Two cylindrical rods of same cross-section area and same length are connected in series to an ideal cell as shown.The resistivity of left rod is ρ and that if right rod is 2ρ Then the variation of potential and electric field at any point P distant x from left end of combined rod system are given by

A. 

B. 

C. 

D. 

Answer: B

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4. A uniformly wound solenoid coil of self inductance $1.8 \times 10^{-4} H$ and resistance 6Ω is broken up into two identical coils. These identical coils are then connected in parallel across a $12V$ battery of negligible resistance. The time constant and steady state current will be

A. $3 \times 10^{-5} s$

B. $1.5 \times 10^{-5} s$

C. $0.75 \times 10^{-5} s$

D. $6 \times 10^{-5} s$

Answer: A

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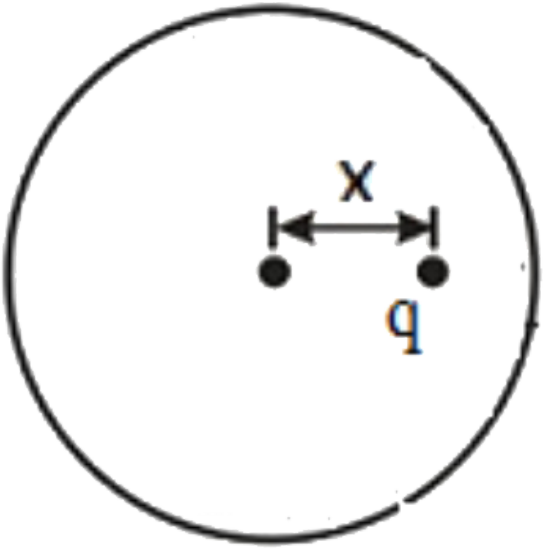
5. A point charge q ie kept inside an uncharged conducting shperical shell . The radius of the shell is R and the charge is kept inside the shell at a distance x

from the centre . Identify thet correct statement .



A. Net force acting on the shell is zero

B. Net force on the shell is towards right side

C. Net force on the shell is towards left side

D. Nothing can be said about the net direction of the net force on the shell.

Answer: C

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6. Two spherical conductors A and B of radii R and 2R respectively , are separated by a large distance . If some charge is given to both the spheres and later they are connected by a conducting wire , then in equilibrium condition , the ratio of the magnitude of the electric fields at the surface of spheres A and B is

A. $1:4$

B. $4:1$

C. $1:2$

D. $2:1$

Answer: D

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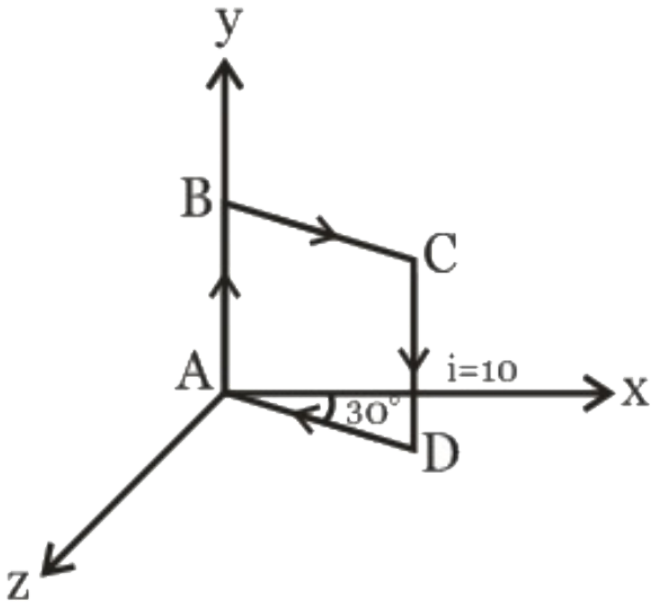
7. The figure shows a current - carrying square loop ABCD of side 10 cm and current $i = 10A$. The

magnetic moment $\overrightarrow{M}$ of the loop is



A. $(0.05)\left(\hat{i}-\sqrt{3}\hat{k}\right)Am^2$

B. $(0.05)\left(\hat{i}+\hat{k}\right)Am^2$

C. $(0.05)\left(\sqrt{3}\hat{i}+\hat{k}\right)Am^2$

D. $\left(\hat{i}+\hat{k}\right)Am^2$

Answer: A

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8. A block of mass 5 kg is placed on a rough inclined plane. The inclination of the plane is gradually increased till the block just begins to slide down. The inclination of the plane is than 3 in 5. The coefficient of friction between the block and the plane is (Take, $g = 10m/s^2$)

A. $\frac{3}{5}$

B. $\frac{3}{4}$

C. $\frac{4}{5}$

D. $\frac{2}{3}$

Answer: B

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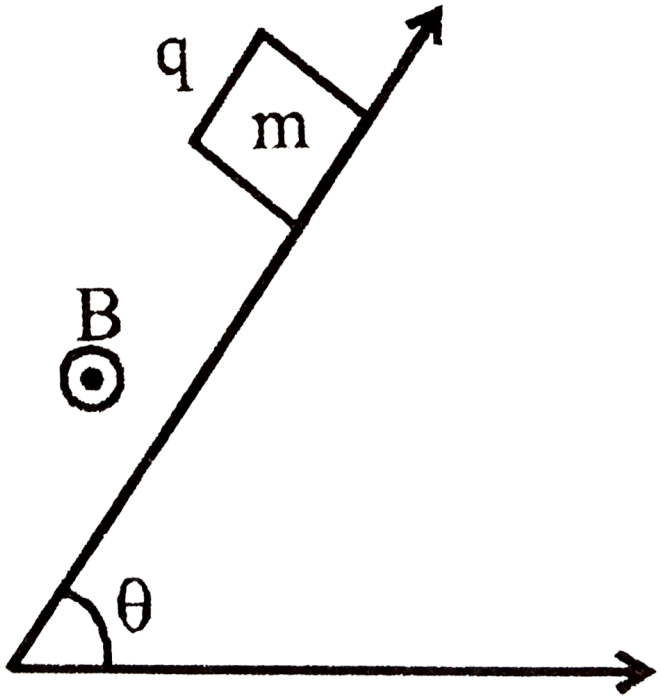
9. A block of mass m & charge q is released on a long smooth inclined plane magnetic field B is constant, unifrom, horizontal and parallel to surface a shown Find the time from start when block loses contact with

the surface



A. $\frac{m\cos\theta}{qB}$

B. $\frac{m\text{cosec}\theta}{qB}$

C. $\frac{m\cot\theta}{qB}$

D. $\frac{m\tan\theta}{qB}$

Answer: C

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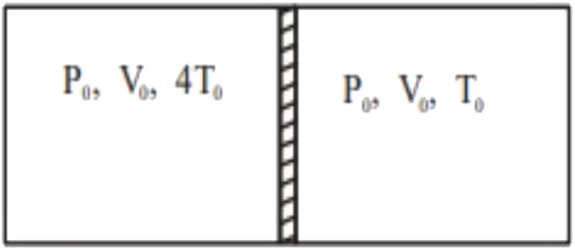
10. A cylindrical adiabatic container of total volume $2V_0$ divided into two equal parts by a conducting piston which is free to move as shown in figure. Each part containing identical gas at pressure P_0. Initially temperature of left and right part is $4T_0$ and T_0 respectively. An external force is applied on the piston of area 'A' to keep the piston at rest. The value of external force required when thermal equilibrium is

reached is.



A. $\frac{8}{5}P_0A$

B. $\frac{2}{5}P_0A$

C. $\frac{5}{6}P_0A$

D. $\frac{6}{5}P_0A$

Answer: D

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11. The pressure at the bottom of an open tank of water is 3p where p is the atmospheric pressure. If the water is drawn out till the level of water remains one fifth, the pressure at the bottom of the tank will now be

A. 2P

B. $\frac{13}{5}P$

C. $\frac{8}{5}P$

D. $\frac{4}{5}P$

Answer: B

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12. The elastic limit of brass is 379 MPa . What should be the minimum diameter of a brass rod if it is to support a 400 N load without exceeding its elastic limit ?

A. 1.00 mm

B. 1.36 mm

C. 1.16 mm

D. 0.9 mm

Answer: C

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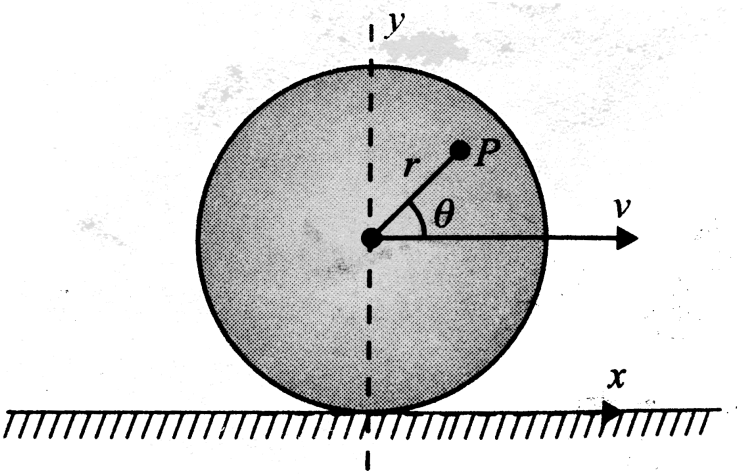
13. A disc of radius R rolls without slipping at speed v along positive x-axis. Velocity of point P at the instant shown in Fig. is



A. $\vec{v}_p = \left(v + \dfrac{vr\sin\theta}{R}\right)\hat{i} + \dfrac{vr\cos\theta}{R}\hat{j}$

B. $\vec{v}_p = \left(v + \dfrac{vr\sin\theta}{R}\right)\hat{i} - \dfrac{vr\cos\theta}{R}\hat{j}$

C. $\vec{v}_p = v + \dfrac{vr\sin\theta}{R}\hat{i} + \dfrac{vr\cos\theta}{R}\hat{j}$

D. $\vec{v}_p = v + \dfrac{vr\sin\theta}{R}\hat{i} - \dfrac{vr\cos\theta}{R}\hat{j}$

Answer: B

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14. A vernier callipers has 20 divisions on the vernier scale which coincide with 19 divisions on the main scale. The least count of the instrument is 0.1 mm. The main scale divisions are of

A. 0.5 mm

B. 1 mm

C. 2 mm

D. 0.25 mm

Answer: C

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15. Radiation of wavelength λ is incident on a photocell. The fastest emitted electron has speed v. If the wavelength is charged to $\frac{3\lambda}{4}$, the speed of the fastest emitted electron will be

A. $= v\left(\frac{4}{3}\right)^{\frac{1}{2}}$

B. $= v\left(\frac{3}{4}\right)^{\frac{1}{2}}$

C. $> v\left(\frac{4}{3}\right)^{\frac{1}{2}}$

D. $< v\left(\frac{4}{3}\right)^{\frac{1}{2}}$

Answer: C

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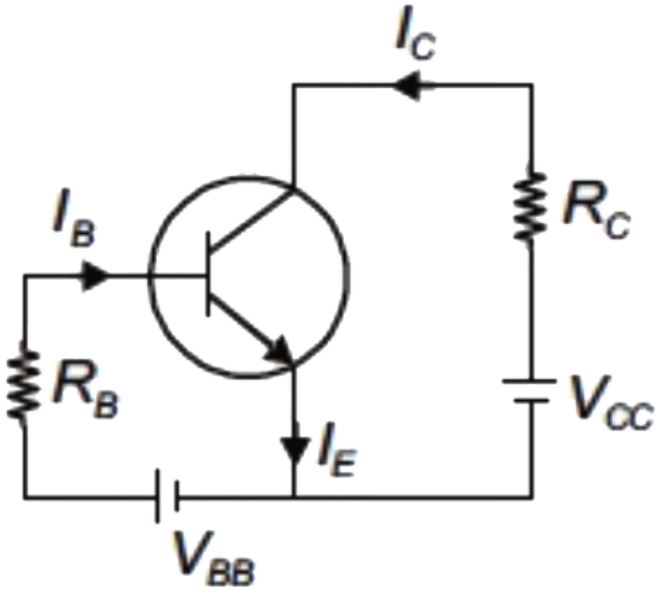
16. In the figure shown , $R_B = 500k\Omega, R_C = 8k\Omega, V_{\mathrm{BB}} = 10.6V$ and $V_{\mathrm{CC}} = 20V$. The current amplification factor $\beta = 100$ and $V_{\mathrm{BE}} = 0.6$ V . Mark the incorrect

statement .



A. $I_B = 20\mu A$

B. $V_{\mathrm{CB}} = 3.4V$

C. $V_{\mathrm{CB}} = 2.8V$

D. the transistor is in active region

Answer: C

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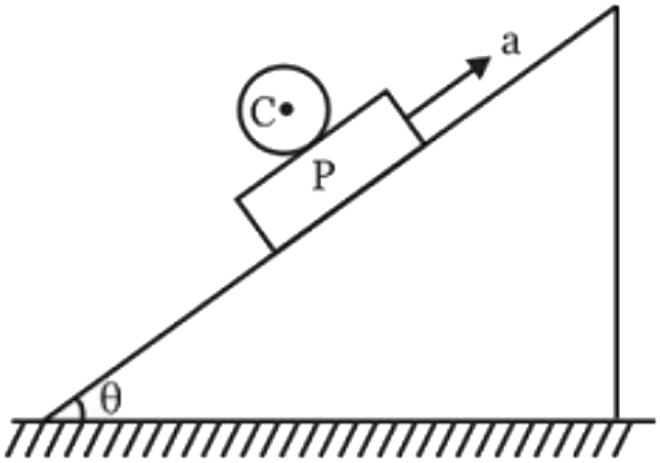
17. The figure shows a fixed inclined plane on which a plank is being pulled upwards such that the center C of the solid cylinder remains at rest with respect to ground. If no slipping takes place between the cylinder and the plank, then the acceleration of the planks is



A. $\frac{g}{2}\sin\theta$

B. $2g\sin\theta$

C. $g\sin\theta$

D. $\sqrt{2}g\sin\theta$

Answer: B

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18. A thin prism of angle 5° is placed at a distance of $10cm$ from object.What is the distance of the image from object?Given $\mu$of prism=1.5).

A. $\frac{\pi}{8}cm$

B. $\frac{\pi}{12} cm$

C. $\frac{5\pi}{36} cm$

D. $\frac{\pi}{7} cm$

Answer: C

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19. A micture of light, consisting of wavelength 590nm and an unknown wavelength, illuminates Young's double slit and gives rise to two overlapping interference patterns on the scree. The central maximum of both lights coincide. Further, it is obseved that the third bright fringe of known light

coincides with the 4th bright fringe of the unknown light. From this data, the wavelength of the unknown light is:

A. 393.4 nm

B. 885.0 nm

C. 442.5 nm

D. 776.8 nm

Answer: C

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20. A particle is released from a height S. At certain height its kinetic energy is three times its potential energy. The height and speed of the particle at that instant are respectively

A. $\frac{H}{3}, \sqrt{\frac{2gH}{3}}$

B. $\frac{H}{3}, 2\sqrt{\frac{gH}{3}}$

C. $\frac{2H}{3}, \sqrt{\frac{2gH}{3}}$

D. $\frac{H}{3}, \sqrt{2gH}$

Answer: B

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21. Total number of elements which are present in a row on the periodic table between those elements, whose wavelength of K_α lines are equal to 250 and 179 pm are (Rydberg constant = $1.097 \times 10^7 m^{-1}$)

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22. A diamtomic molecule can be modelled as two rigid balls connected with a spring such that the balls can vibrate with respect to the center of mass of the system (spring+balls) . Consider a diamtomic gas made of such diatomic molecules. If the gas performs 20 J of work under isobaric condition, then heat given to the gas (in J) is

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23. A body of mass $3kg$ collides elastically with another body at rest and then continues to move in the original direction with one half of its original speed. What is the mass of the target body?

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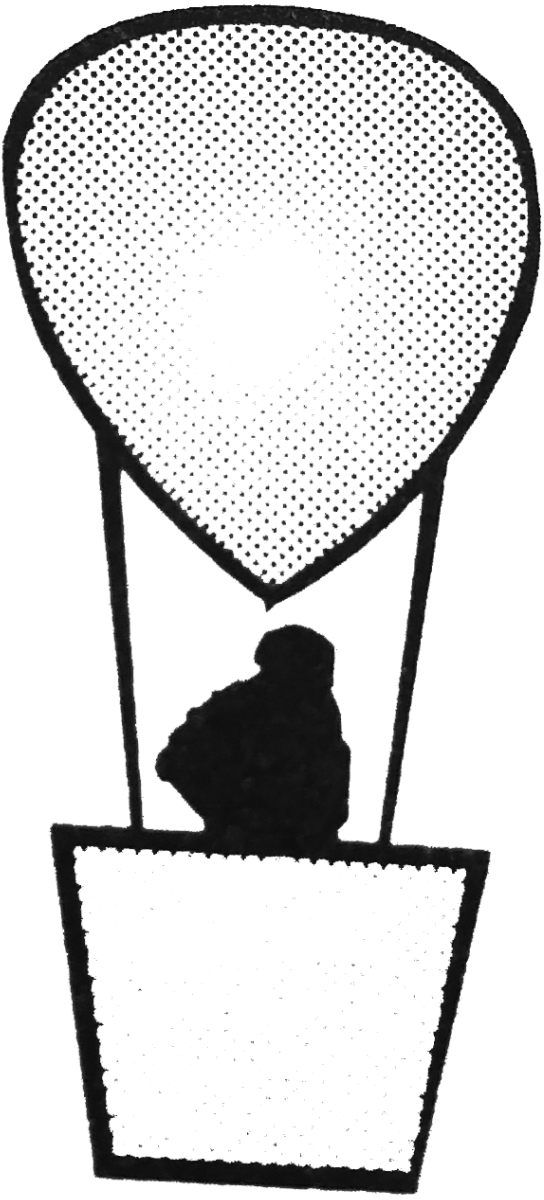
24. A man in a balloon throws a stone downwards with a speed of $5m/s$ with respect to balloon. The balloon is moving upwards with a constant acceleration of $5m/s^2$. Then velocity of the stone relative to the man

after 2 seconds is.



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25. A block of mass 1 kg is connected with a smooth plank of the same mass is performing oscillations. The value of the spring constant is $200Nm^{-1}$ The block and the plank are free to move and there is no friction anywhere. The angular frequency of the oscillation is ω rad s^{-1} Find the value of ω

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