PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 66

Physics

1. An alpha nucleus of energy $\frac{1}{2}m\nu^2$ bombards a heavy nucleus of charge Ze . Then

the distance of closest approach for the alpha nucleus will be proportional to

A. $\frac{Z^2}{v^2}$

B. $\frac{v^2}{Z^2}$

C. $\frac{Z}{v^2}$

D. $\frac{v^2}{Z}$

Answer: C

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2. An isolated particle of mass m is moving in horizontal planexy along the x-axis, at a certain height above the ground. It suddenly explodes into two fragment of masses $m/4$ and $3m/4$. An instant later, the smaller fragment is at $y = +15$ cm. The larger fragment at this instant is at

A. $y = -5cm$

B. $y = +20cm$

C. $y = +5cm$

D. $y = -20cm$

Answer: A

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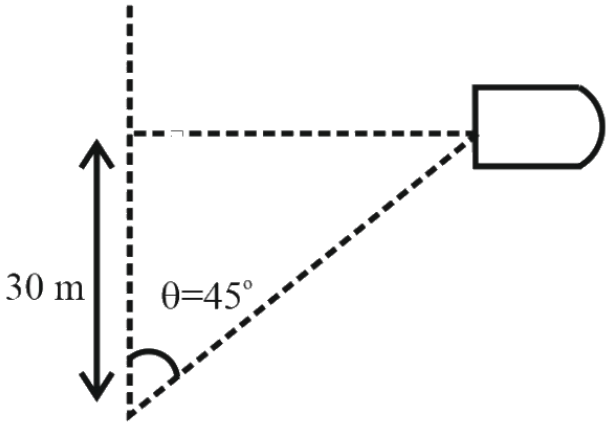
3. A boat is travelling with a speed of $27\ \mathrm{km\ h^{-1}}$ due east. An observer is situated at 30 m south of the line of travel. The angular velocity of the boat relative to be the observer

in the position shown will be



A. $0.125\ \text{rad s}^{-1}$

B. Zero

C. $0.250\ \text{rad s}^{-1}$

D. $0.67\ \text{rad s}^{-1}$

Answer: A

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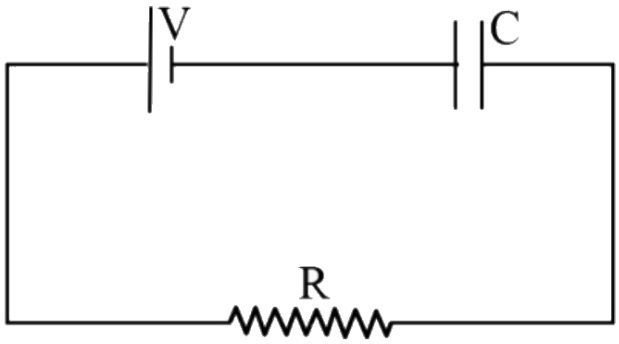
4. An air - filled parallel plate capacitor has capacitance C. The capacitor is connected through a resistor to a voltage source providing a constant potential difference V



A dielectric plate with a dielectric constant K is inserted into the capacitor, filling it

completely. After the equilibrium is established plate is quickly removed. Find the amount of heat generated in the resistor by the time, the equilibrium is re - established.

A. $CV^2(K-1)$

B. $\frac{1}{2}CV^2(K-1)$

C. $CV^2(K-1)^2$

D. $\frac{1}{2}CV^2(K^2-1)$

Answer: B

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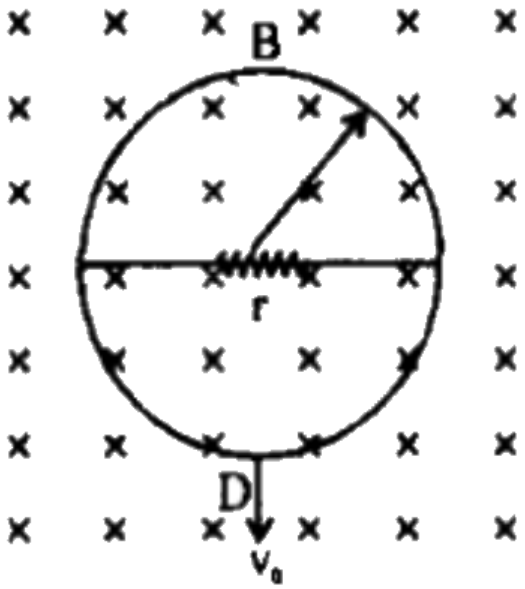
5. A metallic ring (radius R) of negligible resistance has a resistance r connected across its diameter as shown in the figure. It is moving with velocity v_0 in a constant magnetic field B_0 acting perpendicular to the plane of the paper in the inward direction. The current

in the resistance is :



A. $\frac{2BRv_0}{r}$

B. $\frac{BRv_0}{r}$

C. $\frac{BRv_0}{2r}$

D. 0

Answer: A

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6. A ball is projected at an angle of 30° above with the horizontal from the top of a tower and strikes the ground in 5s at an angle of 45° with the horizontal. Find the height of the tower and the speed with which it was projected.

A. $50\left(\sqrt{3}-1\right)ms^{-1}$

B. $50\left(\sqrt{2}-1\right)ms^{-1}$

C. $70\left(\sqrt{3}-1\right)ms^{-1}$

D. $80\left(\sqrt{3}-1\right)ms^{-1}$

Answer: A

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7. The escape velocity for a planet is v_e. A particle starts from rest at a large distance from the planet, reaches the planet only under gravitational attraction, and passes through a

smooth tunnel through its centre. Its speed at the centre of the planet will be

A. v_e

B. $1.5v_e$

C. $\sqrt{1.5}v_e$

D. $2v_e$

Answer: C

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8. A body cools from a temperature $3T$ to $2T$ in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 minutes will be

A. $\frac{7}{4}T$

B. $\frac{3}{2}T$

C. $\frac{4}{3}T$

D. T

Answer: B

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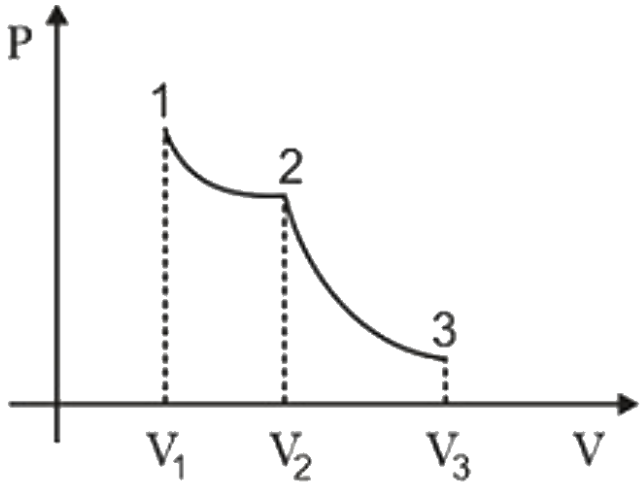
9. One mole of perfect gas, initially at a pressure and temperture of $10^5 Nm^{-2}$ and 300 K, respectively, expands isothermally until its volume is doubled and then adiabatically until its volume is again doubled. Find the final

pressure of the gas. Given $\gamma = 1.4$.



A. $(0.5)^{2.4} \times 10^5 Nm^{-2}$

B. $(0.5)^{1.4} \times 10^5 Nm^{-2}$

C. $(0.5)^{2.4} \times 10^6 Nm^{-2}$

D. $(0.5)^{1.4} \times 10^6 Nm^{-2}$

Answer: A

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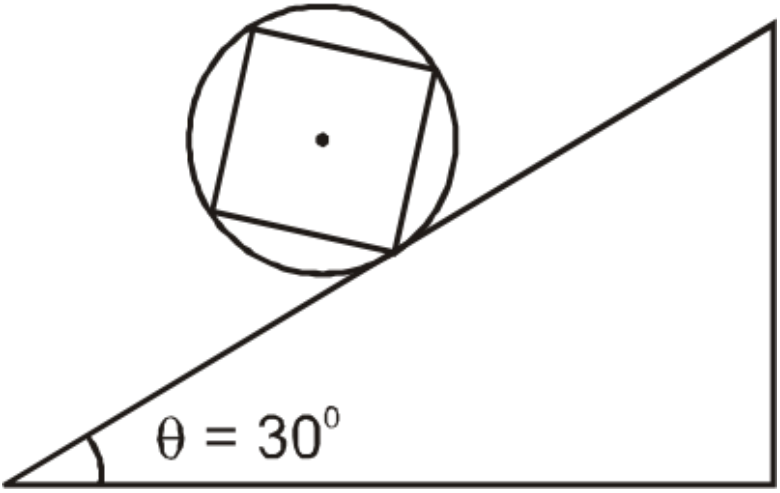
10.



Four identical uniform rods of mass $M = 6kg$ each are welded at their ends to form a square and then welded to a uniform ring having mass m=4kg & radius R=1m the system is allowed to roll down on the rough and fixed

incline of inclination $\theta = 30^\circ$ (assume no sliding anywhere)

Q. The acceleration of centre of mass of system is

A. 6g downwards

B. 6g upwards

C. $\frac{35g}{6}$ upwards

D. $\frac{35g}{6}$ downwards

Answer: C

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11. An elastic string has a force constant k and mass m. the string hangs vertically, and a block of an unknown mass is attached to its bottom end. It is known that the mass of the blocks is much greater than that of the string. The hanging block stretches the string to twice its relaxed length. how long (t) would it t take for a low-amplitude transwerse pulse to travel the length of the string stretched by the hanging block ? m=1 kg, $k = \frac{1}{2} N/m.$

A. $\sqrt{\frac{2m}{k}}$

B. $\sqrt{\frac{m}{k}}$

C. $\sqrt{\frac{m}{2k}}$

D. $\sqrt{\frac{2m}{3k}}$

Answer: A

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12. If the deBroglie wavelenght of an of a photon of frequency 6×10^4Hz ,then the speed of electron is equal to (Speed of light $= 3 \times 10^8 m/s$

Planck's constant $= 6.63 \times 10^{-34}$ J s

Mass of electron $= 9.1 \times 10^{-31}$ kg

A. $1.45 \times 10^{6} ms^{-1}$

B. $1.1 \times 10^{6} ms^{-1}$

C. $1.7 \times 10^{6} ms^{-1}$

D. $1.8 \times 10^{6} ms^{-1}$

Answer: A

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13. A load of 31.4 kg is suspended from a wire of radius 10^{-3} m and density $9 \times 10^{3} kg/m^{3}$ Calculate the change is temperature of the wire if 75% of the work done is converted into heat. The Young's modulus and the specific heat capactiy of the meterial of the wire are $9.8 \times 10^{10} N/m^{2}$ and $490 J/kg/K$ respectively.

A. $4.33 \times 10^{-2} K$

B. $8.33 \times 10^{-3} K$

C. $2.44 \times 10^{-5} K$

D. $6.22 \times 10^{-2} K$

Answer: B

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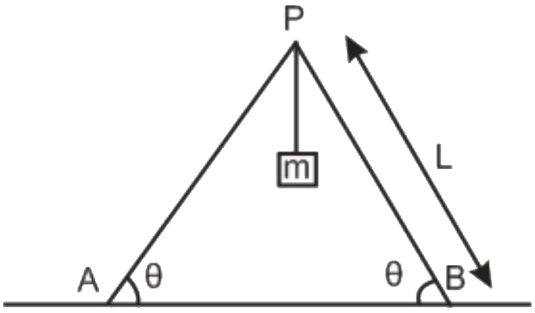
14. Two identical ladders are arranged as shown in the figure. Mass of the block is m and the mass of each ladder is M. The length of each of the ladder is L. The system is in equilibrium. What is the magnitude of

frictional force acting at A or B?



A. $\frac{mg}{2}\cos\theta$

B. $\frac{Mg}{2}\cos\theta$

C. $\frac{(M-m)}{2}g\cos\theta$

D. $\left(\frac{M+m}{2}\right)g\cot\theta$

Answer: D

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15. In common - emitter configuration of a transistor, the base current $I_E = 2\mu A, \alpha = 0.9$ then the value of I_C is

A. $3.0\mu A$

B. $2.25\mu A$

C. $4.9\mu A$

D. $1.8\mu A$

Answer: D

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16. A black body at a temperature of $227^\circ C$ radiates heat energy at the rate of 5 cal/cm^2-sec. At a temperature of $727^\circ C$, the rate of heat radiated per unit area in cal/cm^2-sec will be

A. 400

B. 80

C. 40

D. 15

Answer: B

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17. If P represents radiation pressure , C represents the speed of light , and Q represents radiation energy striking a unit area per second , then non - zero integers x, y, z such that $P^x Q^y C^z$ is dimensionless , find the values of $x, y, \text{ and } z$.

A. $a = 1, b = 1, c = -1$

B. $a = 1, b = -1, c = 1$

C. $a = -1, b = 1, c = 1$

D. $a = 1, b = 1, c = 1$

Answer: B

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18. In YDSE, bichromatic light of wavelengths 400 nm and 560 nm

are used. The distance between the slits is 0.1 mm and the distance between the

plane of the slits and the screen is 1m. The minimum distance between two successive regions of complete darkness is

A. 4 mm

B. 5.6 mm

C. 14 mm

D. 28 mm

Answer: D

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19. A nucleus with mass number 220 initially at rest emits an α-particle. If the Q-value of the reaction is $5.5MeV$, calculate the kinetic energy of the α-particle.

(a) 4.4 MeV (b) 5.4 MeV (c) 5.6 MeV (d) 6.5 MeV

A. 4.4 MeV

B. 5.4 MeV

C. 5.6 MeV

D. 6.5 MeV

Answer: B

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20. A man places a chain (of mass m and length l) on a table slowly. Initially, the lower end of the chain just touches the table. The main brings down the chain by length $l/2$. Work done by the man in this process is

A. $-\frac{mgl}{2}$

B. $-\frac{mgl}{4}$

C. $-3\frac{mgl}{8}$

D. $-\frac{mgl}{8}$

Answer: C

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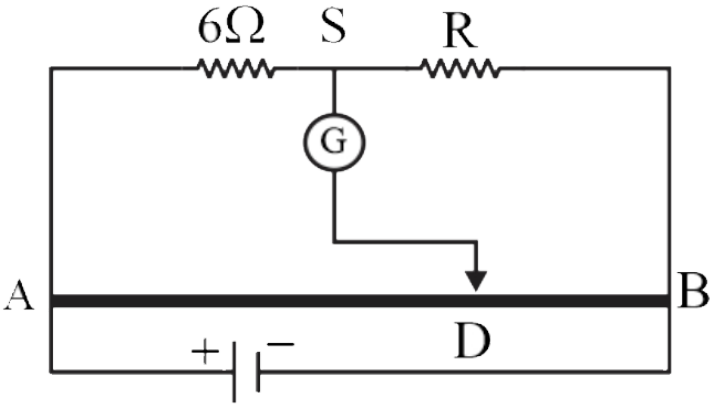
21. The metre bridge wire AB shown in the adjoining figure is 100 cm long when AD = 30 cm, no deflection occurs in the galvanometer. The value of R is



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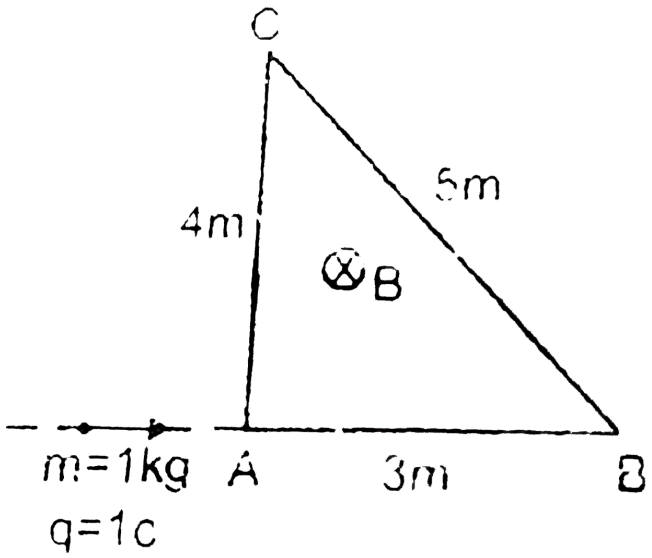
22. A small particle of mass m = 1 kg and charge of 1C enters perpendicularly in a triangular region of uniform magnetic field of strength 2T as shown in figure :



Calculate maximum velocity of the particle with which it should enter so that it complete a half-circle in magnetic region :

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23. A body is projected from the ground with some speed at some angle with the horizontal. Taking the horizontal and vertical direction to be x and y axis respectively and the point of projection as origin, calculate the minimum speed (in ms^{-1}) of projection so that it can

pass through a point whose x and y coordinates are 30 m and 40 m respectively? Take $g = 10ms^{-2}$

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24. A tunning fork having a frequency of 170 Hz is vibrating just above a cylindrical tube. The height of the tube is 110 cm. Water is slowly poured in it. What is the minimum height (in cm) of water column required for resonance to occur? (Velocity of sound in air $= 340ms^{-1}$)

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25. For a certain lens, the magnification of an object when placed at a distance of 0.15 m is twice of the magnification produced, when the distance was 0.2 m. If in both the situations a real image is formed, then what is the focal length (in cm) of the lens?

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