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PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 97

Physics

1. A uniform thin rod AB of length L has linear mass density $\mu(x) = a + \frac{bx}{L}$, where x is measured from A. If the CM of the rod lies at a

distance of $\left(\frac{7}{12}L\right)$ from A, then a and b are related as :_

A. $2a = b$

B. $a = 2b$

C. $a = b$

D. $3a = 2b$

Answer: A

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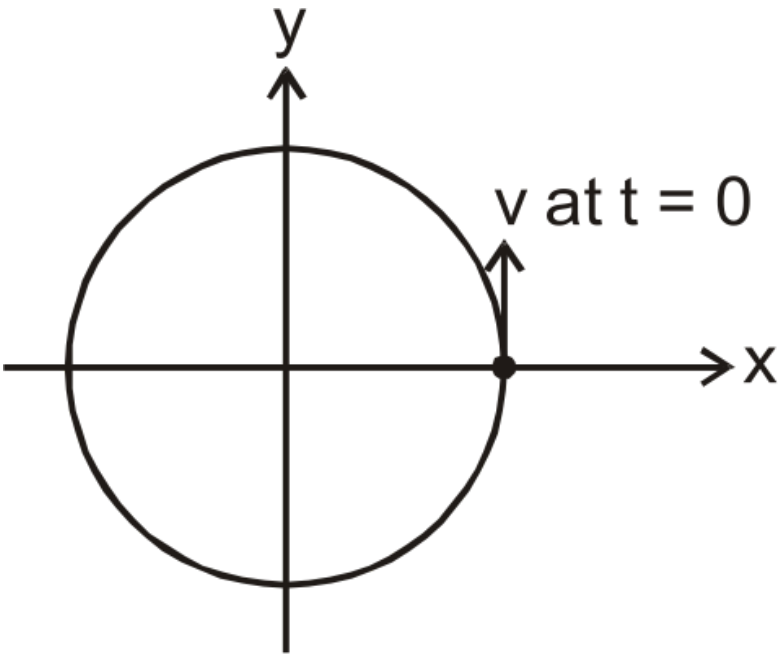
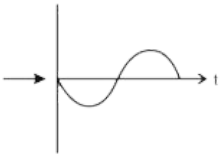
2. A particle is moving in a uniform circular motion on a horizontal surface. Particle's position and velocity at time t = 0 are shown in the figure in the coordinate system. Which of the indicated variable on the vertical axis is/are correctly matched by the graph(s)

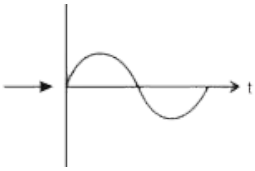
shown alongside for particle's motion ?



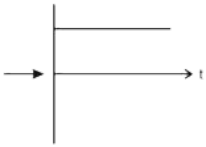
A. y component of force keeping particle moving in a circle



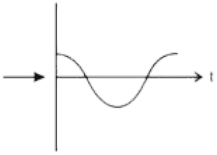
B. x component of velocity



C. Angular velocity of the particle



D. x coordinate of the particle



Answer: B

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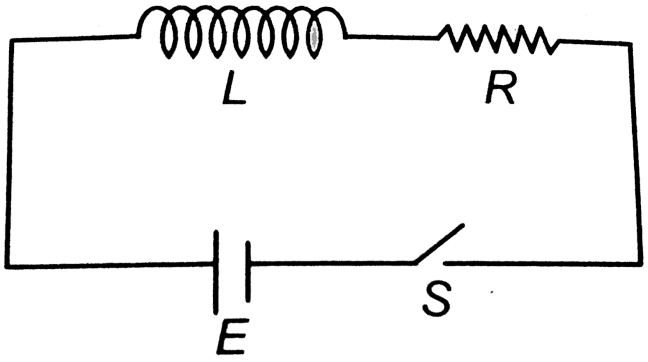
3. In the circuit shown in figure switch S is closed at time $t = 0$. The charge which passes through the battery in one time constant is



A. $\frac{eR^2E}{L}$

B. $\frac{EL}{R}$

C. $\frac{EL}{eR^2}$

D. $\frac{eL}{ER}$

Answer: C

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4. Let $P(r) = \frac{Q}{\pi R^4} r$ be the charge density distribution for a solid sphere of radius R and total charge Q. For a point 'p' inside the sphere at distance r_1 from the centre of the sphere, the magnitude of electric field is:

A. ZERO

B. $\frac{Q}{4\pi\varepsilon_0 r_1^2}$

C. $\frac{Qr_1^2}{4\pi\varepsilon_0 R^4}$

D. $\frac{Qr_1^2}{3\pi\varepsilon_0 R^4}$

Answer: C

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5. Smallest division on the main scale of given Vernier calipers is 0.5 mm. Vernier scale has 25 divisions and these coincide with 24 main

scale divisions. The least count of Vernier callipers is

A. 0.001 cm

B. 0.002 cm

C. 0.01 cm

D. 0.02 cm

Answer: B

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6. If the radius of the earth were to shrink by 1% its mass remaining the same, the acceleration due to gravity on the earth's surface would

A. Decrease by 2%

B. Remain unchanged

C. Increase by 2%

D. Become zero

Answer: C

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7. A diatomic ideal gas is heated at constant at constant volume until the pressure is doubled and again heated of constant pressure until the volume is doubled. The average molar heat capacity for the whole process is

A. $\frac{13R}{6}$

B. $\frac{19R}{6}$

C. $\frac{23R}{6}$

D. $\frac{17R}{6}$

Answer: B

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8. A sound wave passing through air at NTP produces a pressure of $0.001 \frac{\text{dyne}}{c} m^2$ during a compression. The corresponding change in temperature (given $\gamma = 1.5$ and assume gas to be ideal) is

A. $8.97 \times 10^{-4} K$

B. $9.87 \times 10^{-6} K$

C. $8.97 \times 10^{-8} K$

D. $9.87 \times 10^{-4} K$

Answer: C

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9. A body takes time t to reach the bottom of a smooth inclined plane of angle θ with the horizontal. If the plane is made rough, time taken now is $2t$.The coefficient of friction of the rough surface is

A. $\frac{3}{4}\tan\theta$

B. $\frac{2}{3}\tan\theta$

C. $\frac{1}{4}\tan\theta$

D. $\frac{1}{2}\tan\theta$

Answer: A

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10. The half-life of a radioactive isotope X is 50 years . It decays to another element Y which is stable . The two elements X and Y were found

to be in the ratio of 1:15 in a sample of a given rock. The age of the rock was estimated to be

A. 150 years

B. 200 years

C. 250 years

D. 100 years

Answer: B

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11. The period of oscillation of a simple pendulum is given by $T = 2\pi\sqrt{\frac{L}{g}}$, where L is the length of the pendulum and g is the acceleration due to gravity. The length is measured using a meter scale which has 500 divisions. If the measured value L is 50 cm, the accuracy in the determination of g is $1.1\,\%$ and the time taken for 100 oscillations is 100 seconds, what should be the possible error in measurement of the clock in one minute (in milliseconds) ?

A. 1

B. 2

C. 5

D. 0.25

Answer: C

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12. A stone is hung in air from a wire which is stretched over a sonometer. The bridges of the sonometer are L cm apart when the wire is

in unison with a tuning fork of frequency N . When the stone is completely immersed in water, the length between the bridges is l cm for re-establishing unison, the specific gravity of the material of the stone is

A. $\frac{L^2 + e^2}{L^2}$

B. $\frac{L^2 - e^2}{L^2}$

C. $\frac{L^2}{L^2 - e^2}$

D. $\frac{L^2}{L^2 + e^2}$

Answer: C

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13. A plane glass is placed over a various coloured letters (Violet, green, yellow ,red). The letter which appears to be raised more is

A. Red

B. Yellow

C. Green

D. Violet

Answer: D

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14. A thin circular plate of mass M and radius R has its density varying as $\rho(r) = \rho_0 r$ with ρ_0 as constant and r is the distance from its center. The moment of Inertia of the circular plate about an axis perpendicular to the plate and passing through its edge is $I = aMR^2$ The value of the coefficient a is :

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

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

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

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

Answer: C

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15. The height of a TV antenna is 200 m. The population density is $4000km^{-2}$. Find the population benefited

A. 3.2×10^8

B. 3.2×10^7

C. 3.2×10^6

D. 3.2×10^5

Answer: B

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16. What will be the stress at -20° C, if a steel rod with a cross-sectional area of 150 mm^2 is stretched between two fixed points? The tensile load at 20° C is 5000 N (Assume,

$\alpha = 11.7 \times 10^{-6}/^{\circ}C$ and Y = 200×10^{11} N//m^(2)`)

A. $12.7 \times 10^{6} Nm^{-2}$

B. $84.2 \times 10^{6} Nm^{-2}$

C. $127 \times 10^{6} Nm^{-2}$

D. $0.842 \times 10^{6} Nm^{-2}$

Answer: C

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17. The quantity $X = \frac{\varepsilon_0 LV}{t}$ where ε_0 is the permittivity of free space, L is length, V is the potential difference and t is time. The dimensions of X are the same as that of

A. Resistance

B. Charge

C. Voltage

D. Current

Answer: D

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18. Two slits are separated by distance of 0.5 and illuminate with light of $\lambda = 6000\text{Å}$. If the screen is placed $2.5m$ from the slits. The distance of the third bright image from the centre will be

A. 1.5 mm

B. 3 mm

C. 6 mm

D. 9 mm

Answer: D

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19. A train approaching a hill at a speed of $40km/hr$ sounds a whistle of frequency $580Hz$ when it is at a distance of $1km$ from a hill. A wind with a speed of $40km/hr$ is blowing in the direction of motion of the train Find

(i) the frequency of the whistle as heard by an observer on the hill,

(ii) the distance from the hill at which the echo from the hill is heard by the driver and its frequency.

(Velocity of sound in air $= 1,200 km/hr$)

A. 599 Hz

B. 590 Hz

C. 610 Hz

D. 620 Hz

Answer: D

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20. A particle is projected vertically upwards with a speed of $16ms^{-1}$. After some time, when it again passes through the point of projection, its speed is found to be $8ms^{-1}$. It is known that the work done by air resistance is same during upward and downward motion. Then the maximum height attained by the particle is (take $g = 10ms^{-2}$)

A. 8 m

B. 4.8 m

C. 17.6 m

D. 12.8 m

Answer: A

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21. The binding energy of an electron in the ground state of He is equal to 24.6 eV: Find the energy required to remove both electrons.

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22. Three unequal resistor in parallel are equivalent to a resistance 1Ω If two of them are in the ratio 1:2 and if no resistance value is fractional the largest of the three resistance in ohm is

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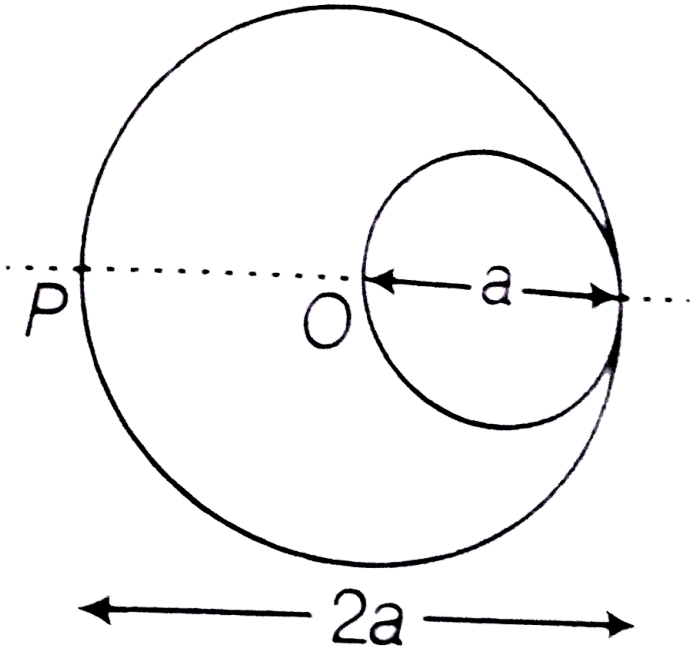
23. A cylinderical cavity of diameter a exists inside a cylinder of diameter 2a as shown in the figure. Both the cylinder and the cavity are

infinitely long. A uniform current density J flows along the length. If the magnitude of the magnetic field at the point P is given by $\frac{N}{12}\mu_0 aJ$, then the value of N is



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24. Two balls A and B are projected from the same position with horizontal velocity $20ms^{-1}$ and $5ms^{-1}$ as shown. The separation between these two bodies at the moment their velocities become perpendicular to each other is x m. The value of x is

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25. An open cylindrical vessel filled with water is rotated together with water at angular speed $1rads^{-1}$ At this angular speed, the

centre of the bottom is just exposed. If the angular speed is increased to $\sqrt{\frac{3}{2}} rads^{-1}$, how much area (in cm^2) of the bottom of the vessel is now exposed to surrounding ? [Area of the cross-section of cylinder is $27cm^2$]

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