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PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 33

Physics

1. The circumference of the second orbit of an atom or ion having single electron,4×10^{-9}

m.The de-Broglie wavelength of electron revolving in this orbit should be

A. $2 \times 10^{-9} m$

B. $4 \times 10^{-9} m$

C. $8 \times 10^{-9} m$

D. $1 \times 10^{-9} m$

Answer: A

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2. An object placed on the ground in the stable equilibrium. If the object is given a light push, then initially the position of centre of gravity

A. moves number of ground

B. rises higher above the ground

C. remains as such

D. may remain at same level

Answer: B

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3. A stone tied to a string is rotated a vertical circle. The minimum speed of the stone during a complete vertical circular motion.

A. is independent of the mass of the stone

B. is independent of the length of the string

C. decreases with increasing mass of the stone

D. decreases with increasing length of the string

Answer: A

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4. If a diamagnetic substance is brought near north or south pole of a bar magnet, it is

A. attracted by poles

B. repelled by poles

C. repelled by the north pole and attracted by the south pole

D. attraction by the north pole and repelled by the south pole

Answer: B

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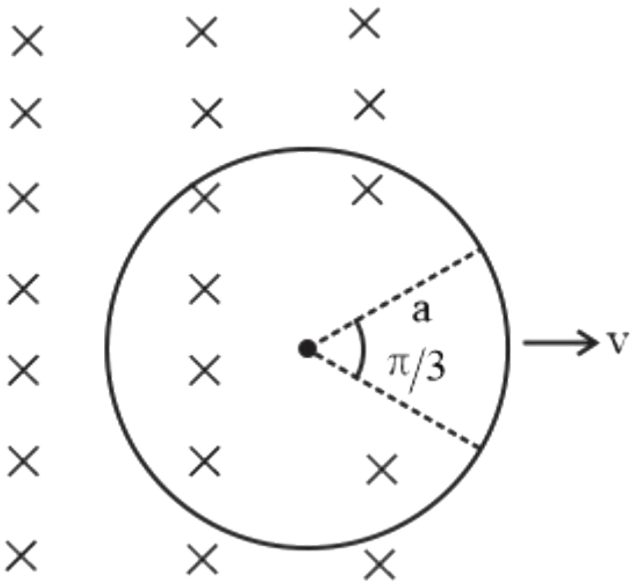
5. A uniform circular loop of radius a and resistance R is pulled at a constant velocity v out of a region of a uniform plane of the loop

and the velocity are both perpendicular to B. Then the electrical power in the circular loop at the instant when the arc (of the circular loop) outside the region of magnetic field subtends an angle $\frac{\pi}{3}$ at the centre of the loop is



A. $\frac{B^2a^2v^2}{R}$

B. $\frac{2B^2a^2v^2}{R}$

C. $\frac{B^2a^2v^2}{2R}$

D. none of these

Answer: A

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6. A $10\mu F$ capacitor and a $20\mu F$ capacitor are connected in series across a $200V$ supply line. The chraged capacitors are then disconnected

from the line and reconnected with their positive plates together and negative plates together and no external voltage is applied. what is the potential difference across each capacitor ?

A. $\frac{400}{9}V$

B. $\frac{800}{3}V$

C. 400 V

D. 200 V

Answer: A

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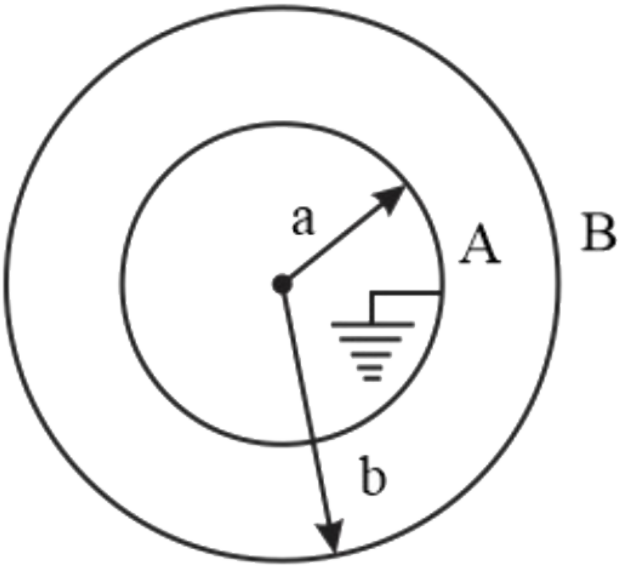
7. The equivalent capacitance between A and B, where two concentric spherical shells having radius a and b are connected as shown in the figure.



A. $\frac{4\pi\varepsilon_0 ab}{(b-a)} + 4\pi\varepsilon_0 b$

B. $4\pi\varepsilon_0 b$

C. $\frac{4\pi\varepsilon_0 ab}{(b-a)}$

D. none

Answer: C

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8. The escape velocity from the earth is about 11 km/s. The escape velocity from a planet

having twice the radius and the twice mean density as the earth, is

A. $22\ \mathrm{km\ s^{-1}}$

B. $11\ \mathrm{km\ s^{-1}}$

C. $5.5\ \mathrm{km\ s^{-1}}$

D. $15.5\ \mathrm{km\ s^{-1}}$

Answer: A

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9. A monatomic ideal gas sample is given heat Q. One half of this heat is used as work done by the gas and rest is used for increasing its internal energy. The equation of process in terms of volume and temperature is

A. $\frac{v^2}{T^3} = \text{constant}$

B. $\frac{v^2}{\sqrt{T}} = \text{constant}$

C. $VT^3 = \text{constant}$

D. $V^2\sqrt{T} = \text{constant}$

Answer: A

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10. A particle is projected directly along a rough plane of inclination θ with velocity u. If after coming to the rest the particle returns to the starting point with velocity v, the coefficient of friction between the partice and the plane is

A. $\frac{u^2}{v^2}\tan\theta$

B. $\frac{u^2 - v^2}{u^2 + v^2}\tan\theta$

C. $\frac{v^2}{u^2}\tan\theta$

D. $\frac{u^2+v^2}{u^2-v^2}\tan\theta$

Answer: B

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11. When a string is divided into three segments of lengths l_1, l_2 and l_3 the fundamental frequencies of these three segments are v_1, v_2 and v_3 respectively.

The original fundamental frequency (v) of the string is

A. $\sqrt{v} = \sqrt{v_1} + \sqrt{v_2} + \sqrt{v_3}$

B. $v = v_1 + v_2 + v_3$

C. $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3}$

D. $\frac{1}{\sqrt{v}} = \frac{1}{\sqrt{v_1}} + \frac{1}{\sqrt{v_2}} + \frac{1}{\sqrt{v_3}}$

Answer: C

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12. The magnetic field of a plane electromagnetic wave is given by: $\overrightarrow{B} = B_0\hat{i} - [\cos(kz - \omega t)] + B_1\hat{j}\cos(kz + \omega t)$ where $B_0 = 3 \times 10^{-5}T$ and $B_1 = 2 \times 10^{-6}T$. The rms value of the force experienced by a stationary charge $Q = 10^{-4}C$ at $z = 0$ is close to:

A. 0.1 N

B. 0.9 N

C. $3 \times 10^{-2}N$

D. 0.6 N

Answer: D

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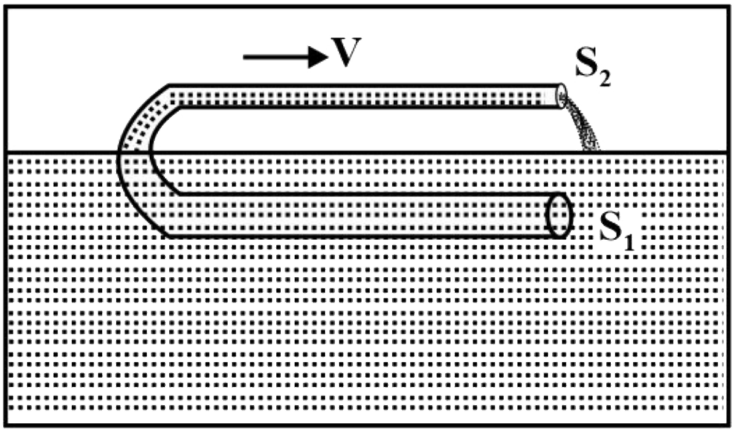
13. U - tube moves with a constant speed parallel to the surface of a stationary liquid. The cross - section area of the lower part of the tube lowered into the liquid, is equal to S_1 and that of the top part located over the liquid is S_2. Friction and formation of waves

should be neglect difference in heights at both the openings of the tube.



The velocity of the liquid coming out of the top part as seen by an observer on the ground will be

A. $v\left(\frac{S_1}{S_2}\right)$

B. $v\left(1+\frac{S_1}{S_2}\right)$

C. zero

D. none of these

Answer: B

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14. The figure shows an overhead view of a corridor with a plane mirror MN mounted at one end. A burglar B sneaks along the corridor directly towards the centre of the mirror. If d = 3m, how far from the mirror will the burglar be

when the security guard S can first see him in the mirror ? ---

A. 3.0m

B. 4.5m

C. 6.0m

D. 1.5m

Answer: D

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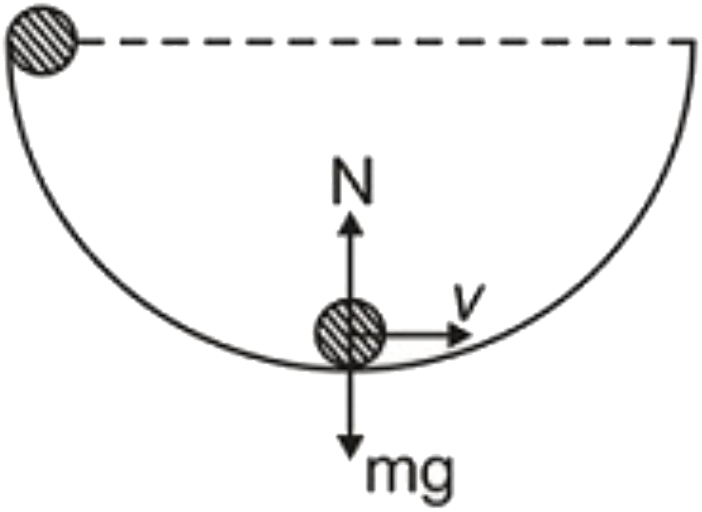
15. A solid spherical ball of mass m is released from the topmost point of the shown semi - spherical shell. The track is sufficiently rough to enablle to enable pure rolling motion. The normal force between the ball and the shell at the lowest position is



A. $\frac{12}{7}mg$

B. $\frac{7}{9}mg$

C. $\frac{17}{7}mg$

D. $\frac{10}{7}mg$

Answer: C

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16. A diode AM detector with the output circuit consisting of $R = 1k\Omega$ and $C = 1\mu f$ would

be more suitable for detecting a carrier signal of:

A. 0.1 kHz

B. 0.5 kHz

C. 1 kHz

D. 10 kHz

Answer: D

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17. A working transitor with its three legs marked P, Q and R is tested using a multimeter No conduction is found between P, Q by connecting the common (negative) terminal of the multimeter to R and the other (positive) terminal to or Q some resistance is seen on the multimeter . Which of the following is true for the transistor ?

A. It is an n-p-n transistor with R as base

B. It is an p-n-p transistor with R as collector

C. It is an p-n-p transistor with R as emitter

D. It is an n-p-n transistor with R as collector

Answer: A

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18. In an energy recycling process, X g of steam at $100^\circ C$ becomes water at $100^\circ C$ which converts Y g of ice at $0^\circ C$ into water at $100^\circ C$. The ratio of $\frac{X}{Y}$ will be (specific heat of

water $= 4200 Jkg^{-1}K$, specific latent heat of fusion $= 3.36 \times 10^5 \mathrm{J\ kg^{-2}}$, specific latent heat of vaporization $= 22.68 \times 10^6\ \mathrm{J\ kg^{-1}}$)

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

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

C. 3

D. 2

Answer: A

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19. In a simple pendulum experiment for determination of acceleration due to gravity (g), time taken for 20 oscillation is measured by using a watch of 1 second least count. The mean value of time taken comes out to be 30 s. The length of pendulum is measured by using a meter scale of least count 1 mm and the value obtained is 55.0 cm. The percentage error in the determination of g is close to :

A. $0.2\,\%$

B. $6.8\,\%$

C. $3.5\,\%$

D. $0.7\,\%$

Answer: B

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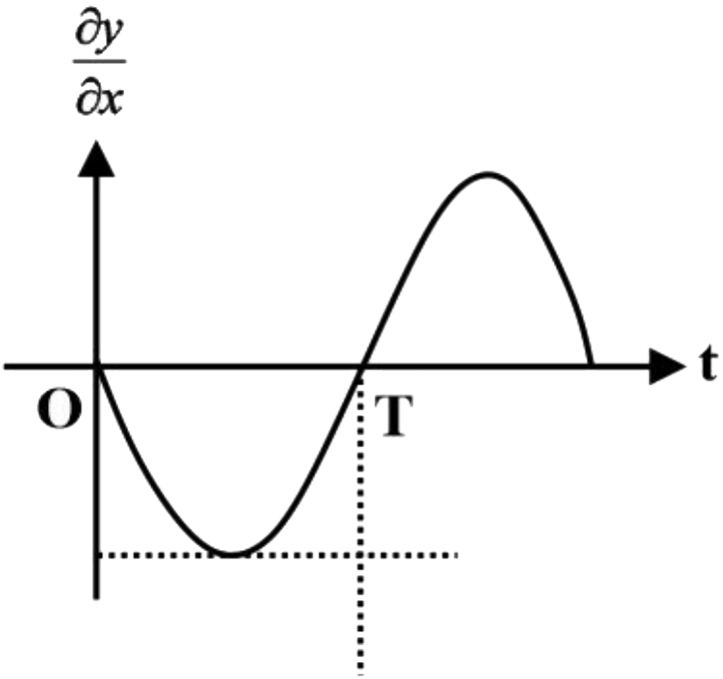
20. A stationary wave of amplitude A is generated between the two fixed ends x = 0 and x = L. The particle at $x = \frac{L}{3}$ is a node. There are only two particle between x $= \frac{L}{6}$ and $x = \frac{L}{3}$ which have maximum

speed half of the maximum speed of the anti-node. Again there are only two particles between x= 0 and $x = \frac{L}{6}$ which have maximum speed half of that at the antibodes. The slope of the wave function at $x = \frac{L}{3}$ changes with respect to time according to the graph shown. The symbols μ, ω and A are having their usual meanings if used in calculations.



The time period of oscillations of a particle is

A. T

B. 2T

C. $\frac{T}{2}$

D. 4T

Answer: B

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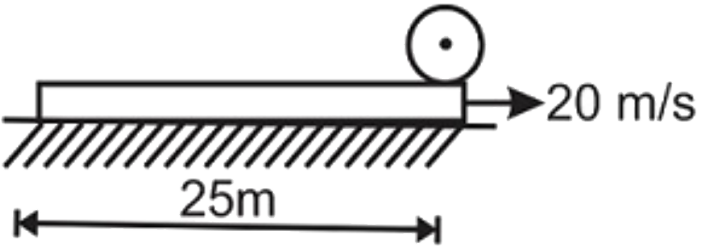
21. A solid cylinder is kept on one edge of a plank of same mass and length 25 m placed on a smooth surface as shown in the figure. The coefficient of friction between the cylinder and the plank is 0.5. The plank is given a velocity of $20ms^{-1}$ towards right. Find the time (in S) after which plank any cylinder will separate.

$[g = 10ms^{-2}]$



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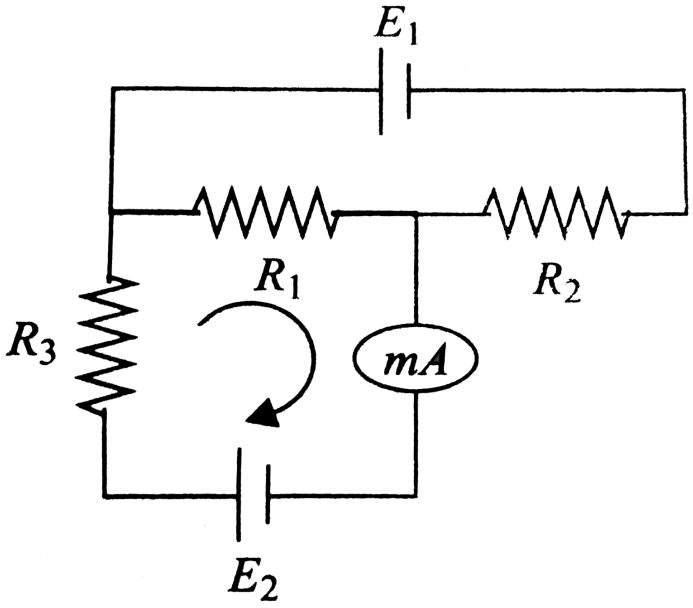
22. The circuit shown in fig 5.230 contains three resistors $R_1 = 100\Omega, R_2 = 50\Omega$ and $R_3 = 20\Omega$ and cells of emfs $E_1 = 2V$ and E_2. The ammeter indicates a current of $50mA$. Determine the currents in the resistors and

the emf of the second cell. The internal resistance of the ammeter and of the cells should be ignored.



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23. The magnetic field induction at the centre of a current - carrying circular coil (coil 1) and a closed coil (coil 2), shaped as a quarter of a disc is found to be equal in magnitude. If both the coils have equal area, then find the ratio of the currents flowing in coil 2 and coil 1.

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24. A body of mass m = 10 kg is attached to a wire of length 0.3m. The maximum angular

velocity with which it can be rotated in a horizontal circle is (Given, breaking stress of wire $= 4.8 \times 10^7 Nm^{-2}$ and area of cross-section of a wire $= 10^{-6} m^2$)

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25. A beam of light consists of two wavelengths, 6300Å and 5600Å. This beam of light is used to obtain an interference pattern in YDSE. If 4^{th} bright fringe of 6300Å coincides

with the n^{th} dark fringe of 5600Å from the central line, then find the value of n.

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