PHYSICS

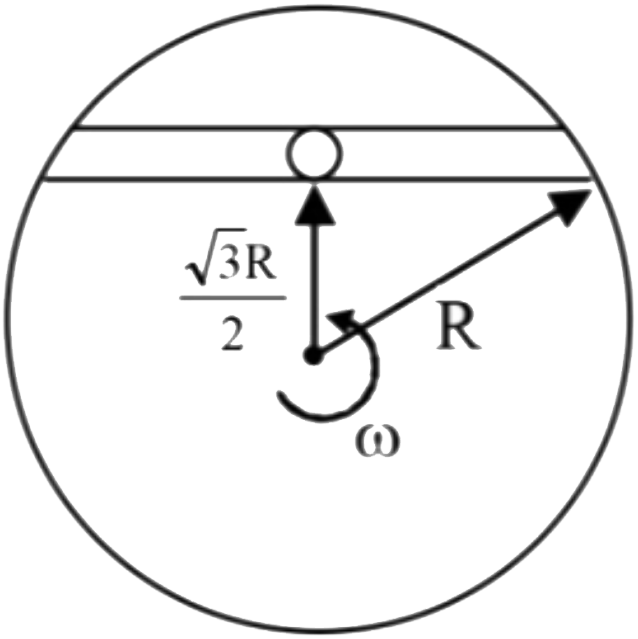
BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 57

Physics

1. A horizontal disk is rotating with angular velocity ω about a vertical axis passing through its centre. A ball is placed at the

centre of groove and pushed slightly. The velocity of the ball when it comes out of the groove -



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

B. $\frac{\omega R}{2}$

C. ωR

D. $\frac{\omega R}{\sqrt{2}}$

Answer: A

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2. A particle starts from rest and traverses a distance 2x with uniform acceleration, then moves uniformly over a further distance 4x and finally comes to rest after moving a further distance 6x under uniform retardation.

Assuming entire motion to be rectilinear motion, the ratio of average speed over the journey to the maximum speed on its way is

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

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

C. $\frac{2}{5}$

D. $\frac{1}{5}$

Answer: B

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3. A galvanometer of resistance 50Ω is converted into an ammeter by connecting a low resistance (shunt) of value 1Ω in parallel to the galvanometer, S. If full - scale deflection current of the galvanometer is 10 mA, then the maximum current that can be measured by the ammeter is -

A. 500 mA

B. 510 mA

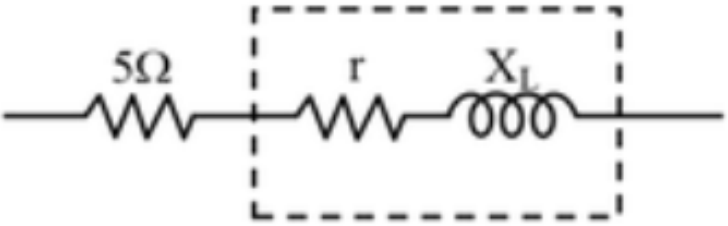
C. 610 mA

D. 490 mA

Answer: B

4. The current through an inductor of impedance 10Ω lags behind the voltage by a phase of 60° when just the inductor is connected to the ac source. Now the inductor is connected to a 5Ω resistance in series, then

the net impedance of the circuit is



A. 15Ω

B. 12Ω

C. 13.2Ω

D. 18Ω

Answer: C

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5. a point charge q is situated at a distance r from one end of a thin conduction rod of length L having a charge Q (uniformly distributed a long its length).find the magnitudes of electric force between the two.

A. $\frac{1}{4\pi\varepsilon_0}\frac{qQ}{2d(d+L)}$

B. $\frac{1}{4\pi\varepsilon_0}\frac{2qQ}{d(d+L)}$

C. $\frac{1}{4\pi\varepsilon_0}\frac{qQ}{3d(d+L)}$

D. $\frac{1}{4\pi\varepsilon_0}\frac{qQ}{d(d+L)}$

Answer: D

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6. Three infinitely long thin wires, each carrying current i in the same direction, are in the $x-y$ plane of a gravity free space . The central wire is along the y - axis while the other two are along $x = \pm d$.

(i) Find the locus of the points for which the magnetic field B is zero.

(ii) If the central wire is displaced along the

$Z - direction$ by a small amount and released, show that it will excecute simple harmonic motion . If the linear density of the wires is λ, find the frequency of oscillation.

A. $\frac{i}{2\pi d}\sqrt{\frac{\mu_0}{\pi\lambda}}$

B. $\frac{i}{2\pi d}\sqrt{\frac{\pi\lambda}{\mu_0}}$

C. $\frac{2\mu d}{i}\sqrt{\frac{\pi\lambda}{\mu_0}}$

D. Not an oscillation

Answer: A

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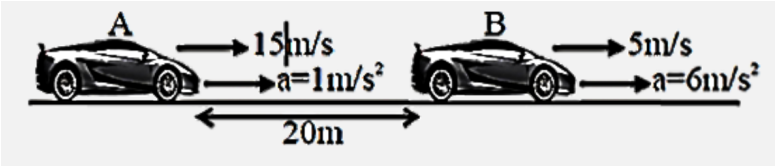
7. Two cars A and B are moving with speed of $15ms^{-1}$ and 5 ms^{-1}, and acceleration of the cars are $1ms^{-2}$ and $6ms^{-2}$ respectively.Then the minimum separation between them is :



A. 5 m

B. 10 m

C. Zero

D. None

Answer: B

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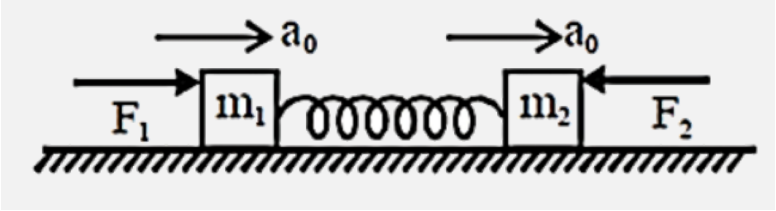
8. Two blocks of masses m_1 and m_2 being connected with a light spring of stiffness k are driven with forces F_1 and F_2 on a smooth horizontal plane.



A. $\frac{F_1 - F_2}{m_1 + m_2}$

B. $\frac{F_1 m_2 - m_1 F_2}{(m_1 + m_2)^2}$

C. $\frac{1}{2}\left(\frac{F_1}{m_1} + \frac{F_2}{m_2}\right)$

D. decided by the stiffness of the spring

Answer: A

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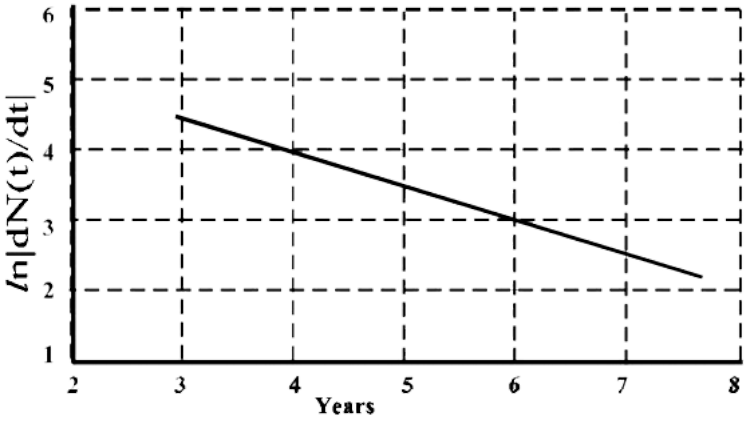
9. To determine the half life of a radioactive element , a student plot a graph of in $\left|\frac{dN(t)}{dt}\right|$ versus t , Here $\left|\frac{dN(t)}{dt}\right|$ is the rate of radiation

decay at time t , if the number of radioactive nuclei of this element decreases by a factor of p after 4.16year the value of p is



A. 8

B. 7

C. 4

D. 8.5

Answer: A

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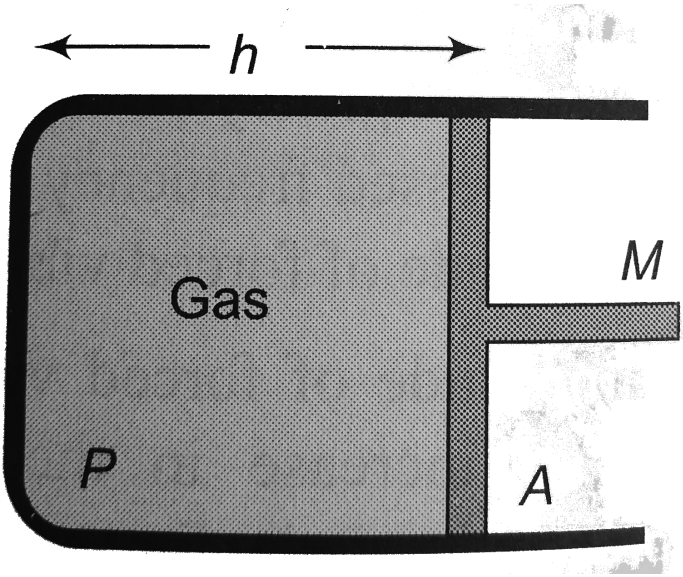
10. A cylinder piston of mass M sides smoothly inside a long cylinder closed at and enclosing a certain mass of gas The cylinder is kept with its axis horizontal if the piston is distanced from its equations positions it oscillation simple harmonically .The period of oscillation

will be



A. $T = 2\pi\sqrt{\left(\frac{Mh}{PA}\right)}$

B. $T = 2\pi\sqrt{\left(\frac{MA}{Ph}\right)}$

C. $T = 2\pi\sqrt{\left(\frac{MA}{PAh}\right)}$

D. $T = 2\pi\sqrt{MPhA}$

Answer: A

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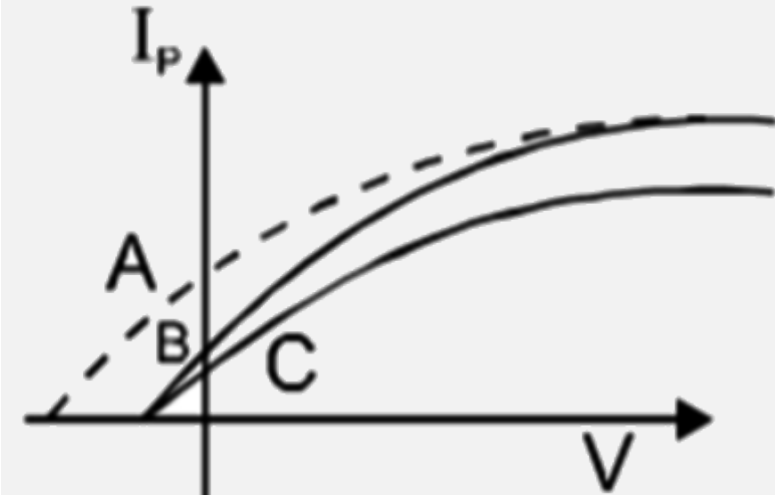
11. The graph shows the variation of photocurrent with the applied voltage in a photoelectric effect experiment for three different beams of light falling on identical metal surfaces, then which among the

following is correct ?



A. A and B receive the light of the same intensity while B & C receive the light of the same intensity while B & C receive the light of the same frequency

B. B and C recieve the light of the same intensity while A & B receive the light of the same frequency

C. A & B receive the light of the same frequency while B & C receive the light of the same intensity

D. A and C reveive the light of the same intensity and B & C receive the light of the same frequency

Answer: A

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12. A sniper fires a rifle bullet into a gasoline tank making a hole $53.0m$ below the surface of gasoline. The tank was sealed at 3.10 atm . The stored gasoline has a density of $660kgm$. The velocity with which gasoline begins to shoot out of the hole is

A. $27.8ms^{-1}$

B. $41.0ms^{-1}$

C. $9.6ms^{-1}$

D. $19.7ms^{-1}$

Answer: B

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13. In a compound microscope, the objective and eye piece have focal lengths $0.95cm$ and $5cm$ respectively, and are kept at a distance of $20cm$. The final image is formed at a distance of $25cm$ from the eye piece.

Calculate the position of the object and the total magnification.

A. 94

B. 84

C. 75

D. 88

Answer: A

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14. A cyclist riding a bicycle at a speed of $14\sqrt{3}$ m/s takes a turn around a circular road of radius $20\sqrt{3}$ m without skidding . What is his inclination to the vertical ?

A. 30°

B. 90°

C. 45°

D. 60°

Answer: D

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15. A Ge specimen is dopped with Al. The concentration of acceptor atoms is $\sim 10^{21} atoms/m^3$. Given that the intrinsic concentration of electron hole pairs is $\sim 10^{19}/m^3$, the concentration of electron in the speciman is

A. $10^{17} m^{-3}$

B. $10^{15} m^{-3}$

C. $10^{4} m^{-3}$

D. $10^2 m^{-3}$

Answer: A

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16. A monoatomic gas undergoes a process in which the pressure (P) and the volume (V) of the gas are related as $PV^{-3} =$ constant. What will be the molar heat capacity of gas for this process?

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

B. $\frac{3}{5}R$

C. $\frac{7}{5}R$

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

Answer: C

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17. Two resistance are measured in ohm and is given as:-

$R_1 = 3\Omega \pm 1\,\% \,\&R_2 = 6\Omega \pm 2\,\%$

When they are connected in parallel, the percentage error in equivalent resistance is

A. 3%

B. 4.5%

C. 0.67%

D. 1.33%

Answer: D

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18. Unpolarised light falls on two polarizing sheets placed one on top of the other. What must be the angle between the characteristic directions of the sheets if the intensity of the final transmitted light is one-third the maximum intensity of the first transmitted beam?

A. $\cos^{-1}\left(\frac{\sqrt{2}}{\sqrt{3}}\right)$

B. $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

C. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

D. $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$

Answer: C

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19. The length of a sonometer wire tuned to a frequency of 250 Hz is 0.60 metre . The frequency of tuning fork with which the vibrating wire will be in tune when the length is made 0.40 metre is

A. 250 Hz

B. 375 Hz

C. 56 Hz

D. 384 Hz

Answer: B

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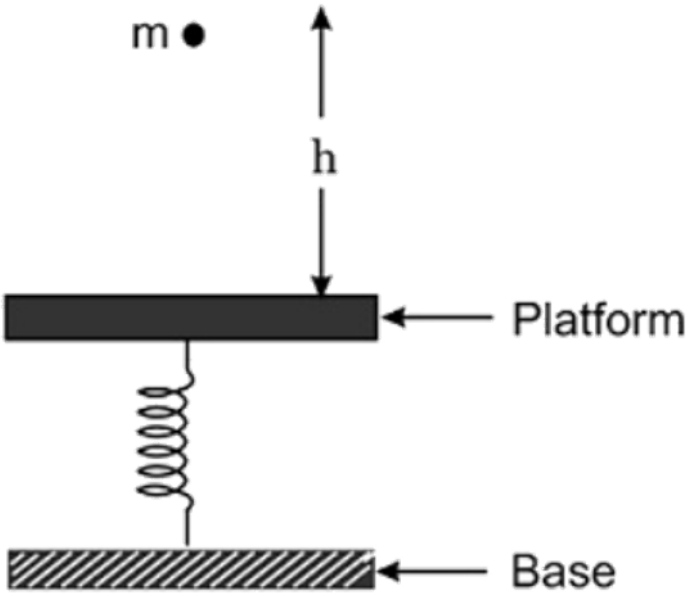
20. A particle of mass $m = 1kg$ is dropped from a height $h = 40cm$ on a light horizontal platform fixed to one end of an elastic spring, the other being fixed to a base, as shown in

the diagram. The particle collides with the platform and sticks to it. As a result, the spring is compressed by an amount $x = 10cm$. What is the force constant of the spring?

(Take $g = 10ms^{-2}$)



A. $600\ \mathrm{N\ m^{-1}}$

B. $800\ \mathrm{N\ m^{-1}}$

C. $1000\ \mathrm{N\ m^{-1}}$

D. $1200\ \mathrm{N\ m^{-1}}$

Answer: C

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21. A nucleus with Z =92 emits the following in a sequence:

$\alpha, \beta^-, \beta^-, \alpha, \alpha, \alpha, \alpha, \alpha, \beta^-, \beta^-, \alpha, \beta^+, \beta^+, \alpha$

. The Z of the resulting nucleus is

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22. A body of mass m moving with velocity v collides head on with another body of mass 2 m which is initially at rest. The ratio of K.E. of colliding body before and after collision will be

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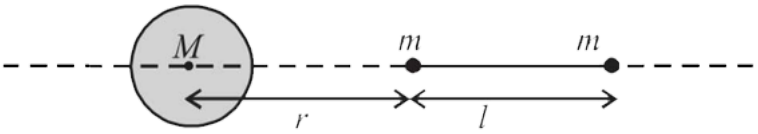
23. A larger spherical mass M is fixed at one position and two identical point masses m are

kept on a line passing through the centre of M. The point masses are connected by rigid massless rod of length l and this assembly is free to move along the line connecting them. All three masses interact only through their mutual gravitational interaction. When the point mass nearer to M is at a distance r =3l form M, the tension in the rod is zero for

$m = k\left(\frac{M}{288}\right)$. The value of k is



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24. Two rectangular blocks A and B of different metals have same length and same area of cross-section. They are kept in such a way that their cross-sectional area touch each other.

The temperature at one end of A is $100^{\circ}C$ and B at the other end is $0^{\circ}C$. If the ratio of their thermal conductivity is $1:3$, then under steady state, the temperature of the junction in contact will be

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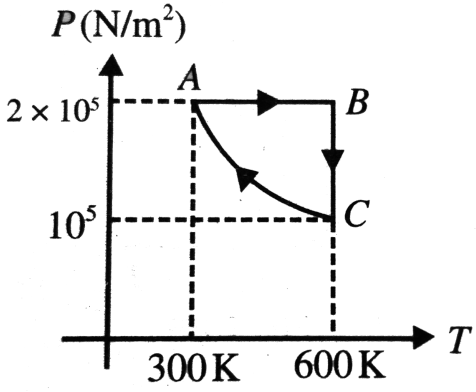
25. Two moles of monatomic ideal gas is taken through a cyclic process shown on $P-T$ diagram in Fig. Process CA is represented as PT = constant. If efficiency of given cyclic

process is

$$1 - \frac{x}{121n2 + 15}$$

then find x,



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