PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 82

Physics

1. In a Coolidge tube, the potential difference used to accelerate the electrons is increased from 24. 8 kV to 49.6 kV . As a result, the

difference between the wavelength of K_α -line and minimum wavelength becomes two times. The initial wavelength of the K_α line is [Take $\frac{hc}{e} = 12.4kV\text{Å}$]

A. 0.75Å

B. 1.50Å

C. 0.25Å

D. 0.50Å

Answer: A

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2. 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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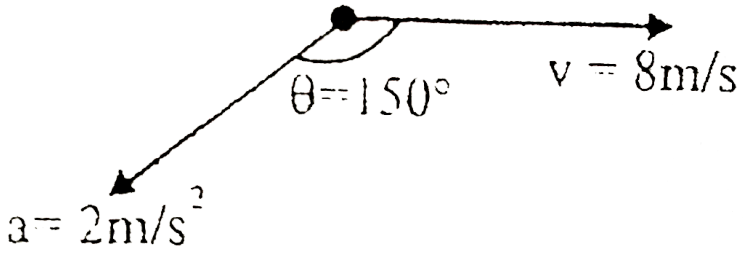
3. The figure shows the velocity and acceleration of a point like body at the initialy moment of its motion. The acceleration vector of the body remains constant. The minimum radius of curvature of trajectory of the body is

:



A. 2 m

B. 4 m

C. 8 m

D. 16 m

Answer: C

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4. An idduced emf is produced when a magnet is plunged into a coil. The magnitude of the induced emf is independent of

A. The number of turns in the coil

B. The medium of the core of the coil

C. The strength of the magnet

D. The resistance of the coil

Answer: D

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5. A small conducting sphere of radius r is lying concentrically inside a bigger hollow conducting sphere of radius R. The bigger and smaller spheres are charged with Q and $q(Q > q)$ and are insulated from each other. The potential difference between the spheres will be

A. $\frac{1}{4\pi\varepsilon_0}\left(\frac{q}{r} - \frac{q}{R}\right)$

B. $\frac{1}{4\pi\varepsilon_0}\left(\frac{q}{R} - \frac{Q}{r}\right)$

C. $\frac{1}{4\pi\varepsilon_0}\left(\frac{q}{R} - \frac{Q}{R}\right)$

D. $\frac{1}{4\pi\varepsilon_0}\left(\frac{Q}{R}+\frac{q}{r}\right)$

Answer: A

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6. Two satellites S_1 and S_2 are revolving round a planet in coplanar and concentric circular orbit of radii R_1 and R_2 in te same direction respectively. Their respective periods of revolution are 1 hr and 8 hr. the radius of the

orbit of satellite S_1 is equal to 10^4km. Find the relative speed in kmph when they are closest.

A. $\pi \times 10^4 \ \ \mathrm{km\,h^{-1}}$

B. $\frac{\pi}{2} \times 10^4 \ \ \mathrm{km\,h^{-1}}$

C. $\frac{3\pi}{2} \times 10^4 \ \ \mathrm{km\,h^{-1}}$

D. $2\pi \times 10^4 \ \ \mathrm{km\,h^{-1}}$

Answer: A

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7. Two particles of charges $+Q$ and $-Q$ are projected from the same point with a velocity v in a region of unifrom magnetic filed B such that the velocity vector makes an angle 'theta' with the magnetic filed Their masses are M and $2M$ respectively Then, they will meet again for the first time at a point whose distane from the point of projection is .

A. $\frac{2\pi Mv\cos\theta}{QB}$

B. $\frac{8\pi Mv\cos\theta}{QB}$

C. $\frac{\pi Mv\cos\theta}{QB}$

D. $\frac{\pi Mv\cos\theta}{QB}$

Answer: D

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8. A stone is projected from the ground with velocity $50\frac{m}{s}$ at an angle of 30°. It crosses a wall after 3 sec. How far beyond the wall the stone will strike the ground $\left(g = 10\frac{m}{\sec^2}\right.$?

A. 90.2 m

B. 12.5 m

C. 86.5 m

D. 216.25 m

Answer: C

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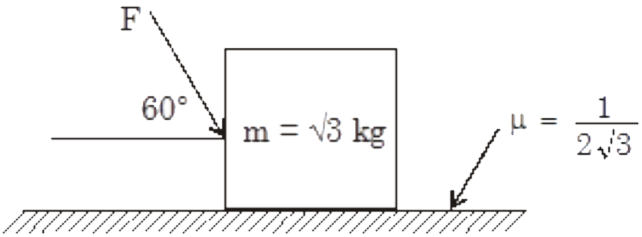
9. What is the maximum value of the force F such that the block shown in the arrangement,

does not move ?



A. 15 N

B. 5 N

C. 10 N

D. 20 N

Answer: D

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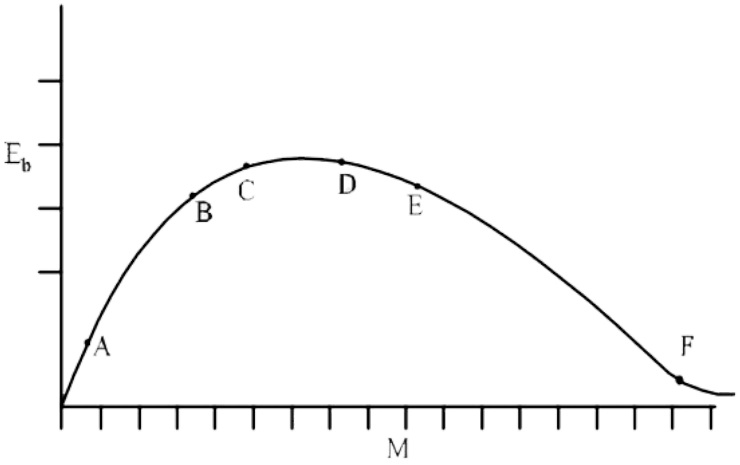
10.



The above is a plate of binding energy per nucleon E_0 against the nuclear mass M, A, B, C, D, E, F correspond to different nuclei Consider four reactions:

A. $A + B \rightarrow C + Q$

B. $A \rightarrow A + B + Q$

C. $D + E \rightarrow F + Q$

D. $F \rightarrow D + E + Q$

Answer: D

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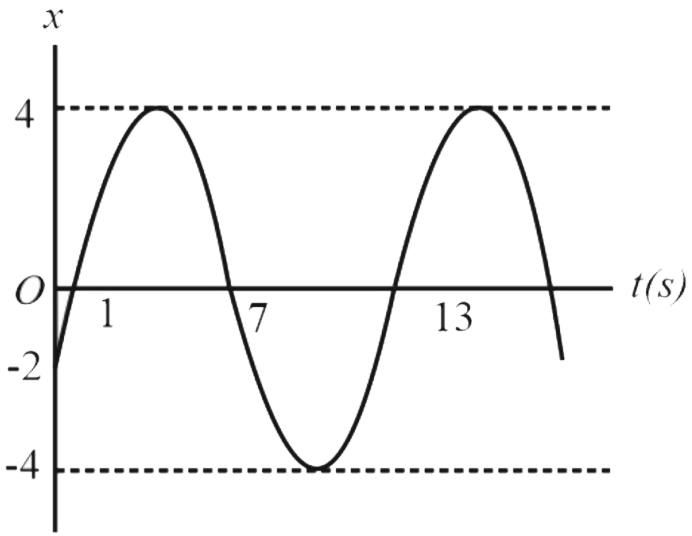
11. The displacement (x) is plotted with time (t) for a particle executing SHM as shown below.

The correct equation of SHM is



A. $x = 4\sin\left(\frac{\pi t}{6} + \frac{\pi}{6}\right)$

B. $x = 4\sin\left(\frac{\pi t}{6} - \frac{\pi}{6}\right)$

C. $x = 2\sin\left(\frac{2\pi}{6} + \frac{\pi}{6}\right)$

D. $x = 2\sin\left(\frac{\pi t}{6} - \frac{\pi}{6}\right)$

Answer: B

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12. Photo-electrons are produced by from a metal surface using a radiation of wavelength 6561Å . These photo-electrons, when made to enter a uniform magnetic field of intensity 3×10^{-4} T, move along different circular paths with a maximum radius of 10mm, then the work function of the metal is close to

A. 3.1 eV

B. 0.1 eV

C. 2.1 eV

D. 1.1 eV

Answer: D

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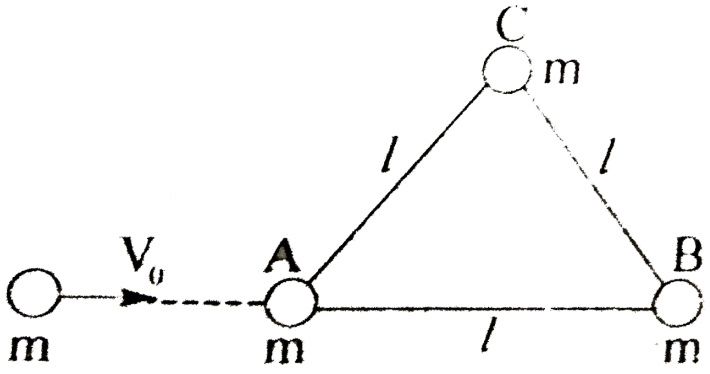
13.



Three (A,B,C) particle each of mass m are

connected by three mass-less rod of length l. All three particle lies on smooth horizontal plane. A particle of mass moving along one of the rod with velocity v_0 strikes on a particle and stops as shown in diagram. Angular velocity of eachh particle after collision is.

A. $\frac{mV_0^2}{36l}$

B. $\frac{mV_0^2}{28l}$

C. $\frac{mV_0^2}{24l}$

D. $\frac{mV_0^2}{12l}$

Answer: A

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14. The average rms speed of molecules in a sample of oxygen gas at 300 K is $484ms^{-1}$., respectively. The corresponding value at 600 K is nearly (assuming ideal gas behaviour)

A. $968ms^{-1}$

B. $986ms^{-1}$

C. $648ms^{-1}$

D. $684ms^{-1}$

Answer: D

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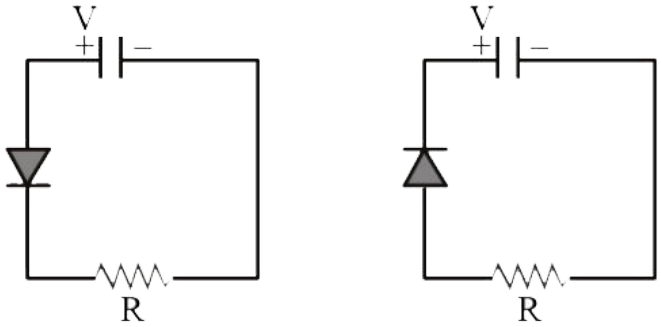
15. Two identical capacitors A and B are charged to the same potential V and are connected in two circuits at t = 0 as shown in figure. The charge of the capacitors at a time t

= CR are respectively -



A. VC, VC

B. $\frac{VC}{e}, VC$

C. $VC, \frac{VC}{e}$

D. $\frac{VC}{e}, \frac{VC}{e}$

Answer: B

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16. Two rods A and B of identical dimensions are at temperature $30^\circ C$. If A is heated upto $180^\circ C$ and B $T^\circ C$, then new lengths are the same . If the ratio of the coefficients of linear expansion of A and B is 4:3,then the value of T is

A. $230^\circ C$

B. $200^\circ C$

C. $270^\circ C$

D. $250^\circ C$

Answer: A

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17. The force F on a sphere of radius r moving in a medium with velocity v is given by $F = 6\pi\eta r v$. The dimensions of η are

A. $\left[ML^{-1}T^{-1}\right]$

B. $\left[ML^{-1}\right]$

C. $\left[MLT^{-2}\right]$

D. $\left[ML^{-3}\right]$

Answer: A

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18. Light of wavelength 5000Å is incident over a slit of width $1\mu m$. The angular width of central maxima will be

A. 30°

B. 15°

C. 60°

D. None of these

Answer: C

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19. A table is revolving on its axis at 5 revolutions per second. A sound source of frequency $1000Hz$is fixed on the table at $70cm$ from the axis. The minimum frequency heard

by a listener standing at a distance from the table will be (speed of sound $= 352m/s$).

A. 1000 Hz

B. 1066 Hz

C. 941 Hz

D. 352 Hz

Answer: C

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20. A ball suspended by a thread swings ia a vertical plane so that its acceleration in the extreme position and lowest position are equal. The angle θ of thread deflection in the extreme position will be

A. $2\tan^{-1}.\frac{1}{2}$

B. $\tan^{-1}.\frac{1}{2}$

C. $\tan^{-1}\sqrt{2}$

D. $\tan^{-1}2$

Answer: A

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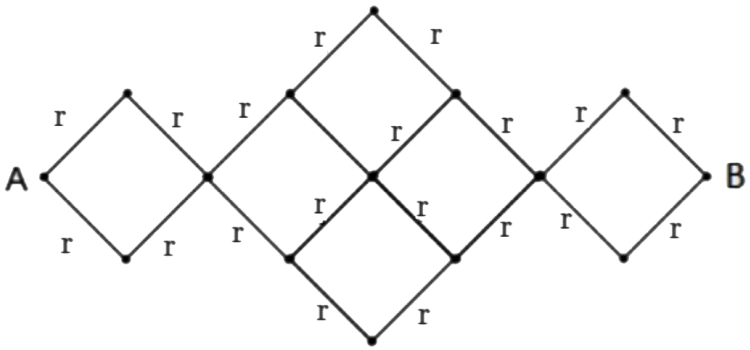
21. The resistance of each straight section $r = 2\Omega$. Find the equivalent resistance (in ohms) between A and B.



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22. A rat is running on ice with speed $v = \pi ms^{-1}$. Suddenly he decides to turn by 90° and want of keep running with the same speed throughout. What is the least amount of time (in seocnds) he needs for such a turn? Suppose that rat's feet can move independently. Coefficieny of friction between rat's feet and ice is 0.125.

$\left(\text{Given}: \ \pi^2 = g\right)$

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23. Three containers C_1, C_2 and C_3 have water at different temperatures. The table below shows the final temperature T when different amounts water (given in liters) are taken from each container and mixed (assume no loss of heat during the process)

C_1	C_2	C_3	T
$1l$	$2l$	$--$	60^oC
$--$	$1l$	$2l$	30^oC
$2l$	$--$	$1l$	60^oC
$1l$	$1l$	$1l$	θ

The value of θ (in $.^{\circ} C$ to the nearest integer) is ----------

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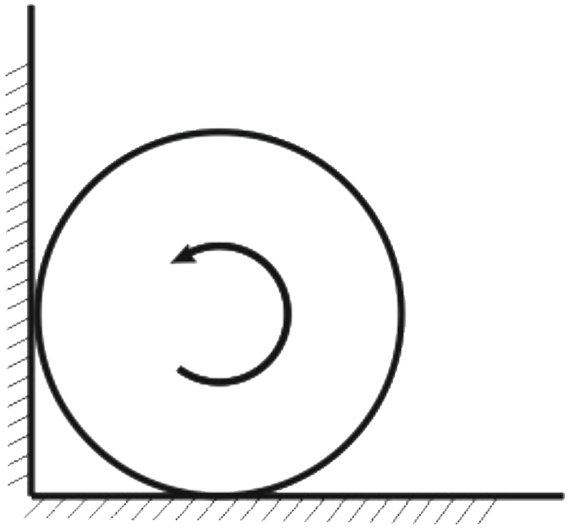
24. A uniform cylinder of the radius R (= 3 m) is spin about its axis at an angular velocity $\omega_0 \left(= 40\sqrt{\pi} \ \mathrm{rad\,s^{-1}} \right)$ and placed between two perpendicular walls. The coefficient of friction between the walls and cylinder is $\mu(= 2)$. Then, how many rotations will the

cylinder make before it comes to rest?



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25. A particle is attached to a string and the other end of the string is attached to a fixed support. In order to just complete the vertical

circular motion, what should be the ratio of the kinetic energy of the particle at its highest point of that at its highest point to that at its lowest point?

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