PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 35

Physics

1. A H-atom moving with speed v makes a head on collision with a H-atom in rest. Both atoms

are in ground state. Find the minimum value of velocity v for which one of atom may excite.

A. $6.25 \times 10^4 ms^{-1}$

B. $8 \times 10^4 ms^{-1}$

C. $7.25 \times 10^4 ms^{-1}$

D. $13.6 \times 10^4 ms^{-1}$

Answer: A

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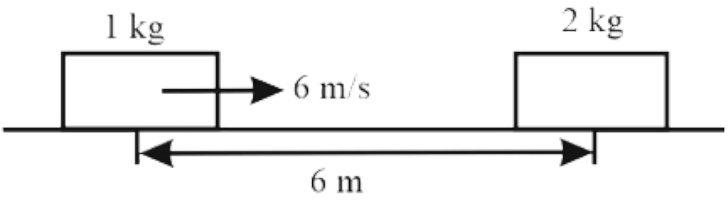
2. A block of mass 1 kg is pushed towards another block of mass 2 kg from a 6 m distance as shown in the figure. If just after the collision, the velocity of 2 kg block is $4ms^{-1}$, then



A. Coefficient of restitution between the blocks is 1

B. Coefficient of restitution between two blocks is $1/2$

C. Coefficient of restitution between two blocks is $1/3$

D. Coefficient of restitution between two blocks is $1/4$

Answer: A

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3. In a deflection magnetometer which is adjusted in the usual way. When a magnet is introduced, the deflection observed is θ and the period of oscillation of the needle in the magnetometer is T. When the magnet is removed, the period of oscillation is T_0. The relation between T and T_0 is

A. $T^2 = T_0^2 \cos\theta$

B. $T = T_0 \cos\theta$

C. $T = \dfrac{T_0}{\cos\theta}$

D. $T^2 = \frac{T_0^2}{\cos\theta}$

Answer: A

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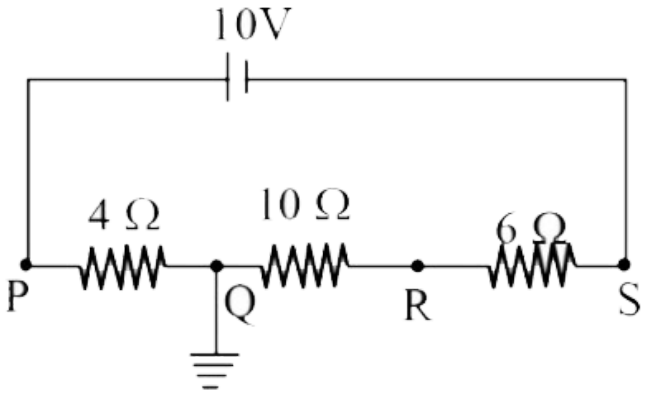
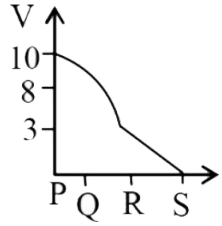
4. The correct graph representation of potential along the branch PQRS is



A.



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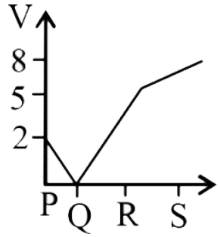
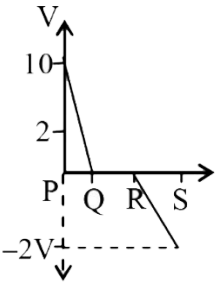
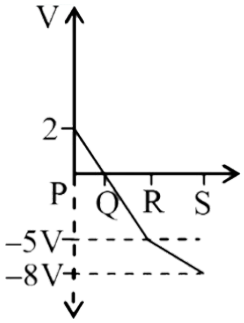


C.



D.



Answer: D

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5. A uniform metal rod is moving with a uniform velocity v parallel to a long straight wire carrying a current I. The rod is perpendicular to the wire with its ends at distance r_1 and r_2 (with $r_2 > r_1$) form it. The E.M.F. induced in the rod at that instant is

A. zero

B. $\frac{\mu_0 I v}{2\pi} \ln\left(\frac{r_2}{r_1}\right)$

C. $\frac{\mu_0 I v}{2\pi} \ln\left(\frac{r_1}{r_2}\right)$

D. $\frac{\mu_0 Iv}{4\pi}\left(1-\frac{r_1}{r_2}\right)$

Answer: B

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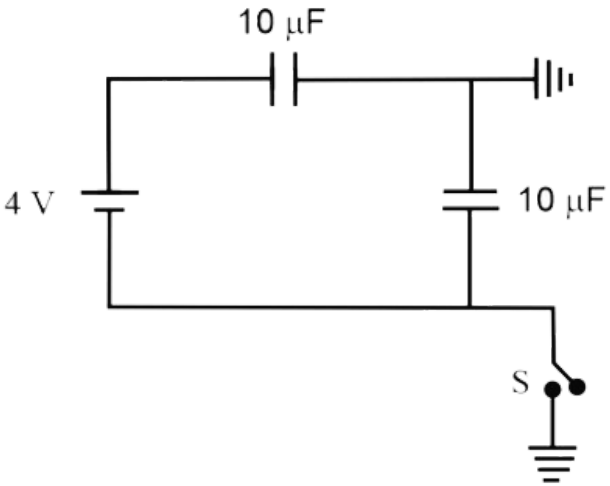
6. In the given figure that work done by the battery after the switch S is closed is



A. $100\mu J$

B. $-100\mu J$

C. $80\mu J$

D. $-80\mu J$

Answer: C

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7. The period of revolution of planet A round from the sun is 8 times that of B. The distance of A from the sun is how many times greater then tht of B from the sun ?

A. 2

B. 3

C. 4

D. 5

Answer: B

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8. Two rods of the same length and material transfer a given amount of heat in 12 seconds when they are joined end to end. But when they are joined lengthwise, they will transfer the same amount of heat, in the same conduction, in :

A. 24 s

B. 3 s

C. 48 s

D. 1.5 s

Answer: B

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9. The motor heat capacity of rock salt at low temperatures varies with temperatures according to Debye's T_3 law.

Thus, C = $k\frac{T^3}{\theta^3}$, where k = 1940 $Jmol^{-1}Ko^{-1}$, θ

= 281 K)

Calculate how much heat is required to raise the temperatures of 2 moles of rock salt from 10 K to 50 K?

A. 800 J

B. 373 J

C. 273 J

D. 400 J

Answer: C

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10. A wire of length L carrying a current I is bent into a circle. The magnitude of the magnetic field at the centre of the circle is

A. $\frac{\pi\mu_0 I}{L}$

B. $\frac{\mu_0 I}{2L}$

C. $\frac{2\pi\mu_0 I}{L}$

D. $\frac{\mu_0 I}{2\pi L}$

Answer: A

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11. Two particles of masses m_1 and m_2 are intially at rest at an infinite distance apart. If they approach each other under their mutual interaction given by $F = -\frac{K}{r^2}$. Their speed of approach at the instant when they are at a distance d apart is

A. $\sqrt{\frac{2K}{d}\left[\frac{1}{m_1}+\frac{1}{m_2}\right]}$

B. $\sqrt{\frac{2K}{d}\left[\frac{1}{m_1}-\frac{1}{m_2}\right]}$

C. $\sqrt{\frac{2K}{d}\left[\frac{m_1 m_2}{m_1+m_2}\right]}$

D. $\sqrt{\frac{2K}{d}\left[\frac{m_1 m_2}{m_1 - m_2}\right]}$

Answer: A

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12. When aluminium is bombarded with fast neutrons, it changes into-sodium with emission of particle according to the equation

$$._{13}^{27}Al + ._{0}^{1}n \rightarrow ._{11}^{24}Na + x$$

What is the name of x?

A. Electron

B. Proton

C. Neutron

D. Alpha - particle

Answer: D

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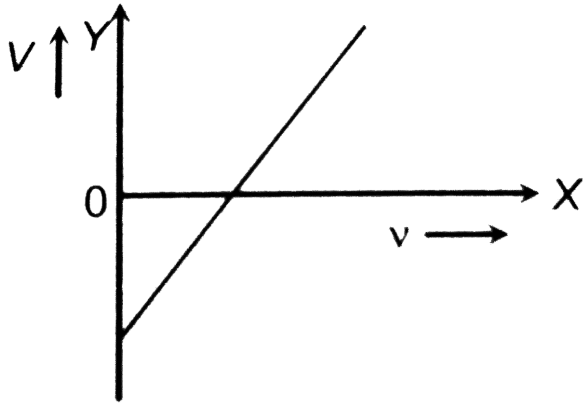
13. The stopping potential V for photoelectric emission from a metal surface is plotted along Y - axis and frequency v of incident light along X - axis . A straight line is obtained as shown .

Planck's constant is given by



A. slope of the line

B. product of slope of the line and charge on the electron

C. intercept along Y - axis divided by charge on the electron

D. product of intercept along X - axis and mass of the electron

Answer: B

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14. A soap bubble A of radius 0.03 m and another bubble B of radius 0.04 m are brought together, so that the combined bubble has a common interface of radius r, then the value of r is

A. 0.24 m

B. 0.48 m

C. 0.12 m

D. none of these

Answer: C

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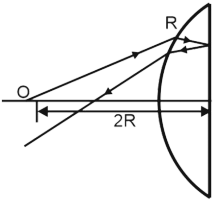
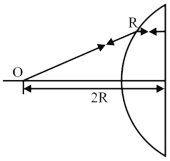
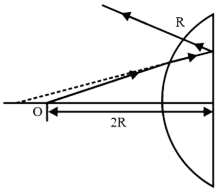
15. An thin Plano - convex glass lens $(\mu = 1.5)$ has its plane surface silvered and R is the radius of curvature of curved part, then which

of the following ray diagram is true for an object placed at O ?

(O is at a distance of 2 R from the lens)

A. 

B. 

C. 

D. None of the above

Answer: B

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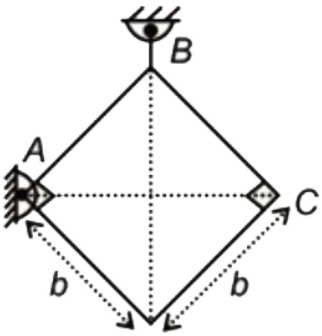
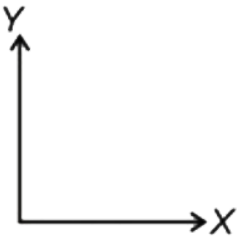
16. A uniform square plate of mass m is supported with its plane vertical as shown in the figure. Assume the centre of mass is on a horizontal the passing through A. If the cable at B breaks then just after that the angular acceleration of the plate is





A. $\frac{3g}{2\sqrt{2}b}$

B. $\frac{3g}{\sqrt{2}b}$

C. $\frac{g}{\sqrt{2}b}$

D. $\frac{2g}{\sqrt{3}b}$

Answer: A

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17. when NPN transistor is used as an amplifier then .....

A. electrons move from base to collector

B. holes move from emitter to base

C. electrons move from collector to base

D. holes move from base to collector

Answer: A

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18. A metal rod having a linear coefficient of expansion $2 \times 10^{-5/\circ}C$ has a length $1m$ at

$25^\circ C$, the temperature at which it is shortened by $1mm$ is `

A. $-20^\circ C$

B. $-15^\circ C$

C. $-30^\circ C$

D. $-25^\circ C$

Answer: C

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19. Three waves of amplitudes 7 mm, 3 mm and 11 mm with a successive phase difference of $\frac{\pi}{2}$ are super - imposed. The amplitude of the resulting wave will be

A. 5 mm

B. 12 mm

C. 8 mm

D. 6 mm

Answer: A

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20. A rod AB of mass M and length L is lying on a horizontal frictionless surface. A particle of mass m traveling along the surface hits the end A of the rod with a velocity v_0 in a direction perpendicular to AB. The collision is completely elastic. After the collision the particle comes to rest. Find the ration m/M.

A. $\frac{1}{4}$

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

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

D. 1

Answer: A

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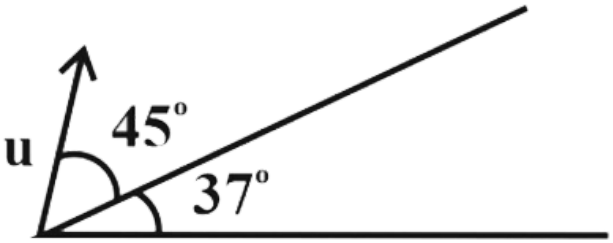
21. A particle is projected on a frictionless inclined plane of inclination 37° at an angle of projection 45° from the inclined plane as shown in the figure. If after the first collision from the plane, the particle returns to its

point of projection, then what is the value of the reciprocal of the coefficient of restitution between the particle and the plane?



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22. A small spherical ball (obeying Stoke's law for viscous force) is thrown up vertically with a speed $20ms^{-1}$ and is received back by the

thrower at the point of projection with a speed $10ms^{-1}$. Neglecting the buoyant force on the ball, assuming the speed of the ball during its flight to be never equal to its terminal speed and taking the acceleration due to gravity $g = 10ms^{-2}$, find the time of flight of the ball in seconds.

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23. In a sample initially there are equal number of atoms of two radioactive isotopes A and B.

3 days later the number of atoms of A is twice that of B. Half life of B is 1.5 days. What is half life of isotope A? (in days)

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24. The lengths of sides of a cuboid are a, 2a and 3a. If the relative percentage error in the measurement of a is 1%, then what is the relative percentage error in the measurement of the volume of the cuboid.

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25. A satellite of mass m is orbiting the earth in a circular orbit at a height 2R abvoe earth surface where R is the radius of the earth. If it starts losing energy at a constant rate β, then it will fall on the earth surface after the time $t = \frac{GMm}{n\beta R}$. Assuming that the satellite is approximately in a circular orbit at all times, find the value of n.

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