PHYSICS

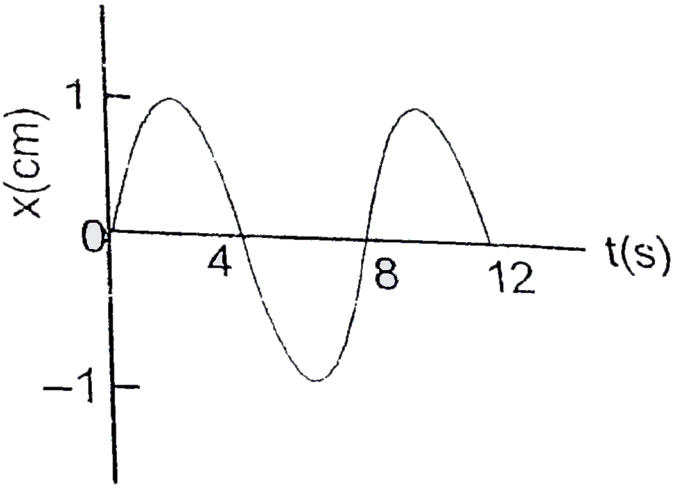
BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 78

Physics

1. The $x - t$ graph of a particle undergoing simple harmonic motion is shown below. The

accelertion of the particle at $t = 4/3s$ is



A. $\frac{\sqrt{3}}{32}\pi^2 \text{cm s}^{-2}$

B. $\frac{-\pi^2}{32}\text{cm s}^{-2}$

C. $\frac{\pi^2}{32}\text{cm s}^{-2}$

D. $-\frac{\sqrt{3}}{32}\pi^2 \text{cm s}^{-2}$

Answer: D

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2. In a one-dimensional collision between two identical particles. A and B, B is stationary and A has momentum p before impact. During impact, B gives an impulse J to A. Find the coefficient of restitution between A and B?

A. $\frac{2J}{P} - 1$

B. $\frac{2J}{P} + 1$

C. $\frac{J}{P} + 1$

D. $\frac{J}{P} - 1$

Answer: A

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3. The string of pendulum of length l is displaced through 90° from the vertical and released. Then the minimum strength of the string in order to withstand the tension, as the pendulum passes through the mean position is

A. mg

B. 2mg

C. 3mg

D. 4mg

Answer: C

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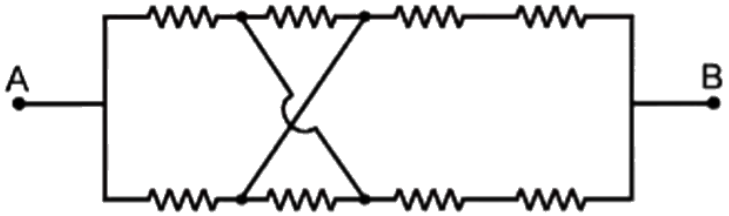
4. In the circuit shown, each resistor is of resistance R. the equivalent resistance between

the terminals A and B is



A. 2R

B. 1.3 R

C. 1.5R

D. 15 R

Answer: C

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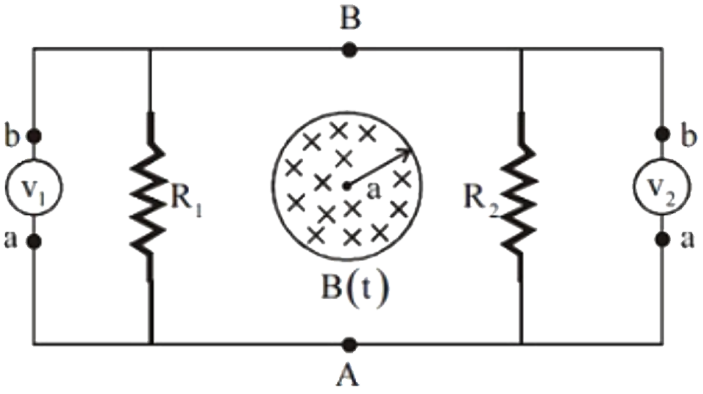
5. The circuit shown in the figure consists of two resistances $R_1 \& R_2$ connected to two ideal voltmetres $V_1 \& V_2$. Assume that a voltmeter reads $\Delta V = -\int_a^b \overrightarrow{E} . d\overrightarrow{l}$ between its terminlas. A time - varying magnetic field $B(t) = B_0 t$ (where B_0 is a positive contant of proper dimensions and t is time) exists in a circular region of radius a and it is directed into the plane of the figure. The reading of

voltmeter V_2 is



A. $\frac{\pi a^2 B_0 R_1}{R_1 + R_2}$

B. $-\frac{\pi a^2 B_0 R_2}{R_1 + R_2}$

C. $-\frac{\pi a^2 B_0 R_1}{R_1 + R_2}$

D. $\frac{\pi a^2 B_0 R_2}{R_1 + R_2}$

Answer: B

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6. The mass of a planet and its diameter are three times those of earth's. Then the acceleration due to gravity on the surface of the planet is : $\left(g = 9.8ms^{-2}\right)$

A. $3.3ms^{-2}$

B. $4.9ms^{-2}$

C. $19.6ms^{-2}$

D. $29.4ms^{-2}$

Answer: A

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7. A car, starting from rest, accelerates at the rate f through a distance s, then continues at constant speed for time t and then decelerates at the rate f/ 2 to come to rest. If the total distance travelled is 15 s, then

A. $S = ft$

B. $S = \frac{1}{6} ft^2$

C. $S = \frac{1}{2} ft^2$

D. $S = \frac{1}{72} ft^2$

Answer: D

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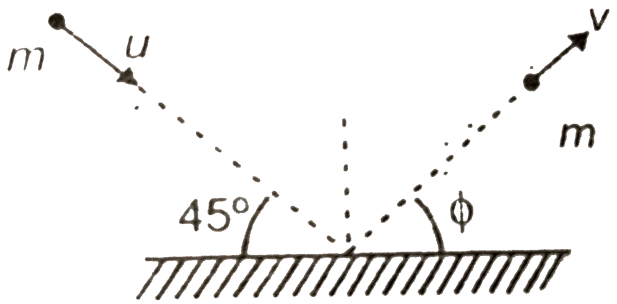
8. A particle of mass m moving with a speed u strikes a smooth horizontal surface at an angle 45°. The particle rebounds at an angle ϕ with speed v. If coefficient of restituion is $\frac{1}{\sqrt{3}}$, then

angle ϕ is



A. 30°

B. 45°

C. 60°

D. 37°

Answer: A

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9. An ideal gas expands isothermally from volume V_1 to V_2 and is then compressed to original volume V_1 adiabatically. Initialy pressure is P_1 and final pressure is P_3. The total work done is W. Then

A. $P_3 > P_1, W > 0$

B. $P_3 < P_1, W < 0$

C. $P_3 > P_1, W < 0$

D. $P_3 = P_1, W = 0$

Answer: C

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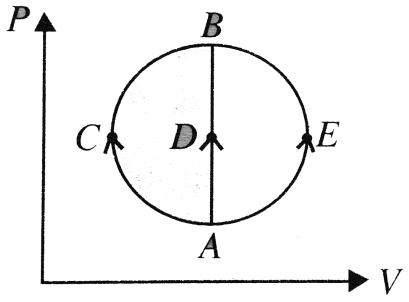
10. One mole of an ideal gas is taken from state A to state B by three different processes (a) ACB, (b) ADB and (c) AEB as shown in the $P-V$ diagram. The heat absorbed by the gas

is



A. Greater in process (b) than in (a)

B. The least in process (b)

C. The same in (a) and (c)

D. Less in (c) than in (b)

Answer: D

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11. Two long parallel wires carry currents i_1 and i_2 such that $i_1 > i_2$. When the currents are in the same direction, the magnetic field at a point midway between the wires is $6 \times 10^{-6} T$. If the direction of i_2 is reversed, the field becomes $3 \times 10^{-5} T$. The ratio $\frac{i_1}{i_2}$ is

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

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

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

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

Answer: C

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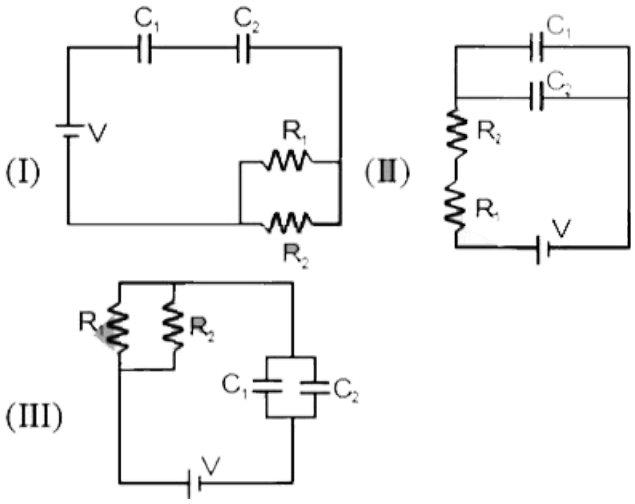
12. Given :

$R_1 = 1ohm, R_2 = 2ohm, C_1 = 2\mu F, C_2 = 4\mu F$

The time constants (in μS) for the circuits I, II,

III are respectively



A. $18, \frac{8}{9}, 4$

B. $18, 4, \frac{8}{9}$

C. $4, \frac{8}{9}, 18$

D. $\frac{8}{9}, 18, 4$

Answer: D

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13. A liquid of density p is coming out of a hose pipe of radius a with horizontal speed v and hits a mesh . 50 % of the liquid passes through the mesh unaffected . 25 % comes back with the same speed .The resultant pressure on the mesh will be:

A. $\frac{1}{2}\rho v^2$

B. $\frac{3}{2}\rho v^2$

C. $3\rho v^2$

D. $\frac{3}{4}\rho v^2$

Answer: D

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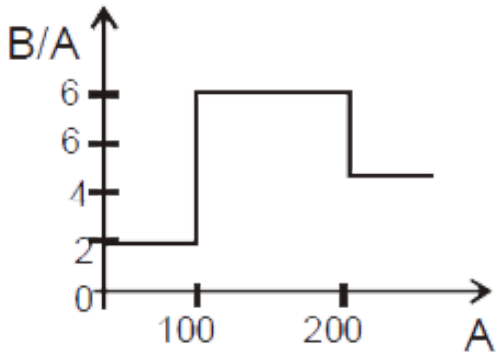
14. Assume that the nuclear binding energy per nucleon (B/A) versus mass number (A) is as shown in the figure. Use



this plot to choose the correct choice(s) given below. Figure

A. Fusion of two nuclei with mass numbers lying in the range of $1 < A < 50$ will release energy.

B. Fusion of two nuclei with mass numbers lying in the range of $51 < A < 100$ will consume energy.

C. Fission of a nucleus lying in the mass range of $100 < A < 200$ will release

energy when broken into two equal fragments.

D. Fission of a nucleuw lying in the mass range of $200 < A < 260$ will release energy when broken into two equal fragments.

Answer: D

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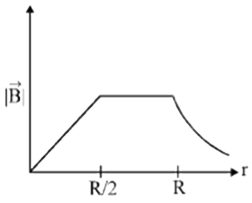
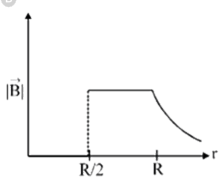
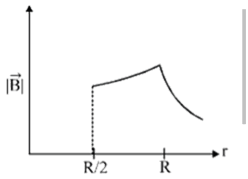
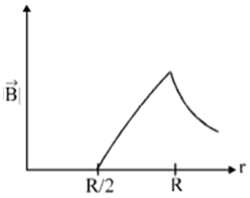
15. An infinitely long hollow coducting cylinder with inner radius $\frac{R}{2}$ and outer radus R carries a uniform current density along its length. The magnitude of the magnetic field $|B|$ as a function of the radial distance r from the axis is best represented by

A. 

B. 

C. 

D. 

Answer: D

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16. Lights of two different frequencies whose photons have energies 1 and 2.5 eV, respectively, successively illuminate a metal

whose work function is 0.5 eV. The ratio of the maximum speeds of the emitted electrons

A. $1:4$

B. $1:1$

C. $1:5$

D. $1:2$

Answer: D

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17. If pressure at half the depth of a lake is equal to 2//3 pressure at the bottom of the lake then what is the depth of the lake ?

A. 10 m

B. 20 m

C. 60 m

D. 30 m

Answer: B

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18. If light travels a distance x in t_1 sec in air and $10x$ distance in t_2 sec in a medium, the critical angle of the medium will be

A. $\sin^{-}\left(\frac{20t_1}{t_2}\right)$

B. $\sin^{-1}\left(\frac{t_1}{t_2}\right)$

C. $\sin^{-1}\left(\frac{t_1}{t_2}\right)$

D. $\sin^{-1}\left(\frac{t_2}{10t_1}\right)$

Answer: B

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19. Which of the following statements is not true?

A. The resistnace of intricsic semiconductors decreases with increase of temperature

B. Doping pure Si with trivalent impurities give p - type semiconductors

C. The majority carriers in n - type semiconductors are holes

D. A p - n junction can act as a semiconductor diode

Answer: C

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20. In electromagnetic theory, the electric and magnetic phenomena are related to each other. Therefore, the dimensions of electric and magnetic quantities must also be related to each other. In the questions below, [E] and [B]

stand for dimensions of electric and magnetic fields respectively. While $[\ \in_0\ ]$ and $[\mu_0]$ stand for dimensions of the permittivity and permeability of free space respectively. [L] and [T] are dimensions of length and time respectively. All the quantities are given in SI units.

The relation between [E] adn [B] is :-

A. $[E] = [B][L][T]$

B. $[E] = [B][L]^{-1}[T]$

C. $[E] = [B][L][T]^{-1}$

D. $[E] = [B] = [L]^{-1}[T]^{-1}$

Answer: C

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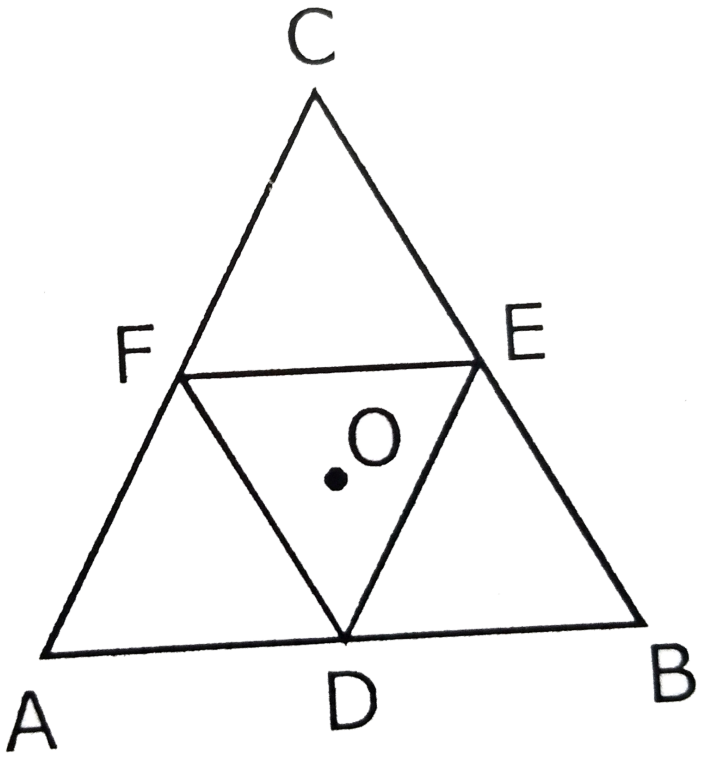
21. Moment of inertia of an equilateral triangular lamina ABC, about the axis passing through its centre O and perpendicular to its plane is I_0 as shown in the figure. A cavithy DEF is cut out from the lamina, where D,E,F are the mid points of the sides. Moment of inertia of

the remaining part of lamina about the same axis is -



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22. In an ideal gas at temperature T , the average force that a molecule applies on the walls of a closed container depends on $T \text{as} T^q$. A good estimate for q is :-

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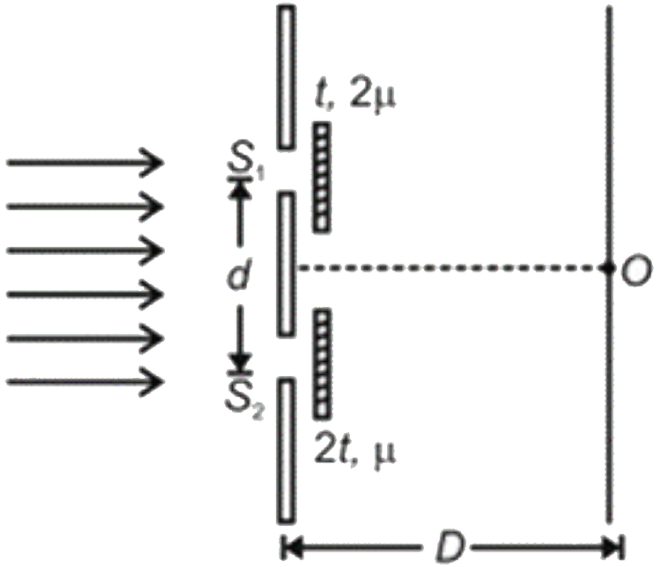
23. In the YDSE shown below, two slits are covered with thin sheets having a thickness t and 2t and refractive indices 2μ and μ respectively. The position of central maxima is shifted by a distance of N (in cm) from the

central position of the screen. Find the value of

N.

$$\left[d = 1mm, D = 1m, t = 2 \times 10^{-2}mm, \mu = \frac{3}{2}\right]$$



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24. The equation of a wave on a string of linear mass density $0.04 kgm^{-1}$ is given by $y = 0.02(m)\sin\left[2\pi\left(\frac{t}{0.04(s)} - \frac{x}{0.50(m)}\right)\right]$. The tension in the string is :

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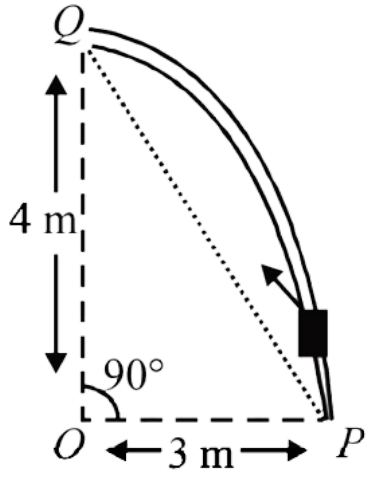
25. Constant as eliptical rail PQ in the varticle plain with $OP = \ = 3m$ and $OQ = 4m$. A block of mass 1 kg is pailed along the rail from P to Q with a force of $18N$, which is always parallel to less PQ Assuming are frictionless

losess , the kinetic energy the block when 0 reches Q is $(n \times 10)$ pales . THe velie of a (Take acceleration due to gravity) $= 10ms^{-2}$)



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