PHYSICS

BOOKS - TS EAMCET PREVIOUS YEAR PAPERS

ONLINE QUESTION PAPER 2018

Physics

1. Match the entries in List I with those in List II.

List I	List II
A. Unified interaction reducing the number of fundamental forces from four to three	(i) Strong interaction
B. Force between two molecules separated by a distance near about the sum of the molecular radii	(ii) Gravitational force
C. Nuclear binding force	(iii) Electroweak interaction
D. Bodies of astronomical proportions	(iv) Electromagnetic interaction

A. $\begin{matrix} A & B & C & D \\ (iii) & (iv) & (i) & ii \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ (iii) & (i) & (ii) & iv \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ (iii) & (i) & (iv) & ii \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ (ii) & (i) & (iii) & iv \end{matrix}$

Answer: A

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2. Assertion (A) Electromagnetic force is enormously strong as compared to gravitational force. Yet gravity dominates in the large-scale phenomena (e.g. formation of galaxies).

Reason (R) Existence os positive and negative charges make matter mostly electrically neutral.

Which of the following is true ?

A. Both (A) and (R) are true and (R) is the correct explantion of (A)

B. Both (A) and (R) are true, but (R) is not the correct explantion of (A)

C. (A) is true, but (R) is false

D. (A) is false, but (R) is true

Answer: A

3. An object moves in a straight line with deceleration whose magnitude varies with deceleration whose magnitude varies with velocity as $3v^{2/3}$. If at an initial point, the velocity is 8 m/s, then the distence travelled by the object before it stops is

A. 2 m

B. 4 m

C. 6 m

D. 8 m

Answer: B

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4. A particle starts from origin at time t=0 and moves in positive x-direction. Its velocity v varies with times as $v = 10t\hat{i}$ cm/s. The distance covered by the particle in 8 s will be

A. 320 cm

B. 80 cm

C. 120 cm

D. 640 cm

Answer: A

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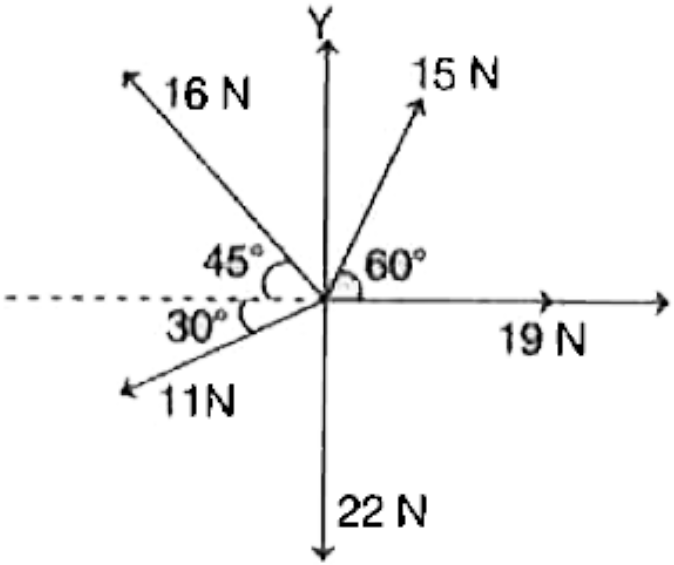
5. Consider an object kept at the centre, in the XY-plane, on which five coplanar forces act as shown in the figure. The resultant forces on the

object is



A. 6.5 N, 330°

B. 6.5 N, 300°

C. 6.5 N, 30°

D. 5.7 N, $331^{<}(\circ)$

Answer: A

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6. Consider an object making uniform motion around a circle of radium 5 m with tangental velocity 2 ms^{-1}. The time it takes to complete 2 revolution and the magnitude of acceleration respectively are

A. 0.2π s and 0.8 ms^{-2}

B. 0.5π s and 1 ms^{-2}

C. 10π s and 0.8 ms^{-2}

D. 5π s and 5 ms^{-2}

Answer: C

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7. A small block starts sliding down an inclined plane forming an angle 45° horizontal. The coefficient of friction μ, varies with distence s as $\mu = cs^2$ wherem, c is a constant of appropriate

dimension, then distence covered by the block before it stops is

A. $\sqrt{\frac{3}{c}}$

B. $\sqrt{3C}$

C. $\sqrt{C}$

D. $\sqrt{\frac{1}{C}}$

Answer: A

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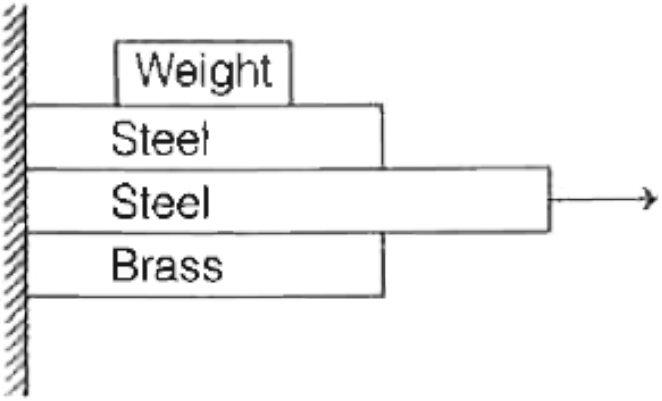
8. A movable steel plate is placed between fixed steel and brass plates and the stack of plates is subjected to a weight of 100 N as shown in the figure. The coefficient of kinetic friction for steel on steel is 0.57 and for steel on brass is 0.44. Assuming that the entire weight comes onto the stack and that the weight of the plates is negligible in comparison to the applied weight, the force required to move the middle plate (in

N) is



A. 13

B. 101

C. 440

D. 570

Answer: B

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9. A car of mass 1200 kg (together with the driver) is moving with a constant acceleration of 2 m/s^2. How much power does the engine generate at the instance, when the speed reaches 20 m/s? (Assume that the coefficient of friction between the car and the road is 0.5).

A. 48000 W

B. 120000 W

C. 168000 W

D. 288000 W

Answer: C

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10. A ball moving with a velocity v, colliders head on with a stationary second ball of same mass. After the collision, the velocity of the first ball is reduced to 0.15 v. The kinetic energy of the system is decreased nearly by

A. 0.2

B. 0.25

C. 0.3

D. 0.4

Answer: B

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11. A uniform disc of mass 100 kg and radius 2 m is rotating at 1 rad/s about a perpendicular axis passing through its centre of the disk suddenly jumps to a point which is 1 m from the centre of

the disc. The final angular velocity of the boy (in rad/s) is

A. 0.77

B. 0.5

C. 41

D. 2

Answer: A

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12. A force $F_1 = A\hat{j}$ is applied to a whose radius vector $r_1 = a\hat{i}$, while a force $F_2 = B\hat{i}$ is applied to the point whose radius vector $r_2 = b\hat{j}$.

Both the radius vector are determined relative to the origin of the coordinate axes 0.

The moment of the force relative to 0 is

A. $(aA - bB)\hat{k}$

B. $(aA - bB)\hat{j}$

C. $(ab - AB)\hat{k}$

D. $(aB - bA)\hat{j}$

Answer: A

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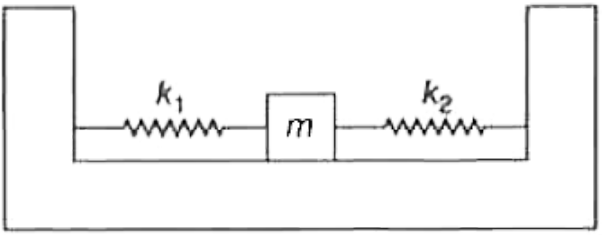
13. Two springs of spring constant k_1 and k_2 are connected by a mass m as shown in the figure.

Under negligible friction, if the mass is displaced by small amount x from its equilibrium position and released, the period of

oscillation is



A. $2\pi\sqrt{\frac{m(k_1+k_2)}{k_1k_2}}$

B. $2\pi\sqrt{\frac{m}{k_1+k_2}}$

C. $2\pi\sqrt{\frac{mk_1k_2}{(k_1+k_2)}}$

D. $2\pi\sqrt{\frac{m(k_1-k_2)}{k_1k_2}}$

Answer: B

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14. The density of a solid sphere of radius R is $P(r) = 20\frac{r^2}{R^2}$ where, r is the distence from its centre. If the gravitational field due to this sphere at a distence 4 R from its centre is E and G is the gravitational constant, them the ratio of $\frac{E}{GR}$ is

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

B. 3π

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

D. π

Answer: D

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15. In a tensile test on a metal bar of diametrer 0.015 m and length 0.2 m, the relation between the load and elongation within the proportional limit is found to be $F = 97.2 \times 10^6(\Delta L),$ where F is the load (in N) and (ΔL) is the elongation (in m).

The Young's modulus of the material in Gpa is

A. 75.5

B. 85.6

C. 98.7

D. 110

Answer: D

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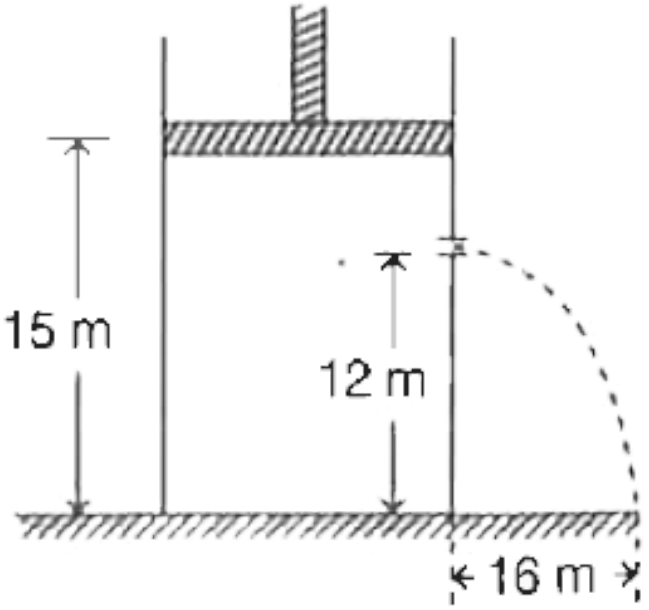
16. A tank of height 15 m and cross-section area 10 m^2 is filled with water. There is a small hole of cross-section area a which is much smaller than the container, located at a height of 12 m

from the base of the container. How much force should be applied with coming out of the top level, so that water coming out of the holwe hits the ground at a distance of 16 m? $\left(\text{Take of water } = 1000\ \text{kg m}^{-3}\right)$



A. 233 kN

B. 200 kN

C. 320 kN

D. 400 kN

Answer: A

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17. An ideal gas has molar heat capecity C_v at constant volume. The gas undergoes a process where in the temperature changes as $T = T_0(1 + \alpha V^2)$, T and V are temperature

and volume respectively, T_0 and α are positive constant.The molar heat capecity C of the gas is given as $C = C_v + Rf(V)$, where, f (V) is a funtion of volume. The expression for f (V) is

A. $\frac{\alpha V^2}{1 + \alpha V^2}$

B. $\frac{1 + \alpha V^2}{2\alpha V^2}$

C. $\alpha V^2 (1 + \alpha V^2)$

D. $\frac{1}{2\alpha V^2 (1 + \alpha V^2)}$

Answer: B

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18. A container is filled with a liquid that cools from 100 $^{\circ}C$ to 70 $^{\circ}C$. The times that it must have taken to cool down to 80 $^{\circ}C$ from its initial temperature approximately is

A. 1.7 min

B. 2.6 min

C. 8.2 min

D. 4.1 min

Answer: B

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19. An ideal gas in a cylinder is compressed adiabatically to one-third of its orignal volume. A work of 45 J is done on the gas by the gas and the heat flowed into the gas, respectively are

A. 45 J and zero

B. -45 J and zero

C. 45 J and heat flows out of the gas

D. -45 J and heat flows into the gas

Answer: A

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20. In a cubic container of inner side length 10 cm, nitrogen gas of 100 k pa pressure is maintained at 300 K. If the pressure inside the gas is increased to 300 kpa by adding oxygen gas, the ratio of number of N_2 to O_2 molecules in the container is

A. 0.5

B. 3

C. 1.5

D. 0.33

Answer: A

21. A source of sound whose frequency is 1000 Hz is moving with a speed 33 m/s. The waves raflected be a fixed obstacle are registered by a receiver that moves together with the source. The speed of the sound waves is 330 m/s, then the frequency registered by the reciver is

A. 0.9 kHz

B. 1.1 kHz

C. 1.2 kHz

D. 2.2 kHz

Answer: C

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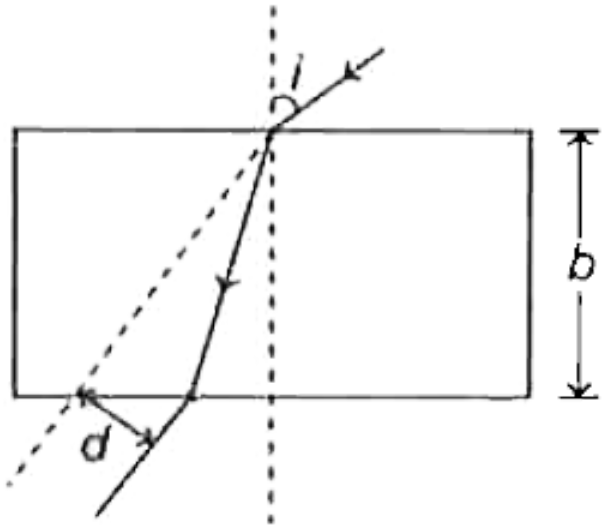
22. Figure shows a ray of light entering and passing through a dense glass slab and emerging from the side. If the angle $i = 60^\circ$,

slab thickness b= 0.04 m and the refractive index of glass $= \sqrt{3}$, the parallel shift d between the emerging and entering rays in mm is



A. $\sqrt{\frac{3}{4}}$

B. $\sqrt{\frac{4}{3}}$

C. $\frac{40}{\sqrt{3}}$

D. $15\sqrt{3}$

Answer: C

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23. Let S_1 be the amount of Rayleigh scattered light of wavelength λ_1 and S_2 that of light of wavelength λ_2 from a particle of size a . Which of the following statement is true?

A. $\frac{S_1}{S_2} = \left(\frac{\lambda_2}{\lambda_1}\right)^4$, if $\lambda_1, \lambda_2 > > a$

B. $\frac{S_1}{S_2} = \left(\frac{\lambda_1}{\lambda_2}\right)^4$, if $\lambda_1, \lambda_2 > > a$

C. $\frac{S_1}{S_2} = \left(\frac{\lambda_2}{\lambda_1}\right)^4, \quad \text{if} \quad \lambda_1, \lambda_2 < < a$

D. $\frac{S_1}{S_2} = \left(\frac{\lambda_1}{\lambda_2}\right)^4, \quad \text{if} \quad \lambda_1, \lambda_2 < < a$

Answer: A

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24. In a Young's d

ouble slit experiment, a monochromatic light of wavelenght 600 nm is used. If the two slits are covered bt transparent sheets of thickness 0.132 mm and 0.1 mm of refractive index 1.5, then the

number of fringes that will shift due to introdiction of the sheets are

A. 27

B. 40

C. 60

D. 80

Answer:

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25. The volume charge density in a spherical ball of radius R varies with distence r from the centre as $p(r) = p_0\left[1 - \left(\frac{r}{R}\right)^3\right]$, where,$p_0$ is a constant. The radius at which the field would be maximum is

A. $\frac{R}{2^{1/3}}$

B. R

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

D. $\frac{R^{1/3}}{2}$

Answer: A

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26. The potential $\phi(x, y)$ of an electrostatic field

$E = a\left(y\hat{i} + c\hat{j}\right)$ is [a is a constant and $\hat{i}$ and $\hat{j}$ are unit vectors along X and Y axes]

A. $-2axy +$ c (c is a constant)

B. $-axy +$ c (c is a constant)

C. $a^2xy +$ c (c is a constant)

D. $a(xy)^2 +$ c (c is a constant)

Answer: B

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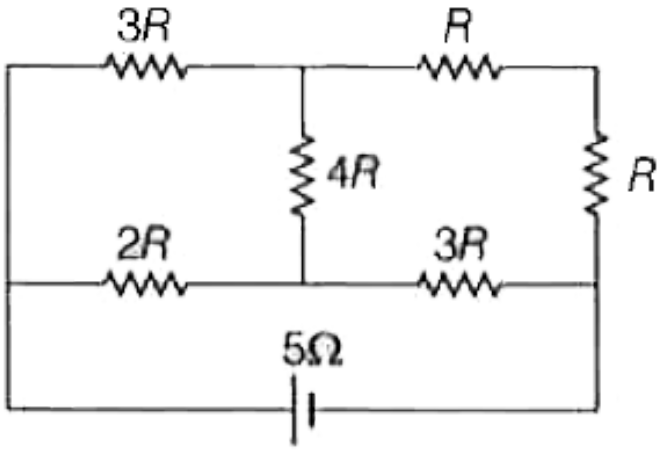
27. A resistance network is connected to a battery as shown in the figure below. If the intrrnal resistance of the battery is 5ω, then the value of

R $(\in \omega)$ for maximum power delivered to the

network is



A. 2

B. 4

C. 5

D. 6

Answer: A

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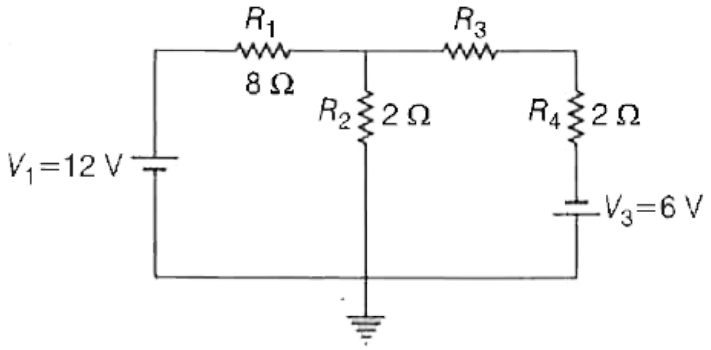
28. Find the voltage V_2 across R_2 for the given



circuit

A. 0.56V

B. 1.61V

C. 0.63V

D. 0.21V

Answer:

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29. A moving coil galvanometer has a rectangular wire coil of enclosed area 0.001 m^2 and 500 turns. The coil operates in a radial mafnetic field of 0.2T and carries a current of $6\pi \times 10^{-8}$ A.

If the torsional spring constant is $6 \times 10^{-7} N -$ m/rad, then angular deflection of the coil in radians is

A. $\frac{\pi}{100}$

B. $\frac{\pi}{200}$

C. $\frac{\pi}{300}$

D. $\frac{\pi}{400}$

Answer: A

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30. A charge q enters a region having electric field

E and magnetic field B with velocity v. If it

continues to move with the same velocity, then which of the following statement is not true

A. E.B=0

B. E.v=0

C. If v.B = 0.then $v = \frac{E \times B}{B \times B}$

D. v xx E = B

Answer: D

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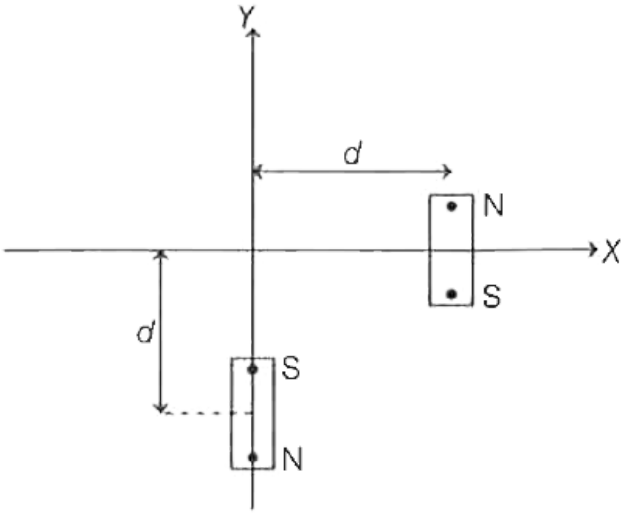
31. Two identical bar magnets of magnetic moment M each, are placed along X and Y-axes, respectively at a distance d from the origin (as shown in the figure). The origin lies on perpendicular bisector of magnet placed on X-axis and on the magnetic axis of magnet placed on Y-axis If the magnitude of total magnetic field at the origin is B $= \alpha \left[\frac{\mu_0}{4\pi} \frac{M}{d^3} \right]$ then the value of constant α will be ($d > > l$. where lis the lenght of the bar magnets and direction of N to S in magnets is oppsite with

respect to each other)



A. 2

B. 1

C. 3

D. $\sqrt{5}$

Answer: C

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32. A conducting rod of length L lies in XY-plane and makes an angle 30° with X-axis. One end of the rod lies at origin initially. A magnetic field also exists in the region pointing along positive Z-direction. The magnitude of the magnetic field varies with y as $B_0\left(\frac{y}{L}\right)^3$, where,$B_0$ is a constant. At some instant the rod stars moving with a velocity v_0 along X-axis

The emf induced in the rod is

A. $\frac{B_0 v_0 L}{64}$

B. $\frac{B_0 v_0 L}{16}$

C. $B_0 v_0 L$

D. $64 B_0 v_0 L$

Answer: A

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33. An oscillating circuit consisting of a capacitor with capacitance $C = 10\mu F$, a coil with inductance $L = 6.0\mu H$ and active

resistance $R = 10\Omega$. The mean power that should be fed to the circuiit to maintain undamped harmonic oscillations with an external driving power with 50Hz and a V_m of 280 V is

A. 3.8 W

B. 48 W

C. 3 mW

D. 48 mW

Answer: A

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34. If the magnetic field of a plane electromagnetic wave is given by $5 \times 10^{-6} \sin\left(0.6 \times 10^{2} x + 0.5 \times 10^{10} t\right)$, then the speed of the wave is

A. $0.83 \times 10^{7} m/s$

B. $0.83 \times 10^{8} m/s$

C. $5.24 \times 10^{8} m/s$

D. $5.24 \times 10^{9} m/s$

Answer: B

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35. An isolated lead ball is charged upon continuous irradiation by EM radiation of wavelength,$\lambda =$ 221 nm. The maximum potential attained by the lead ball, if its work funtion is 4. 14 eV is (take, h $= 6.63 \times 10^{-34}$ J-s, $c = 3 \times 10^{8} m/s$, $e = 1.6 \times 10^{-19} C$)

A. 1.49 V

B. 2.67 V

C. 3.14V

D. 0.51V

Answer: A

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36. An energy of 12.6 eV is equal to

A. $0.518 \times 10^{-25}\text{kcal}$

B. $6.04 \times 10^{-25}\text{kWh}$

C. $2.17 \times 10^{-10}\text{J}$

D. $2.17 \times 10^{-15}\text{kN-m}$

Answer: B

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37. The frequency of light emitted, when the electron makes transition from the level of principle quantum number n = 2 to the level with n = 1 is (Take, the ionization energy of hydrogen to be 13.6eV andh $= 4 \times 10^{-15}$ eV -s)

A. $2.55 \times 10^{15} Hz$

B. $1.7 \times 10^{15} Hz$

C. $3.4 \times 10^{15} Hz$

D. $5.1 \times 10^{15} Hz$

Answer: A

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38. In a juction transistor, the collector current changes by 6.8 mA, if the emitter current is changed by 7 mA. For such transistor,the current amplification factor is

A. 30

B. 34

C. 40

D. 45

Answer: B

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39. In a p-n juction diode, an electric field of magnitude $2 \times 10^5 V$ / m exists in the depletion region. A particle with charge -3e can diffuse

from n-side to p-side, if it has minimum kinetic energy 0.6 eV.

The width of the depletion region of the p-n juction is

A. 300 nm

B. 600 nm

C. 1000 nm

D. 1200 nm

Answer: C

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40. A person tries to broadcast with the same antenna both the signals at 10^7 Hz and 10^6 Hz. If the reciver at some distance has to receive an equal strenght for both the frequencies, then the broadcaster has to approximately increase the signal strenght at 10^6 Hz to 10^7 Hz by

A. $\frac{1}{10}\text{times}$

B. 10 times

C. 100 times

D. $\frac{1}{100}\text{times}$

Answer: C

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41. Two resistance 60.36Ω and 30.09Ω are connected in parallel. The equivalent resistance is

A. $20 \pm 0.08\Omega$

B. $20 \pm 0.06\Omega$

C. $20 \pm 0.03\Omega$

D. $20 \pm 0.10\Omega$

Answer: A

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42. Assertion (A) The velocity of a projectile at a point on its trajectory is equal to the slope at that point.

Reason (R) The velocity vector at a point always along the tangent to the trajecotry at that point.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not the correct explanation of A

C. A is true but R is false

D. A si false but R is true

Answer: D

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43. A body is projected from the ground at an angle of $\tan^{-1}\left(\frac{8}{7}\right)$ with the horizontal. The ratio of the maximum height attained by it to its range is

A. $8:7$

B. $4:7$

C. $2:7$

D. $1:7$

Answer: C

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44. A body is projected with a speed u at a angle θ with the horizonatl. The radius of curvature of the trajectory, when it makes an angle $\left(\frac{\theta}{2}\right)$ with the horizontal is (g- acceleration due to gravity)

A. $\frac{u^2 \cos^2\theta \sec^3\left(\frac{\theta}{2}\right)}{\sqrt{3}g}$

B. $\frac{u^2 \cos^2\theta \sec^3\left(\frac{\theta}{2}\right)}{2g}$

C. $\frac{2u^2 \cos^2\theta \sec^2\left(\frac{\theta}{2}\right)}{g}$

D. $\frac{u^2 \cos^2 \theta \sec^3\left(\frac{\theta}{2}\right)}{g}$

Answer: D

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45. S and is to be piled up on a horizontal ground in the form of a regular cone of a fixed base of radius R. Coefficient of static friction between the sand layers is μ. Maximum volume of the sand can be piled up in the form of cone without slipping on the ground is

A. $\frac{\mu R^3}{3\pi}$

B. $\frac{\mu R^3}{3}$

C. $\frac{\pi R^3}{3\mu}$

D. $\frac{\mu\pi R^3}{3}$

Answer: D

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46. A block of mass 2 kg is being pushed against a wall by a force F=90 N as shown in the figure. If the coefficient of friction is 0.25, then the

magnitude of acceleration of the block is (Take, $g = 10ms^{-2}$) $\left(\sin 7^{\circ} = \frac{3}{5}\right)$

A. $16ms^{-2}$

B. $8ms^{-2}$

C. $38ms^{-2}$

D. $54ms^{-2}$

Answer: B

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47. A body of mass 2 kg thrown vertically from the ground with a velocity of $8ms^{-1}$ reaches a maximum height of 3m. The work done by the air resistance is (acceleration due to gravity $= 10ms^{-2}$)

A. 4J

B. 60J

C. 64J

D. 8J

Answer: A

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48. The system of two masses 2 kg and 3 kg as shown in the figure is released from rest. The work done on 3 kg block by the force of gravity during first 2 seconds of its motion is $(g = 10ms^{-2})$

A. 120 J

B. 80 J

C. 40 J

D. 30 J

Answer: A

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49. A rigid metallic sphere is sprinnig around its own axis in the absence of external torque. If the temperature is raised, its volume increases by 9%. The change in its angular speed is

A. increases by 9%

B. decreases by 9%

C. increase by 6%

D. decrease by 6%

Answer: D

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50. Two spheres P and Q, each of mass 200 g are attached to a string of length one metre as shown in the figure. The string and the spheres are then whirled in a horizontal circle about O at a constant angular speed. The ratio of the

tension in the string between P and Q to that of between P and O is (P is at mid-point of the line joining O and Q)

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

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

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

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

Answer: B

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51. The potential energy of a simple harmonic oscillator of mass 2 kg at its mean position is 5 J. If its total energy is 9 J and amplitude is 1 cm, then its time period is

A. $\frac{\pi}{100}s$

B. $\frac{\pi}{50}s$

C. $\frac{\pi}{20}s$

D. $\frac{\pi}{10}s$

Answer: A

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52. Three masses m, 2m and 3m are arranged in two triangular configurations as shown in figure 1 and figure 2. Work done by an external agent in changing, the configuration from figure 1 to figure 2 is

A. $\frac{6Gm^2}{a}\left[2-\frac{6}{\sqrt{2}}\right]$

B. 0

C. $\frac{Gm^2}{a}\left[6+\frac{6}{\sqrt{2}}\right]$

D. $-\frac{Gm^2}{a}\left[6-\frac{6}{\sqrt{2}}\right]$

Answer: D

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53. Two equal and opposite forces each F act on a rod of uniform cross-sectional area a as shown in the figure. Shearing stress on the section AB will be

A. $\frac{F\sin\theta\cos\theta}{a}$

B. $\frac{F \sin \theta}{a}$

C. $\frac{F \cos \theta}{a}$

D. $\frac{F \sin^2 \theta}{a}$

Answer: A

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54. A body is suspended by a light string. The tension in the string when the body is in air, when the body is totally immersed in water and when the body is totally immersed in a liquid

are respectively 40.2 N, 28.4N and 16.6 N. The density of the liquid is

A. $1200kg - m^{-3}$

B. $1600kg - m^{-3}$

C. $2000kg - m^{-3}$

D. $2400kg - m^{-3}$

Answer: C

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55. Steam at $100^\circ C$ is passed into 1 kg of water contained in a calorimeter at $9^\circ C$ till the temperature of water and calorimeter is increased to $90^\circ C$. The mass of the steam condensed is nearly

(water equivalent of calorimeter =0.1 kg, specific heat of water $= 1 \ \text{cal g}^{-1\circ}C^{-1}$ and latent heat of vaporisation $= 540 \ \text{cal g}^{-1}$)

A. 81 g

B. 162 g

C. 243 g

D. 486 g

Answer: B

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56. Three very large plates of same area are kept parallel and close to each other. They are considered as ideal black surfaces and have very high thermal conductivity. First and third plates are maintained at absolute temperatures 2T and 3T respectively. Temperature of the middle plate in steady state is

A. $\left(\frac{65}{2}\right)^{\frac{1}{4}} T$

B. $\left(\frac{97}{4}\right)^{\frac{1}{4}} T$

C. $\left(\frac{97}{2}\right)^{\frac{1}{4}} T$

D. $(97)^{\frac{1}{4}} T$

Answer: C

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57. A thermally insulated vessel with nitrogen gas at $27^{\circ} C$ is moving with a velocity of $100 ms^{-1}$. If the vessel is stopped suddenly,

then the percentage change in the pressure of the gas is nearly (assume entire loss in KE of the gas is given as heat to gas and $R = 8.3 \ \text{Jmol}^{-1}K^{-1}$)

A. 1.1

B. 0.93

C. 0.5

D. 2.25

Answer: D

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58. Match the following lists.

The correct answer is

A. A B C D
II IV III I

B. A B C D
III IV II I

C. A B C D
III I II IV

D. A B C D
I III IV II

Answer: B

View Text Solution

59. For a molecule of an ideal gas, the number density is $2\sqrt{2} \times 10^8 cm^{-3}$ and the mean free path is $\frac{10^{-2}}{\pi} cm$. The diameter of the gas molecule is

A. $5 \times 10^{-4} cm$

B. $0.5 \times 10^{-4} cm$

C. $2.5 \times 10^{-4} cm$

D. $4 \times 10^{-4} cm$

Answer: A

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60. A solid ball is suspended from the ceiling of a motor car through a light string. A transverse pulse travels at the speed $60cm^{-1}$. The acceleration of the car is nearly $(g = 10ms^{-2})$

A. $4.3ms^{-2}$

B. $2.9ms^{-2}$

C. $6.8ms^{-2}$

D. $5.5ms^{-2}$

Answer: C

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61. A reflector is moving with $20ms^{-1}$ towards a stationary source of sound. If the source is producing sound waves of 160 Hz., then the wavelen of the reflected wave is (speed of sound in air is $340ms^{-1}$)

A. $\frac{17}{8}m$

B. $\frac{17}{11}m$

C. $\frac{17}{9}m$

D. $\frac{17}{16}m$

Answer: C

62. A light ray incidents normally on one surface of an equilateral prism. The angle of deviation of the light ray is (refractive index of the material of the prism $=\sqrt{2}$)

A. 60°

B. 30°

C. 0°

D. 120°

Answer: A

Watch Video Solution

63. Two polaroids are placed in the path of unpolarised light beam of intensity I_0 such that no light is emitted from the second polarisation. If a third polaroid whose polarisation axis makes an angle θ with that of the first polaroid is placed between the

polaroids, then intensity of light emerging from the last polaroid is

A. $\left(\frac{I_0}{8}\right)\sin^2 2\theta$

B. $\left(\frac{I_0}{4}\right)\sin^2 2\theta$

C. $\left(\frac{I_0}{2}\right)\cos^2 \theta$

D. $I_0 \cos^2 \theta$

Answer: A

View Text Solution

64. Two points charges are kept in air with a separation between them. The force between them is F_1, if half of the space between the charges is filled with a dielectric constant 4 and the force between them is F_2. If $\frac{1}{3}$rd of the space between the charges is filled with dielectric of dielectric constant 9. Then $\frac{F_1}{F_2}$ is

A. $\frac{27}{64}$

B. $\frac{16}{81}$

C. $\frac{81}{64}$

D. $\frac{100}{81}$

Answer: D

View Text Solution

65. A simple pendulum with a bob of mass 40g and charge $+2\mu C$ makes 20 oscillation in 44 s. A vertical electric field magnitude $4.2 \times 10^4 NC^{-1}$ pointing downward is applied. The time taken by the pendulum to make 15 oscillation in the electric field is (acceleration due to gravity $= 10ms^{-2}$)

A. 30 s

B. 60 s

C. 90 s

D. 15 s

Answer: A

Watch Video Solution

66. A parallel plate capacitor has a capacity $80 \times 10^{-6} F$, when air is present between its plates. The space between the plates is filled with a dielectric slab of dielectric constant 20.

The capacitor is now connected to a battery of 30V by wires. The dielectric slab is then removed. Then, the charge passing through the wire is

A. $12 \times 10^{-3} C$

B. $253 \times 10^{-3} C$

C. $120 \times 10^{-3} C$

D. $456 \times 10^{-3} C$

Answer: D

Watch Video Solution

67. Three uncharged capacitors C_2 and C_3 are connected as s figuree. A,B and C are at pot V_v respectively, then the pot

A. $\frac{C_1V_1 + C_2V_2 + C_3V_3}{C_1 + C_2 + C_3}$

B. $\frac{C_1V_1 + C_2V_2 - C_3V_3}{C_1 + C_2 + C_3}$

C. $\frac{C_1V_1 - C_2V_2 - C_3V_3}{C_1 + C_2 + C_3}$

D. zero

Answer: A

View Text Solution

68. The equivalent resistance between 6Ω. The value of R_1 is

A. 20Ω

B. 10Ω

C. 51Ω

D. 40Ω

Answer: B

View Text Solution

69. A battery of emf 10 V is con uniform wire AB of 1m leng resistance of 10Ω in series resistons as shown in the figure emf 2V and 3V having inter and 3Ω. Respectively are configure in the figure. If the galvano deflection at point J on the distance of point J from the

A. 48 cm

B. 50 cm

C. 52 cm

D. 54 cm

Answer: C

View Text Solution

70. Two infinitely long wires carry currents 4A and 3A placed along X-axis and Y-axis respectively. Magnetic field at a point p(0,0,d) m will be.....T.

A. $\frac{4\mu_0}{2\pi d}$

B. $\frac{3\mu_0}{2\pi d}$

C. $\frac{7\mu_0}{2\pi d}$

D. $\frac{5\mu_0}{2\pi d}$

Answer: D

Watch Video Solution

71. Two moving coil galvanometer, X and Y have coils with resistance $10\Omega \text{ and } 14\Omega$ cross-sertional areas $4.8 \times 10^{-3} m^2 \text{ and } 2.4 \times 10^{-3} m^2$, number of turns 30 and 45 respectively. They are placed in

magnetic field of 0.25 T and 0.50 T respectively. Then, the ratio of their voltage sensitivities and the ratiof of their voltage senstivities are respectively

A. $2:3, 14:15$

B. $5:7, 2:1$

C. $2:13, 1:2$

D. $14:15, 2:9$

Answer: A

Watch Video Solution

72. Two short bar magnets each of magnetic moment of $9Am^{-2}$ are placed such that one is at $x = -3cm$ and the other at y=-3 cm. If their magnetic moments are directed along positive and negative X-directions respectively, then the resultant magnetic field at the origin is

A. 100T

B. 10T

C. 0.1T

D. 0.001T

Answer: C

Watch Video Solution

73. A conducting rod PQ of length 1 m is moving with a uniform speed $2ms^{-1}$ in a uniform magnetic field of 4T which is directed into the paper. A capacitor of capacity $10\mu F$ is connected as shown in the figure. Then, the charge on the plates of the capacitor are

A. $q_A = +80\mu C, q_n = -80\mu C$

B. $q_A = -80\mu C, q_B =_{80} \mu C$

C. $q_A = +125\mu C, q_B = 1.25\mu C$

D. $q_A = -125\mu C, q_B = +1.25\mu C$

Answer: A

View Text Solution

74. For the AC circuit shown below, phase difference between emf and current is $\frac{\pi}{4}$ radian as shown in the graph. If the impedance of the

circuit is 1414Ω, then the values of P and Q are

A. $1k\Omega,\ 10\mu F$

B. $1k\Omega,\ 1\mu F$

C. $1k\Omega 10mH$

D. $1k\Omega,\ 1mH$

Answer: A

View Text Solution

75. In a plance electromagnetic wave, the electric field oscillates with a frequency $2 \times 10^{10} s^{-1}$ and amplitude $40 V m^{-1}$, then the energy density due to electric field is $\left(\varepsilon_0 = 8.85 \times 10^{-12} F m^{-1}\right)$

A. $1.52 \times 10^{9} \ \mathrm{Jm}^{-3}$

B. $2.54 \times 10^{9} \ \mathrm{Jm}^{-3}$

C. $3.54 \times 10^{9} \ \mathrm{Jm}^{-3}$

D. $4.56 \times 10^{9} \ \mathrm{Jm}^{-3}$

Answer: C

Watch Video Solution

76. Photons of frequencies equal to the frequencies of H_β and H_∞ lines of hydrogen incident on a photosensitive plate, whose threshold frequency is equal to the frequency of H_α line of hydrogen. The ratio of the maximum kinetic energies of the emitted electrons is

A. $7:16$

B. $3:4$

C. $8:27$

D. $5:36$

Answer: A

Watch Video Solution

77. Hydrogen atom is in its n^{th} energy state. If de-Broglie wavelength of the electrons is λ, then

A. $\lambda \propto \frac{1}{n^2}$

B. $\lambda \propto \frac{1}{n}$

C. $\lambda \propto n^2$

D. $\lambda = n$

Answer: D

Watch Video Solution

78. If 200 MeV of energy is released in the fission of one nucleus of $^{236}\_(92)U$, the number of nuclei that must undergo fission to release an energy of 1000 J is,

A. 3.125×10^{13}

B. 6.25×10^{13}

C. 12.5×10^{13}

D. 3.125×10^{14}

Answer: A

Watch Video Solution

79. If the diodes are ideal in the circuit given below, then the current through the cell is

A. 4A

B. 1.5 A

C. 2A

D. 3A

Answer: C

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80. If a message signal of frequency 10 kHz and peak voltage 12 V is used to modulate a carrier wave of frequency 1 MHz, the modulation lindex

is 0.6. To make the modulation index 0.75, the carrier peak voltage should be

A. decreased by 25%

B. increased by 25%

C. decreased by 20%

D. increased by 20%

Answer: C

 Watch Video Solution

81. In a system , uits of mass is A kg, length is B m and time is C s, then the value of 10 N in this sysem is

A. $10A^{-1}B^{-1}C^{-2}$

B. $10A^{-1}B^{-1}C^{2}$

C. $10ABC^{-2}$

D. $5A^{-1}BC^{2}$

Answer: B

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82. Assertion (A) The angle between acceleration and velocity of a body is one-dimensionla motion is always zero.

Reason (R) One -dimensional motion is along a straight line.

A. Both (A) and (R) are ture and (R) is the correct explanation of (A).

B. Both (A) and (R) are ture but (R) is not the correct explanation of (A)

C. (A) is true but (R) is false.

D. (A) is false but (R) is true.

Answer: D

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83. A projectile is given an initial velocity of $\left(\hat{i}+2\hat{j}\right)ms^{-1}$. The equation of its path is $(g=10ms^{-2})$

A. $y=2x-5x^2$

B. $y=x-5x^2$

C. $4y = 2x - 5x^2$

D. $y = 2x - 25x^2$

Answer: A

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84. A body projected with some velocity at an angle 45° with the horizontal from the origin in XY- plane passes through a point at (4,3) m . Its horizontal range is

A. $10m$

B. $14m$

C. $18m$

D. $16m$

Answer: D

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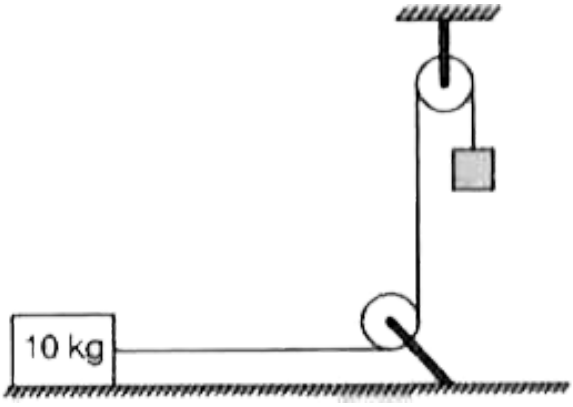
85. A block of mass 10 kg is placed on a horizontal frictionless surface and is attached to a cord which passes over two light frictionless pulleys as shown in the figure. The

hanging block tied to the other end of the cord is initially at rest 2 m above the horizontal floor. If the hanging vlock strikes the floor 2 s after the system is released, then weight of the hanging block is ... $\left(g = 10ms^{-2}\right)$,



A. 22.22 N

B. 11.11 N

C. 1.11 N

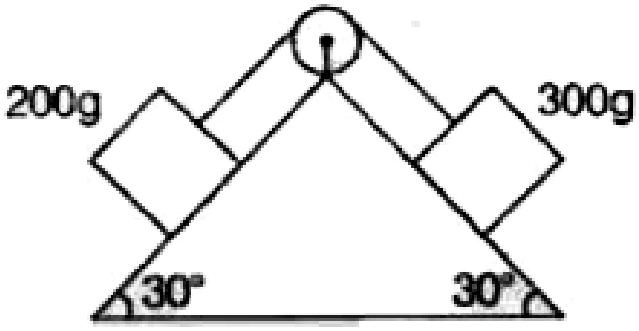
D. 2.22 N

Answer: B

Watch Video Solution

86. A double inclined plane as shown in th figure has fixed horizontal base and smooth faces with the same angle of inclination of 30° . A block of mass 300 g is on one face and is connected by a cord passing over a fictionless pulley to a second blocks of mass 200 g kept on another face. The acceleration with which the

system of the blocks moves is .... % of acceleration due gravity.



A. 5

B. 10

C. 15

D. 20

Answer: B

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87. A canon shell fired breaks into two equal parts at its highest point. If one part reatraces the path to the canon with kinetic energy E_1 and kinetic energy of the second part is E_2 , then

A. $E_2 = 15E$

B. $E_2 = E_1$

C. $E_2 = 4E_1$

D. $E_2 = 9E_1$

Answer: D

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88. A uniform chain of mass m and length l is on a smooth horizontal table with $\left(\frac{1}{n}\right)^t h$ part of its leght is hanging from one end of the table. The velocity of the chain, when it completely slips off the table is

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

B. $\sqrt{2gl\left(1+\frac{1}{n^2}\right)}$

C. $\sqrt{2gl\left(1-\frac{1}{n^2}\right)}$

D. $\sqrt{2gl}$

Answer: A

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89. Two particles of masses in th ration 1:2 are placed along a verttical line . The lighter particle is raised through a height of 9 cm. To raise the centre of mass of the system by 2 cm, the heavier particle should be

A. moved 1.5 cm downward

B. moved 2 cm upward

C. moved 1.5 cm upward

D. moved 2 cm downward

Answer: A

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90. A solid sphere and a ring of same radius roll down an inclined plane without slipping . Both start from rest from the top of the inclined

plane. If the sphere and the ring reach the bottom of the inclined plane with velocities v_s and v_r repectively. , $then \frac{v_r^2}{v_s^2}$ is

A. 0.2

B. 0.5

C. 0.7

D. 0.9

Answer: C

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91. A particle is executing SHM. The time taken for $\left(\frac{3}{8}\right)^t h$ of oscillation from extreme positions is x. Then the time taken for the particles to complete $\left(\frac{5}{8}\right)^{th}$ of oscillation from mean position is

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

B. $\frac{7x}{4}$

C. $\frac{21x}{8}$

D. $\frac{7x}{12}$

Answer: B

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92. An object is thrown vertically upwards from the surface of the earth with a velocity x times the escape velocity on the earth $(x < 1)$, then the maximum height ot which its rises from the centre of the earth is (radius of earth is R)

A. $R(1-x)^2$

B. $\frac{R}{1-x^2}$

C. $\frac{1-x^2}{R}$

D. $\frac{x^2}{1-R}$

Answer:

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93. A sphere of mass 2 kg and diameter 4.5 cm is attached to the lower and of a steel wire of 2 m length and are of cross- section $0.24 \times 10^{-6} m^2$. The wire is suspended from 205 cm high ceilling of a room. When the system is made to oscillate as a simple pendulum, the sphere just grazes the floor at its lowest psition. The velocity of the sphere at the lowest position is

(young's modulus of steel $= 2 \times 10^{11} Nm^{-2}$ and acceleraiton due to gravity $= 10ms^{-2}$)

A. $10ms^{-1}$

B. $12ms^{-1}$

C. $15ms^{-1}$

D. $18ms^{-1}$

Answer: A

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94. A spherical body of density ρ is floating half immersed in liquid of density d, if α is the surface tension of the liquid, then the diameter of the body is

A. $\sqrt{\frac{3\alpha}{g(2\rho - d)}}$

B. $\sqrt{\frac{6\sigma}{g(2\rho - d)}}$

C. $\sqrt{\frac{4\sigma}{g(2p - d)}}$

D. $\sqrt{\frac{12\sigma}{g(2\rho - d)}}$

Answer: A

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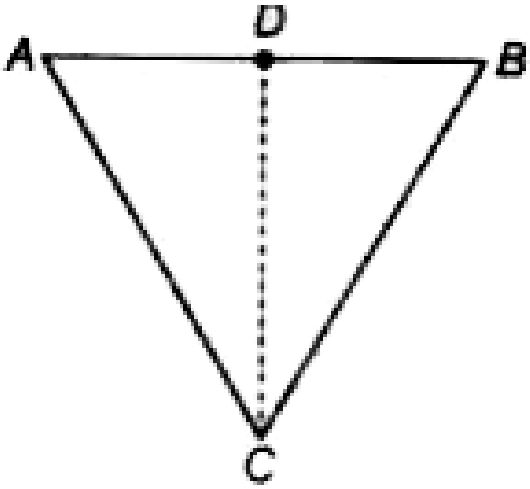
95. As shown in the figure , an equilateral triangle ABC is formed by joining three rods of equal lengths and D is the midpoint of AB. Coefficient of linear expansion of the material of $ABis\alpha_1$ and that of AC and BC is α_2 . If the length DC remains constant for small changes

in temperature , then



A. $\alpha_1 = \alpha_2$

B. $\alpha_1 = 4\alpha_2$

C. $\alpha_2 = 4\alpha_1$

D. $\alpha_1 = \frac{\alpha_2}{2}$

Answer: B

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96. Match the following List I with List II

List I	List II
A. When ice melts into water	I. Volume increases
B. When water changes into steam	II. Volume decreases
C. Melting point of ice	III. Increases with increase of pressure
D. Boiling point of water	IV. Decreases with increase in pressure

A. $\begin{matrix} A & B & C & D \\ I & II & III & IV \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ II & I & IV & III \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ III & II & IV & I \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ II & I & III & IV \end{matrix}$

Answer: B

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97. A cylindrical vessel of unifrom cross-section consisting of a gas of γ =1.5 is divided into two parts A and B using a piston. Intially the piston is kept fixed such that part A has pressure p and volume 5 v and the part B has pressure 8 p and volume V. If the piston is let free and the gas is allowed to undergo adiabatic process, then the final volume of the gas in part A is

A. $3V$

B. $\frac{8}{3}V$

C. $\frac{10}{3}$V

D. $\frac{13}{3}$ V

Answer: C

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98. A diatomic ideal gas is used in Carnot's engine as working substance. Duting aidabatic expansion of the cycle , if the volume of the gas

increases from V t0 32 V, then the efficiency of the engine is

A. 0.25

B. 0.5

C. 0.67

D. 0.75

Answer: D

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99. The absolute temperature at which the rms speed of hydrogen molecule is equal to its (where ,R is radiud of moon is r,g acceleration due to gravity on Moon's surface , m is mass of hydrogen molecules and k is Boltzmann constant).

A. $\frac{mgR}{2k}$

B. $\frac{2mgR}{k}$

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

D. $\frac{2mgR}{3K}$

Answer: D

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100. An object of density 2000kg-m^{-3} is hung from a thin light wire . The fundamental frequency of the transverse waves in the wire is 2009 Hz. If the object if immersed in water such that half of its volume is submerged, the the fundamental frequency of the transverse waves in the wire is

A. 200Hz

B. 173.2Hz

C. 100Hz

D. 141.4 Hz

Answer: B

101. An observer and a source emitting sound of frequency 120 Hz are the X-axis . The observer is stationary while the source of sound is in motion given by the equation x=3 sin ω (x is in

metres and t is in seconds). If the diffrence between the maximum and minimum frequencies of the sound observed by the observers is 22Hz , then the value of ω is (speed of sound in air = 330 ms^{-1}

A. 33 rad s^{-1}

B. 36 rad s^{-1}

C. 20 rad s^{-1}

D. 10 rad s^{-1}

Answer: D

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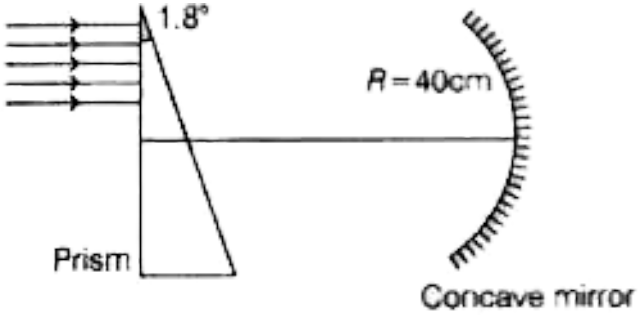
102. As shown in the figure , a parallel beam of light incidents on the upper part of a prism of angle 1.8° and material pf refractive index 1.5 . The light emerging out from the prism falls on a convature 40 cm. This distance of the point from the principal axis of the mirror where the light rays are focussed after reflection from the mirror is



A. 4.76 cm

B. 1.57mm

C. 3.14mm

D. 6.28mm

Answer: B

View Text Solution

103. A microscope has an objective of aperture 8 mm and focal length of 5cm .The minimum separation between two objects to be just

resolved by the microscope is (wavelength of light used = 5500 Å

A. $2.2\mu m$

B. $3.4\mu m$

C. $4.2\mu m$

D. $3.6\mu m$

Answer: C

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104. The electric field due to a short electric dipole at a distance r on the axial line from its mid-point is 2r on the equatorial line from the mid -point of dipole. Then the value of x is

A. 16

B. 9

C. 25

D. 36

Answer: A

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105. A point charge q is placed at origin. Let E_A, E_B and E_c be the electric fields at three points A (1,2,3) , B (1,1,-1) and C (2,2,2) respectively due to the charge q. Then , the relation between them is

1. $E_A \perp E_B$ 2. $E_A \mid\mid E_c$

3. $|E_B| = 4|E_c|$ 4. $|E_B| = 8|E_c|$

A. 1,4 are correct

B. 2,4 are correct

C. 1,3 are correct

D. 2,3 are correct

Answer: C

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106. A dipole has two charges $+1\mu C$ and $-1\mu C$ and each of mass 1 kg. The separation between the charges is 1 m. An electric field $20 \times 10^3 Vm^{-1}$ is applied on the dipole. If the dipole is deflected through 2° from the equilibrium position, then the time

taken by it to come to equilibrium position again is

A. 2.5π

B. 2π

C. 5π

D. 4π

Answer: A

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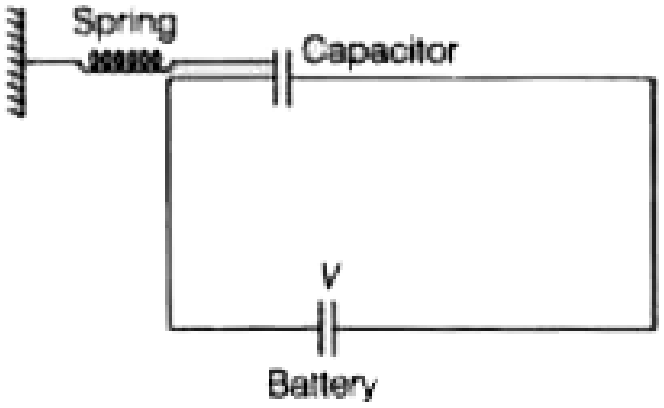
107. One plate of a parallel plate capacitor is connected to a spring as shown in the figure. The area of each plate of the capacitor is A when the battery is not connected and the spring is unstreteched. After connecting the battery, in the steady state the distance between the plates is 0.75 d , then the force constant of the spring is



A. $\frac{3}{8}\frac{\varepsilon_0 V^2 A}{d^3}$

B. $\frac{8}{3}\frac{\varepsilon_0 V^2 A}{d^3}$

C. $\frac{9}{32}\frac{\varepsilon_0 V^2 A}{d^3}$

D. $\frac{32}{9}\frac{\varepsilon_0 V^2 A}{d^3}$

Answer: D

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108. Two cells P and Q each of emf 2.16 V are connected in series with a resistor of 19.6 Ω An ideal voltmeter reads 2V, when connected

across the cell P and 1.92 V when connected across the cell Q. The ratio of the internal resistance ot the cell P and Q is

A. $1:2$

B. $2:3$

C. $3:4$

D. $1:3$

Answer: B

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109. A resistor has bands with colours orange, green , silver and gold . Then, the resistance of the resistor is.

A. $(350 \pm 5)m\Omega$

B. $(350 \pm 17.5)m\Omega$

C. $(35 \pm 5\,\%\,)m\Omega$

D. $(250 \pm 5\,\%\,)m\Omega$

Answer: B

View Text Solution

110. A beam of protons enters a uniform magnetic field of 0.314 T with a velocity 4×10^5 ms^{-1} in a direction making an angle 60° with the direction of the magnetic field. The path of the beam is (mass of proton = 1.6×10^{-27}kg)

A. a circle of radius 0.2 m

B. a straight line

C. a helix with a pitch 4 cm

D. a helix with a pitch 4 mm

Answer: C

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111. The magnetic field due to a current carrying loop of radius 3 cm at a point on axis at a distance of 4 cm from its centre of 54 μ T. Then , the value of the magnetic field at the centre of the loop is

A. 250μ T

B. 150μT

C. 75μT

D. 125μT

Answer: A

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112. A short bar magnet of magnetic moment 0,21 A -m^2 is placed with its axis perpendicular to the direction of the horizontal component of the earth 's magnetic field .The distance of the point on the axis of the magnet from the centre of the magnet where the resultant magnetic field is inclined at 45° with the horizontal component of the earth's field direction is

(horizontal component of the earth's magnetic field 4.2×10^{-5}

A. 12cm

B. 20cm

C. 5cm

D. 10cm

Answer: D

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113. The length of a wire required to make a solenoid of length l and self - induction L is

A. $f_a = f_b \text{ and } l_a \neq l_b$

B. $f_a = f_c \text{ and } l_a = l_c$

C. $f_a = f_b \text{ and } l_a = l_b$

D. $f_b = f_c \text{ and } l_b = l_c$

Answer: A

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114. An inductor and a resistor are connected in series to an AC source. The current in circuit is 500 mA, if the applied AC voltage is $8\sqrt{2}$ V at a frequency of $\frac{175}{\pi}$ Hz and the current in the circuit is 400 mA, if the same AC voltage at a frequency of $\frac{225}{\pi}$ Hz is applied . The values of the inductance and the resistance are respectively

A. 60 m H ,71 Ω

B. $\sqrt{60}$mH,71Ω

C. $\sqrt{60}$ mH,$\sqrt{71}\Omega$

D. 60 mH, $\sqrt{71}\Omega$

Answer: D

View Text Solution

115. An electromagnetic wave of frequency 2 MHz propagates from vacuum to a non - magnetic medium of relative permittivity 9. Then its ' wavelength

A. increases by 100 m

B. increases by 50 m

C. decreases by 50 mm

D. decreases by 100 m

Answer: D

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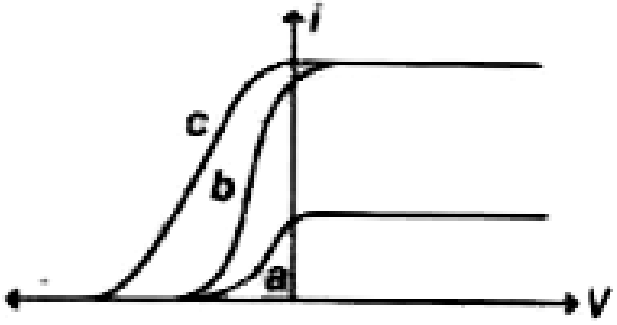
116. The figures shows th variation of photocurrent i with anode potential V for three differential radiations. Let $I_a I_b$ and I_c be the intensities and f_a, f_b and f_c be the frequencies for the curves a, b and c

respectively . Then



A. $f_a = f_b$ and $l_a \neq l_b$

B. $f_a = f_c$ and $l_a = l_c$

C. $f_a = f_b$ and $l_a = l_b$

D. $f_b = f_c$ and $l_b = l_c$

Answer: A

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117. A stationary hydrogen atom undrgoes a transition from n=5 to n=4. Recoil speed of the atom is (R=Rydberg constant, h=Planck's constant and m=mass of the proton.)

A. $\frac{Rh}{m}$

B. $\frac{9m}{400Rh}$

C. $\frac{9Rh}{400m}$

D. $\frac{7Rh}{400}$

Answer: C

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118. The half life of $^{238}_{92}U$against α - decay is 13.86×10^{16} s . The activity of 1 g sample of is

A. $1.26 \times 10^{4} s^{-1}$

B. $1.26 \times 10^{-4} s_{-1}$

C. $12.6 \times 10^{4} s^{-1}$

D. $12.6 \times 10^{-4} s^{-1}$

Answer: A

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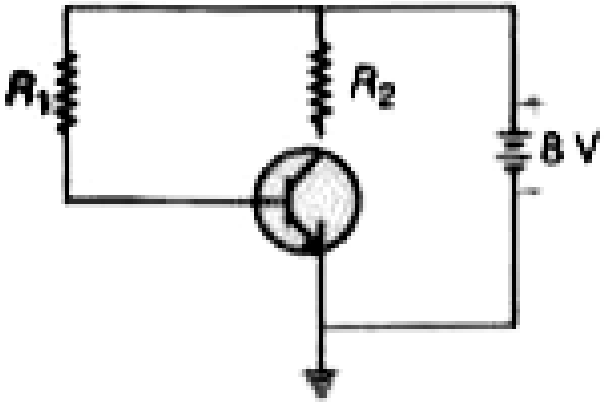
119. An n-p-n transistor is connected in common - emitter configuration as shown in $V_{BE} = 0.6V, V_{CE} = 3$ and common - emitter current amplification factor is 50, then the values of R_1 and R_2 are respectively.



A. $1k\Omega, 74kg\Omega$

B. $74k\Omega, 1k\Omega$

C. $37K\Omega, 2k\Omega$

D. $2k\Omega, 37k\Omega$

Answer: B

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120. The maximum distance between the transmitting and receiving TV towers is 65km . If the ratio of the heights of the TV transmitting tower to receiving tower is 36:49, the heights of

the transmitting and receiving towers respectively are (radius of earth = 6400km)

A. 51.2 m,80m

B. 70.3m,95.7m

C. 30m, 65m

D. 25m.75m

Answer: B

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121. Match the measurements given in List I with the number of significant figures given in List II.

	List I	List II
(A)	74.083	I. 3
(B)	0.029	II. 4
(C)	0.002407	III. 2
(D)	2.74×10^7	IV. 5

The correct answer is

A. A B C D
IV II III I

B. A B C D
IV III II I

C. A B C D
III IV II I

D. A B C D
I II III IV

Answer: B

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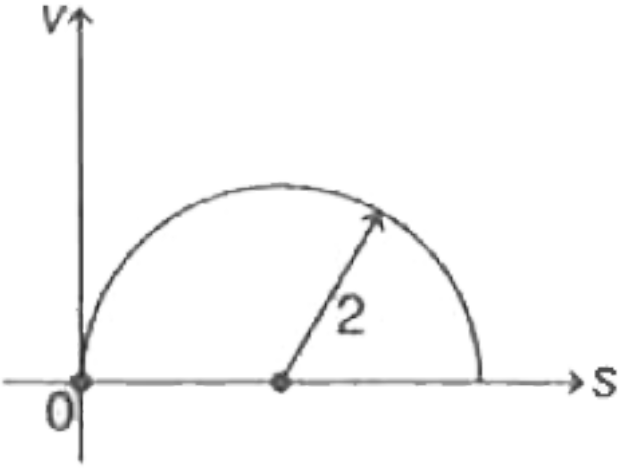
122. The velocity - displacement (v-s) graph shows the motion of particle moving in a straight line.

Velocity-displacement graph is a circle of radius 2 m and centre is at (2, 0) m.

The value of acceleration for this particle at a

point $(2-\sqrt{2}, \sqrt{2})$m will be ..... ms^{-2}.



A. $\sqrt{2}$

B. 4

C. 2

D. 3

Answer: A

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123. A body is projected horizontally from the top of a tall tower with a velocity of $30ms^{-1}$. At time t_1, its horizontal and vertical components of the velocity are equal and at time t_2, its horizontal and vertical displacements are equal. Then $t_2 - t_1$ is (take, $g = 10ms^{-2}$)

A. 1 s

B. 1.5 s

C. 2 s

D. 3 s

Answer: D

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124. A particle is projected at an angle of 60° with the horizontal from the ground with a velocity $10\sqrt{3}ms^{-1}$. The angle between velocity

vector after 2s and initial velocity vector is ($g = 10ms^{-2}$)

A. 0°

B. 30°

C. 60°

D. 90°

Answer: D

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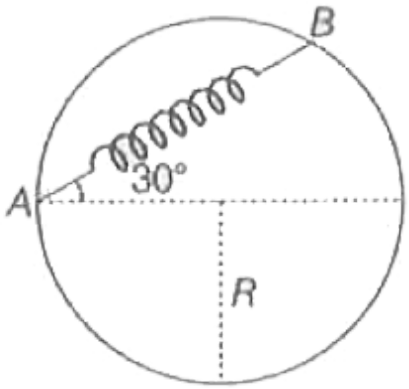
125. A bead of mass 100 g is attached to one end of a spring of natural length L and spring constant $k = \frac{\left(\sqrt{3}+1\right)mg}{L}$, where m is the mass of bead. The other end of the spring is fixed at point A on a smooth vertical ring of radius R as shown in the figure. The normal reaction at B just after it is released to move is (take, $g = 9.8ms^{-2}$)



A. 1.73 N

B. 2.23 N

C. 2.44 N

D. 2.55 N

Answer: D

View Text Solution

126. A rocket with an initial mass m_0 is going up with a constant acceleration a by exhausting gases with a velocity v relative to the rocket

motion, then the mass of the rocket at any instant of time is (assume that no other forces act on it)

A. $m = m_0 e^{-\frac{at}{v}}$

B. $m = m_0 e^{-\frac{2at}{v}}$

C. $m = m_0 e^{-\frac{at}{2v}}$

D. $m = m_0 e^{-\frac{a^2t^2}{v^2}}$

Answer: A

View Text Solution

127. A particle is released freely from a height H. At a certain height, its kinetic energy is two times of its potential energy. Then, the height and the speed of the particle at that instant are respectively

(g = acceleration due to gravity)

A. $\frac{H}{3}, \sqrt{\frac{2gH}{3}}$

B. $\frac{H}{3}, 2\sqrt{\frac{gH}{3}}$

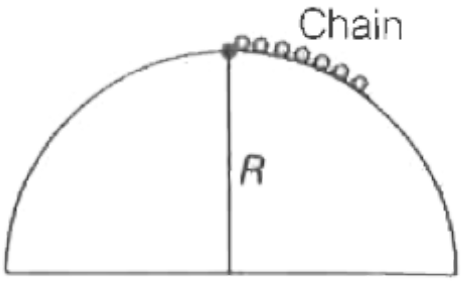
C. $\frac{2H}{3}, \sqrt{\frac{2gH}{3}}$

D. $\frac{H}{3}, \sqrt{2gH}$

Answer: B

View Text Solution

128. A uniform chain of length l and mass m lies on the surface of a smooth hemisphere of radius $R(R > l)$ with one end tied to the top of the hemisphere as shown in the figure. Gravitational potential energy of the chain with respect to the base of the hemisphere is



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

B. $\frac{mgR^2}{l}\sin\left(\frac{l}{R}\right)$

C. $\frac{mgR^2}{l}\sin\left(\frac{R}{l}\right)$

D. $\frac{mgl^2}{R}\sin\left(\frac{l}{R}\right)$

Answer: B

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129. A particle of mass 15 kg is moving with a uniform speed $8ms^{-1}$ in xy-plane along the line 3y = 4x + 10, then the magnitude of its angular

momentum about the origin in

$kg - m^2 s^{-1}$ is $\ldots \left(\sin 53^\circ = \frac{4}{5} \right)$

A. 240

B. 80

C. 120

D. 280

Answer: A

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130. An empty bucket of mass 1 kg attached by a light cord passed over a pulley of a water well is released from rest. If the pulley assembly is assumed to be a uniform solid cylinder of mass 8 kg and free to rotate about its axis without any friction, then the speed of the bucket as it hits the water 16 m below is (take, g = $10ms^{-2}$)

A. $4ms^{-1}$

B. $8ms^{-1}$

C. $16ms^{-1}$

D. $20ms^{-1}$

Answer: B

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131. The displacement of a particle of mass 2 g executing SHM is given by $y = 5\sin\left(4t + \frac{\pi}{3}\right)$. Here, y is in metres and t is in seconds. The kinetic energy of the particle, when $t = \frac{T}{4}$ is

A. 0.4 J

B. 0.5 J

C. 3 J

D. 0.3 J

Answer: D

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132. Two bodies of equal masses are some distance apart. If 20 % of mass is transferred from the first body to the second body, then the gravitational force between them

A. increases by 4%

B. increases by 14%

C. decreases by 4%

D. decreases by 14%

Answer: C

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133. One end of a long metallic wire of length L, area of cross-section A and Young's modulus Y is tied to the ceiling. The other end is tied to a massless spring of force constant k and a mass m is hung from the free end of the spring. If m

is slightly pulled down and released, then its time period of oscillation is

A. $2\pi\sqrt{\frac{m}{k}}$

B. $2\pi\sqrt{\frac{mYA}{kL}}$

C. $2\pi\sqrt{\frac{m(kA+YL)}{kYA}}$

D. $2\pi\sqrt{\frac{m(kL+YA)}{kYA}}$

Answer: D

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134. Two solid sphere of radii 2 mm and 4 mm are tied to the two ends of a light string and released in a liquid of specific gravity 1.3 and coefficient of viscosity 1 pa-s. The string is just taut, when the two spheres are completely in the liquid. If the density of the materials of the two sphere is $2800 kgm^{-3}$, then the terminal velocity of the system of the sphere is

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

A. $2 cms^{-1}$

B. $4 cms^{-1}$

C. $4ms^{-1}$

D. $2ms^{-1}$

Answer: B

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135. Assertion (A) A room can be cooled by opening the door of a refrigerator in it.

Reason (R) Heat always flows from a body at higher temperature to a body at lower temperature.

A. (A) and (R) are true and R is the correct explanation of (A).

B. (A), (R) are true and (R) is not the correct explanation of (A).

C. (A) is true but (R) is false

D. (A) is false but (R) is true.

Answer: D

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136. A wire of 20Ω is immersed in ice. If 10 A current is passed through this wire for 1 minute, ice completely melts. The mass of the ice is nearly $\left(L_{\text{ice}} = 79.7\text{cal}g^{-1}\right)$

A. 3.5 g

B. 359 g

C. 540 g

D. 3.5 kg

Answer: B

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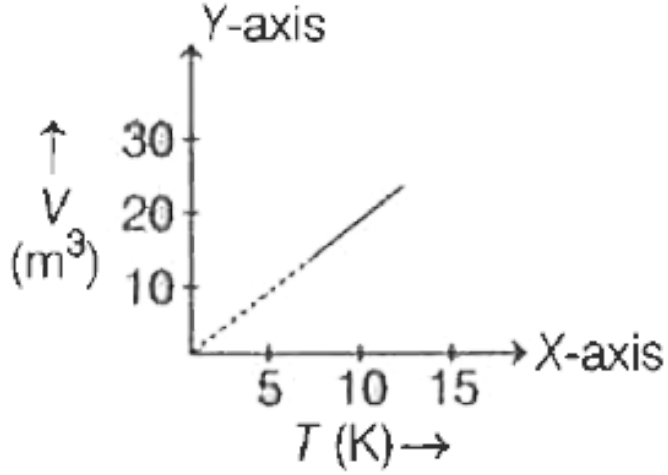
137. A graph drawn between absolute temperature and volume of 3 moles of helium gas as shown in the figure. If 5 cal of heat is used in the process, then the work done is



A. 21.0 J

B. 8.4 J

C. 12.6 J

D. 6.2 J

Answer: B

Watch Video Solution

138. An ideal gas is found to obey $pV^{\frac{3}{2}}$ = constant during an adiabatic process. If such a gas initially at a temperature T is adiabatically

compressed to half of its initial volume, then its final temperature is

A. $\sqrt{2}T$

B. 2T

C. $2\sqrt{2}T$

D. 4T

Answer: A

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139. The rms speed of oxygen molecule at a certain temperature is $600ms^{-1}$. If the temperature is doubled and oxygen molecule dissociates into atomic oxygen atoms, the new rms speed is

A. $120ms^{-1}$

B. $150ms^{-1}$

C. $1200ms^{-1}$

D. $600ms^{-1}$

Answer: C

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140. A progressive wave of frequency 500 HZ is travelling with a velocity of $360ms^{-1}$. The distance between the two points, having a phase difference of 60° is .....

A. 1.2 m

B. 12 m

C. 0.12 m

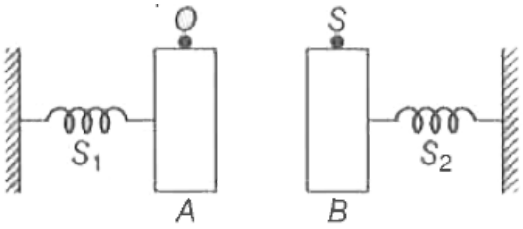
D. 0.012 m

Answer: C

Watch Video Solution

141. A source S emitting sound of frequency 288 Hz is fixed on block B which is attached to the free end of a spring S_2 and an observer O is on block A which is attached to the free end of spring S_1 as shown in the figure. The blocks A and B are simultaneously displaced towards each other through a distance of 0.5 m and then left to oscillate. If the angular velocity of

each blocks is $40 \mathrm{rad} s^{-1}$, then the maximum frequency observed by the observer is (speed of sound in air is 340 ms^{-1})



A. 288 Hz

B. 310 Hz

C. 324 Hz

D. 256 Hz

Answer: C

Watch Video Solution

142. In a compound microscope, the focal lengths of two lenses are 1.5 cm and 6.25 cm. An object is placed at 2 cm from the objective and the final image is formed at 25 cm from the eye lens. The distance between the two lenses is ... (in cm).

A. 6

B. 7.75

C. 9.25

D. 11

Answer: D

Watch Video Solution

143. In Young's double slit experiment of central fringe is I_0 and fringe width is β. If a point is at a distance x from the central fringe, then the intensity at that point is

A. $I_0 \cos^2\left(\frac{\pi x}{\beta}\right)$

B. $I_0 \cos^2\left(\frac{x}{\beta}\right)$

C. $\frac{l_0}{4}\cos^2\left(\frac{\pi x}{\beta}\right)$

D. $l_0\cos^2\left(\frac{\pi\beta}{x}\right)$

Answer: A

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144. A proton and an α-particle start from rest in a uniform electric field. The ratio of times taken by them to travel the same distance in the field is

A. `sqrt5:sqrt2

B. $\sqrt{3}:1$

C. $2:1$

D. $1:\sqrt{2}$

Answer: D

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145. Two charged balls moving in the same direction with same velocity v are placed in an electric field. After some time, one ball moves with velocity $\frac{v}{2}$ at an angle of 60° with the

initial direction and the other ball moves at right angles to the initial direction with a velocity v'.

Then, the value of v' is

A. $\frac{v}{\sqrt{2}}$

B. $\frac{v}{\sqrt{3}}$

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

D. v

Answer:

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146. Electric field vector in a region is given by $E = \left(3\hat{i} + 4\hat{j}\right)V - m^{-1}$. The potential at the origin is zero. Then, the potential at a point (2, 1) m is

A. 7V

B. 8V

C. $-8V$

D. $-7V$

Answer: C

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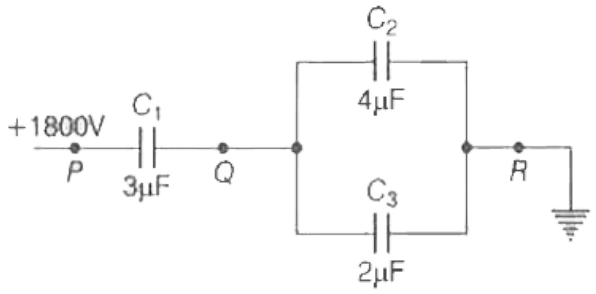
147. In the circuit shown in figure, if the point R is earthed and point P is given a potential of +1800V, then charges on C_2 and C_3 are respectively



A. $2.4 \times 10^{-3}C, 12 \times 10^{-3}C$

B. $1.6 \times 10^{-3}C, 0.8 \times 10^{-3}C$

C. $32 \times 10^{-3}C, 1.6 \times 10^{-3}C$

D. $4.8 \times 10^{-3} C, 2.4 \times 10^{-3} C$

Answer: A

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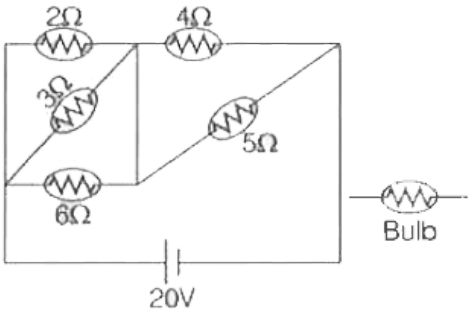
148. The bulb which glows with maximum intensity in the given circuit is



A. 4Ω bulb

B. 2Ω bulb

C. 3Ω bulb

D. 6Ω bulb

Answer: A

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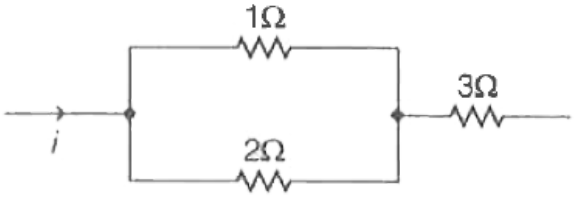
149. In the circuit shown in figure, power developed across $1\Omega, 2\Omega$ and 3Ω resistances

are in the ratio.



A. $1:2:3$

B. $4:2:27$

C. $6:4:9$

D. $2:1:27$

Answer: B

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150. Two long straight parallel conductors are carrying currents i_1 and i_2 in the same direction. Work done per unit length, when the distance between them is doubled is

A. $2 \times \frac{\mu_0}{2\pi} i_1 i_2$

B. $\frac{\mu_0}{2\pi} i_1 i_2 \ln[2]$

C. $\frac{\mu_0}{2\pi} i_1 i_2 \ln[4]$

D. 0

Answer: B

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151. A straight conductor of length 32 cm carries a current of 30 A. Magnetic induction at a point in air at a perpendicular distance of 12 cm from the mid-point of the conductor is

A. 0.2 G

B. 0.3 G

C. 0.4 G

D. 0.5 G

Answer: C

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152. A sample of a paramagnetic salt containing 3×10^{24} atomic dipoles each of dipole moment $2 \times 10^{-23} A - m^2$ is subjected to a uniform magnetic field of 800 mT and cooled to a temperature of 3.5 K. The degree of magnetic saturation achieved is 10%. If the sample is subjected to a magnetic field of 990 mT and cooled to a temperature of 2.1 K, then the total dipole moment of the sample is

A. $11.25 A - m^2$

B. $23.5A - m^2$

C. $15A - m^2$

D. $75A - m^2$

Answer: A

Watch Video Solution

153. A coil of wire of radius r has 600 turns and self inductance of 108 mH. The self inductance of a coil with same radius and 500 turns is

A. 80 mH

B. 75 mH

C. 108 mH

D. 90 mH

Answer: B

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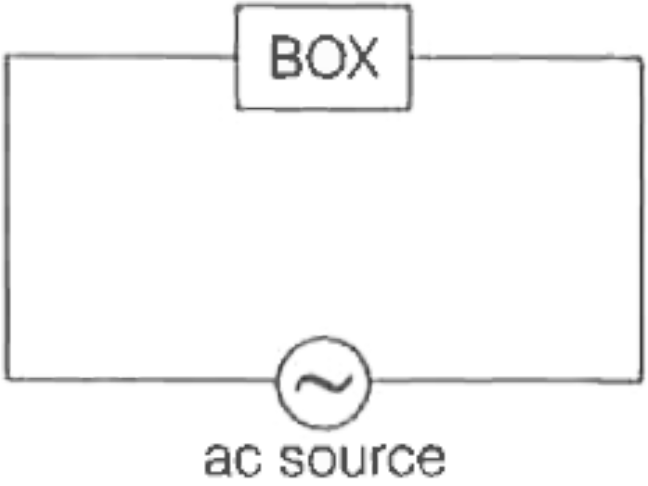
154. In the AC circuit shown,

$E = E_0 \sin(\omega t + \phi)$ and $i = i_0 \sin\left(\omega t + \phi + \frac{\pi}{4}\right)$

.

Then, the box contains



A. Only C

B. L and R in series

C. C and R in series or L, C and R in series

D. Only R

Answer: C

Watch Video Solution

155. The oscillating electric field of an electromagnetic wave is given by $E_y = 30\sin\left(2 \times 10^{11}t + 300\pi x\right)Vm^{-1}$. Then, the value of wavelength of the electromagnetic wave is

A. $5.67 \times 10^{-3}m$

B. $6.67 \times 10^{-3}m$

C. $66.7 \times 10^{-3} m$

D. $7.66 \times 10^{-3} m$

Answer: B

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156. Photons of wavelength λ emitted by a source of power P incident on a photo cell. If the current produced in the cell is I, then the percentage of incident photons which produce

current in the photo cell is. (where, h is Planck's constant and c is the speed of light in vacuum)

A. $\frac{100ePc}{lh\lambda}$

B. $\frac{100eP\lambda}{lhc}$

C. $\frac{100lh\lambda}{ePc}$

D. $\frac{100lhc}{eP\lambda}$

Answer: D

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157. If λ_1 and λ_2 are the wavelength of the photons emitted, when electrons in the n^{th} orbit of hydrogen atom fall to first excited state and ground state respectively, then the value of n is

A. $\sqrt{\frac{2(\lambda_2 - \lambda_1)}{2\lambda_2 - \lambda_1}}$

B. $\sqrt{\frac{2\lambda_2 - \lambda_1}{2(\lambda_2 - \lambda_1)}}$

C. $\sqrt{\frac{4\lambda_2 - \lambda_1}{4(\lambda_2 - \lambda_1)}}$

D. $\sqrt{\frac{4(\lambda_2 - \lambda_1)}{(4\lambda_2 - \lambda_1)}}$

Answer: D

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158. The number of half lives elapsed before 93.75% of a radioactive sample has decayed is

A. 6

B. 4

C. 2

D. 8

Answer: B

Watch Video Solution

159. In the common-base configuration, a transistor has current amplification factor 0.95. If the transistor is used in common-emitter configuration and base current changes by $2\mu A$, then the change in the collector current is

A. $19\mu A$

B. $0.91\mu A$

C. $1.9\mu A$

D. $38\mu A$

Answer: D

160. If the height of the transmitting tower is increased by 30%, then the area covered by it increases by

A. 0.1

B. 0.21

C. 0.3

D. 0.6

Answer: C