Ideal Question Paper - 1

Question Paper : 1

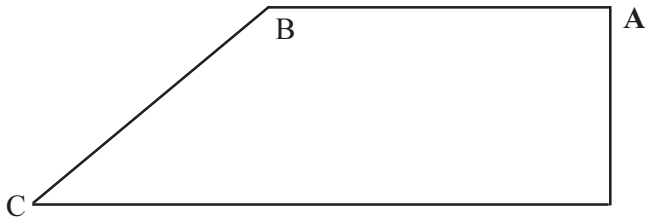
(1) Assertion : 37,800 has three significant numbers.
Reason : All non - zero digits are significant.
(A) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(B) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(C) If assertion is true but reason is false.
(D) If assertion is false but reason is true.

(2) A car starting from position of rest, moves with constant acceleration x. Then it moves with constant decceleration y and become stationary. If the total time elapsed during this is t, then the total distance traveled by car in time t is ..... .

(A) $\frac{xyt}{x+y}$ (B) $\frac{x^2y^2t}{x^2+y^2}$ (C) $\frac{x^2y^2t^2}{2(x^2+y^2)}$ (D) $\frac{xyt^2}{2(x+y)}$

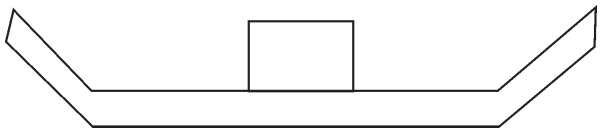
(3) A sphere of mass 1 kg is thrown with velocity of 3 ms^{-1} at a closed door. After the collision with door it moves in the direction opposite to the original one. If 60 N of force is required to open the door, then how many spheres should be thrown to open this door in one second ?
(A) more then 30 (B) less then 10 (C) more then 20 (D) less then 5

(4) As shown in the figure A, sphere of 3 kg mass is moving with constant speed on a horizontal surface. During this motion it travells a distance of 12 m in 4 s. Then it rolls down on an inclined plane from point B, and at point C its velocity becomes 5 ms^{-1}. What is work done in joule by gravitational force on reaching the sphere from A to C. Assume that only gravitational force is acting on the sphere. Rest of the forces are absent take g = 10 ms^{-2}



(A) Zero (B) 24 J (C) 12 J (D) 8 J

(5) A ice cube of side L is kept in a big tray having mass M and uniform density as shown in the figure. After melting, the ice forms a thin layer of water on the surface of the tray. So that the centre of mass of the water comes on the surface of the tray. Then what will be the shift in the centre of mass of the system of tray and water ?



(A) downward $\frac{mL}{(M+m)}$ (B) upward $\frac{mL}{(M+m)}$

(C) downward $\frac{mL}{2(m+M)}$ (D) upward $\frac{mL}{2(m+M)}$

(6) The gravitational force between two point like particles, separation 10 cm is F. If the distance between them is increased to 20 cm. Now a glass plate of 10 cm thickness is kept between them. Then new gravitational force acting between the particles will be..... . Dielectric constant of glass plate = K.
(A) F (B) F/4 (C) F/2 (D) F/4K

(7) The relationship between Young's modulus Y, Bulk modulus K and modulus of rigidity n is .....

(A) $Y = \frac{9nK}{n+3K}$ (B) $Y = \frac{3nK}{9n+K}$ (C) $K = \frac{9nY}{n+3Y}$ (D) $n = \frac{9YK}{Y+3K}$

(8) The temperature of a substance increases by 50 °C on the celcius scale. on the Fahernheit scale this increases to ..... .

(A) 50 °F (B) 60 °F (C) 90 °F (D) 70 °F

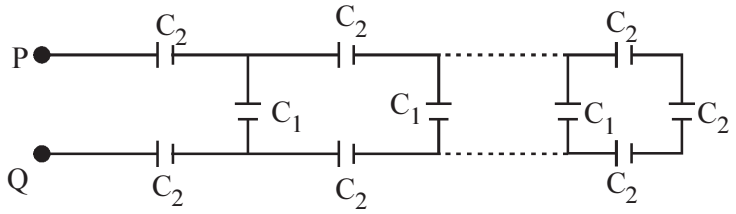
(9) The v_{rms} speed of molecules of Hydrogen gas at 1 atm pressure and 0 °C temperature is ..... (take $\rho = 8.9 \times 10^{-2}$ MKS)

(A) 1845 ms^{-1} (B) 1845 cms^{-1} (C) 18.43 ms^{-1} (D) 18.45 cms^{-1}

(10) A particle is executing simple harmonic motion along Y axis on a path of 20 cm long. It starts S.H.M. from a position of Y = –5 cm and completes one oscillation in 0.5 s.Its phase at the end of 20 S will be .....

(A) 391 $\frac{\pi}{6}$ rad (B) 291 $\frac{\pi}{6}$ rad (C) 491 $\pi/6$ rad (D) 191 $\pi/6$ rad

(11) The equivalent capacitance between point P and Q in the network shown below is .....
where, $C_1 = 6\mu C$ and $C_2 = 9\mu C$



(A) 3 μF (B) 9 μF (C) 6 μF (D) 12 μF

(12) The resistance of a wire at temperature 50 °C is 5 Ω and at temperature 100 °C is 6 Ω, then resistance at temperature 0 °C will be ..... .

(A) 3 Ω (B) 2 Ω (C) 1 Ω (D) 4 Ω

(13) A charged particle is projected normally to uniform magnetic field. Now area swept by it during its motion is directly proportional to ..... .

(A) velocity of particle (B) Linear momentum of particle

(C) Kinetic energy of particle (D) angular momentum of particle

(14) A square coil of 1000 turns and side length 10 cm is placed in uniform magnetic field of 0.1 T in such a way that plane of coil makes an angle of 30° with magnetic field. Resistance of this coil is 20 Ω.Now coil is rotated in such a way that its plane becomes parellel to the magnetic field in 0.05 s. Then induced current in the coil is ..... .

(A) 0.5 A (B) 5 A (C) 1.0 A (D) 10 A

(15) A inductor of inductance L and a resistor R is connected to a battery, Then after what time the magnetic energy stored in inductor will become 25 % of its maximum value ?

(A) 0.693 R/L (B) 0.3010 R/C (C) 0.693 L/R (D) 0.3010 L/R

(16) Two plane mirrors are inclined at an angle of 70°. A ray of light is incident on one mirror at an angle θ, so reflected ray becomes parallel to the first mirror, then θ = ...

(A) 70° (B) 60° (C) 40° (D) 50°

(17) The length of a tube of astronomical telescope is 36 cm and its magnification in normal condition is 5, then focal lengths of objective and eyepiece are ..... and ..... respectively.

(A) 30, 6 cm (B) 50, 10 cm (C) 45, –9 cm (D) 7.2, 5 cm

(18) The maximum velocity of emitted photo electron from the surface of photocell is 3×10^8 cms^{-1}. The value of stopping potential for this photocell is ..... (mass of electron = 9×10^{-31} kg)

(A) 25.3 V (B) 45.2 V (C) 36.8 V (D) 19.6 V

(19) Initial activity of Sr^{90} is 10 *m*Ci and its half life time is 28 year, then what will be its activity after 84 year ..... (in disintegration / see)

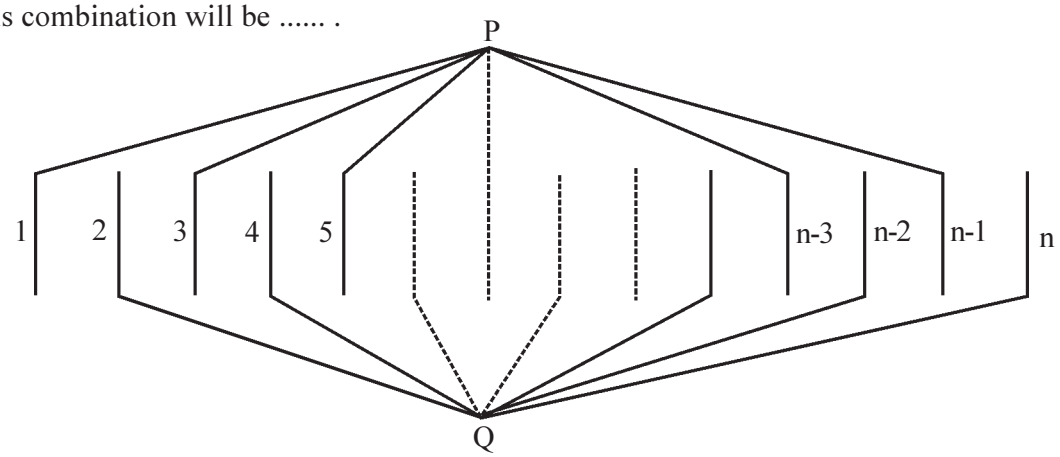
(A) 3.7×10^{10} (B) 4.63×10^7 (C) 1.25×10^{-3} (D) 1.25×10^7

(20) A light of maximum wavelength 1.724×10^{-6} m is incident on a semi conductor so pairs of electron and holes are produced. Then what the band gap energy (E_g) of this semiconductor ?

$h = 6.62 \times 10^{-34}$ Js, c = 3×10^8 ms^{-1}, leV = 1.6×10^{-19} J

(A) 0.64 *e*V (B) 0.72 *e*V (C) 0.80 *e*V (D) 0.78 *e*V

(21) Plates of equal area A and distance between each plates is *d* are shown in the figure. Now odd numbered plates are connected to P and even numbered plates are connected to Q. Then capacitance of this combination will be ..... .

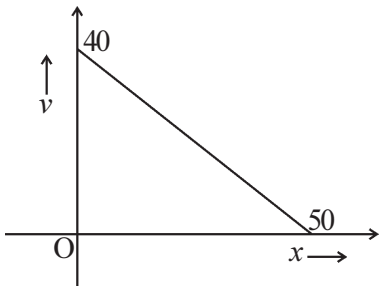


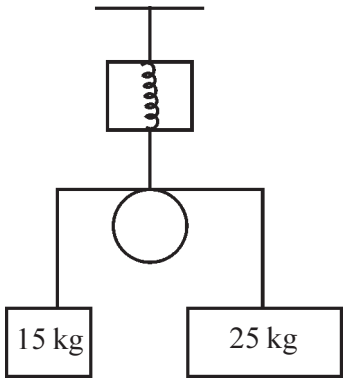
(A) $n\frac{A \in o}{d}$ (B) $\frac{A \in o}{nd}$ (C) $(n-1)\frac{A \in o}{d}$ (D) $\frac{A \in o}{(n-1)d}$

(22) A particle is moving on a straight line having velocity of 40 ms^{-1}. Now, when the displacement of this particle is 50 m, its velocity reduced to zero. When displacement is 25 m, then acceleration of the particle will be .....

(A) 80 ms^{-2} (B) 16 ms^{-2}

(C) –16 ms^{-2} (D) –80 ms^{-2}





(23) A light string passes over a frictionless pulley. Two blocks are attatched to two ends of string are connected to spring balance as shown in the figure. Then what is the reading of this spring balance ?

(A) 225 N (B) 215 N

(C) 400 N (D) 375 N

(24) A disc of radius R is placed in *xy* plane such a way that its centre coincides with the origin. If moment of inertia about Z axis is equals to the moment of inertia about a line $y = x + C$. Then C = ...

(A) $\frac{R}{2}$ (B) $\frac{R}{\sqrt{2}}$ (C) $\frac{-R}{\sqrt{2}}$ (D) $\frac{R}{4}$

(25) A body cools from 80 °C to 50 °C in 6 min. If room temperature is 20 °C, then the temperature of the body at the end of next 6 minutes will be ..... .

(A) 35 °C (B) 40 °C (C) 30 °C (D) 20 °C

(26) The Vrms of molecules of 4 mole of O_2 gas kept in a container is 100 ms^{-1}. If 2 mole of O_2 gas is taken out of container at constant temperature, then v_{rms} of remaining molecules will be ..... .

(A) 50 ms^{-1} (B) 100 ms^{-1} (C) 200 ms^{-1} (D) 300 ms^{-1}

(27) The linear mass density of a string is 5×10^{-2} kg m^{-1}, string is under the tension of 80 N. The power required to produce transverse wave of frequency 60 Hz and amplitude of 6 cm is .....

(A) 125 W (B) 312 W (C) 512 W (D) 625 W

(28) The work is 0.8 J done for angular displacement of 60° for a magnet placed parallel to the magnetic field. So work required to be done for additional angular displacement of 30° is .....

(A) 0.8×10^7 erg (B) 0.4 J (C) 8 J (D) 0.8 erg

(29) The work function of A*l* is 4.2 *e*V. If the sphere of A*l* is illuminated by the X-ray of wavelength 10 Å. Find the maximum potential in the sphere. $h = 6.625 \times 10^{-34}$ Js.

(A) 1031.4 V (B) 1238 V (C) 942.1 V (D) 1117 V

(30) The K_∞ wavelength for a atom having Z = 11 is λ, then the K_∞ wavelength is 4λ for a atom having Z = ...

(A) 6 (B) 4 (C) 11 (D) 44

Ans. : 1 (B), 2 (D), 3 (C), 4 (B), 5 (C), 6 (B), 7 (A), 8 (C), 9 (A), 10 (C), 11 (A), 12 (D), 13 (C), 14 (C), 15 (C), 16 (D), 17 (A), 18 (A), 19 (B), 20 (B), 21 (C), 22 (C), 23 (D), 24 (B), 25 (A), 26 (B), 27 (C), 28 (A), 29 (B), 30 (A)

Question Paper : 2

(1) If $A = B + \frac{C}{D + E}$ is given.The dimensional formula of B and C is $\left(M^0 L^1 T^{-1}\right)$ and $\left(M^0 L^1 T^0\right)$ then the dimensional formula for A and D ..... .

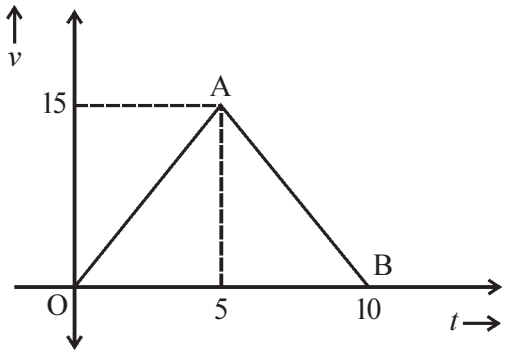
(A) $A = \left(M^0 L^1 T^{-1}\right)$, $D = \left(T^1\right)$

(B) $A = \left(M^0 L^1 T^{-1}\right)$, D = (MT)

(C) $A = \left(M^1 L^1 T^{-1}\right)$, $D = \left(T^2\right)$

(D) $A = \left(M^0 L^0 T^{-1}\right)$, $D = \left(T^1\right)$

(2) The graph of $v \rightarrow t$ is shown in figure for a linear motion of a particle. Distance travel by the particle in time interval t = 3 s to t = 6 s is ..... .



(A) 75 m

(B) 13.5 m

(C) 37.5 m

(D) 24 m

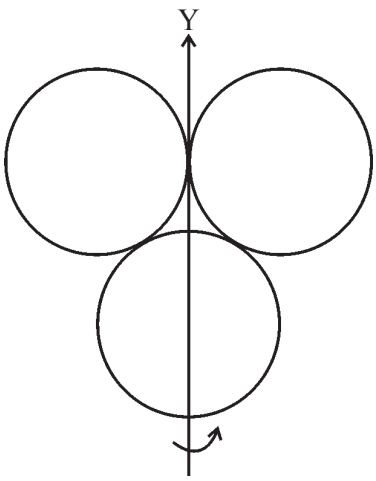
(3) Two sphere of mass 7 kg and 21 kg taken from one end to another end of a friction less strip of length $\frac{1}{2}$ m by applying same force. Multiplication of, the ratio of the time to reach and the ratio of velocity is ..... .

(A) $\frac{1}{2}$ (B) 1 (C) 2 (D) 4

(4) A cord is used to lower vertically a block of mass M by a distance d with constant downward acceleration $\frac{g}{3}$. Work done by the cord on the block is ..... .

(A) $-\frac{2}{3}$ Mgd (B) $\frac{2}{3}$ Mgd (C) $-\frac{1}{3}$ Mgd (D) $\frac{1}{3}$ Mgd

(5) Three rings each of mass M and radius R are arranged as shown in the figure. The moment of inertia of the system about the Y-axis is ..... .



(A) $\frac{3}{2}$ MR^2

(B) $\frac{7}{2}$ MR^2

(C) $\frac{5}{2}$ MR^2

(D) 2 MR^2

(6) Four stars of mass M = 10^{30} kg placed on the corners of a square of side $b = 4 \times 10^{12}$ m. The escape velocity of a particle of mass m placed at the centre of square is..... .

($G = 6.67 \times 10^{-11}$ Nm^2 kg^{-2})

(A) $11 \cdot 2 \times 10^3$ kms^{-1} (B) $13 \cdot 7 \times 10^3$ kms^{-1}

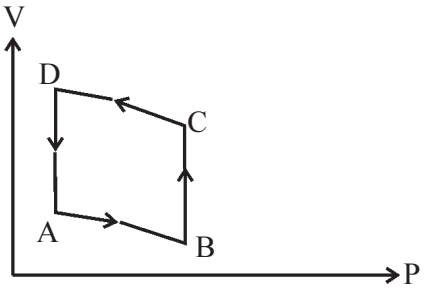
(C) $14 \cdot 6 \times 10^3$ kms^{-1} (D) $15 \cdot 8 \times 10^3$ kms^{-1}

(7) If the Young's modulus of the material is 2.8 times its modulus of rigidity, then what is their poisson's ratio ?

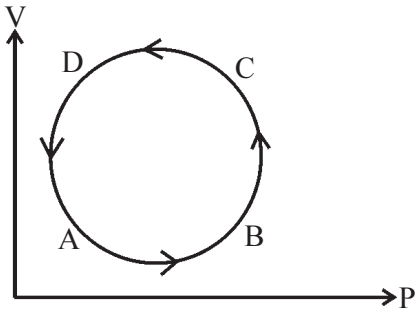
(A) 1.2 (B) 0.2 (C) 0.4 (D) 0.28

(8) The P–V graph shows closed loops of a system of gas moves on the path ABCDA, then the change in internal energy of gas is ..... .

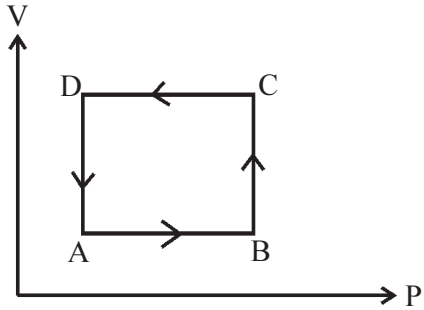
(A)



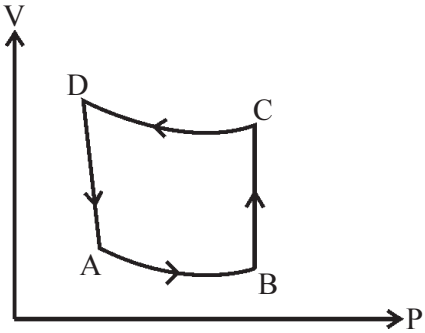
(B)



(C)



(D)



(9) In a lake the volume of air bubble is 50 cc at the depth 4.9 m.If the bubble moves on the surface then the volume of air enclosed into bubble is cc

(density of mercury $\rho = 13.6$ g cm^{-3}, $g = 1000$ cms^{-2})

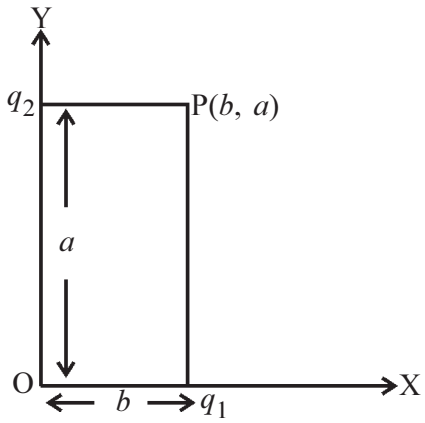
(A) 25 (B) 75 (C) 50 (D) 100

(10) The maximum displacement of a simple harmonic oscillator is 10 cm. After 2 s it is 5 cm away from the origin. After 6 s its kinetic energy decrease 50 % of its mechanical energy, then what is the initial phase (ϕ) and periodic time (T) of S. H. O. ?

(A) $\phi = \frac{\pi}{8}$ rad, T = 96 s (B) $\phi = \frac{\pi}{6}$ rad, T = 96 s

(C) $\phi = \frac{\pi}{8}$ rad, T = 48 s (D) $\phi = \frac{\pi}{6}$ rad, T = 48 s

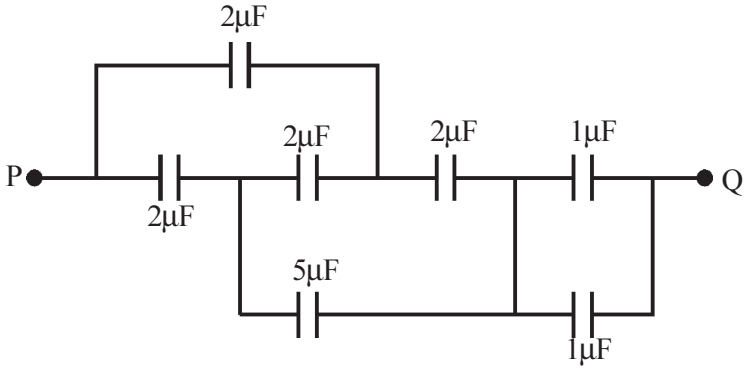
(11) Two point charges q_1 = 2μC and q_2 = 1μC are placed at b = 1 cm and a = 2 cm from the origin of X and Y-axis. The angle made by Electric field at point P (b, a) with X-axis is .....



(A) tan θ = 1 (B) tan θ = 2

(C) tan θ = 3 (D) tan θ = 4

(12) The equivalent capacitance between points P and Q of a circuit shown in figure is ..... μF.

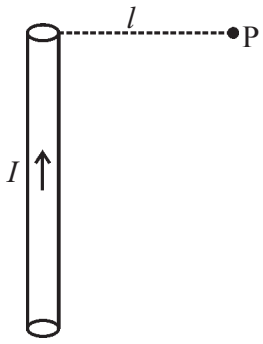


(A) 0.5 (B) 2 (C) 1.33 (D) 1

(13) Six lead cells of *emf* 2 V and internal resistance 0.015 Ω connected in series with a power supply of resistance 8.5 Ω then the terminal voltage of battery is ..... .

(A) 11.6 V (B) 11.7 V (C) 11.8 V (D) 11.9 V

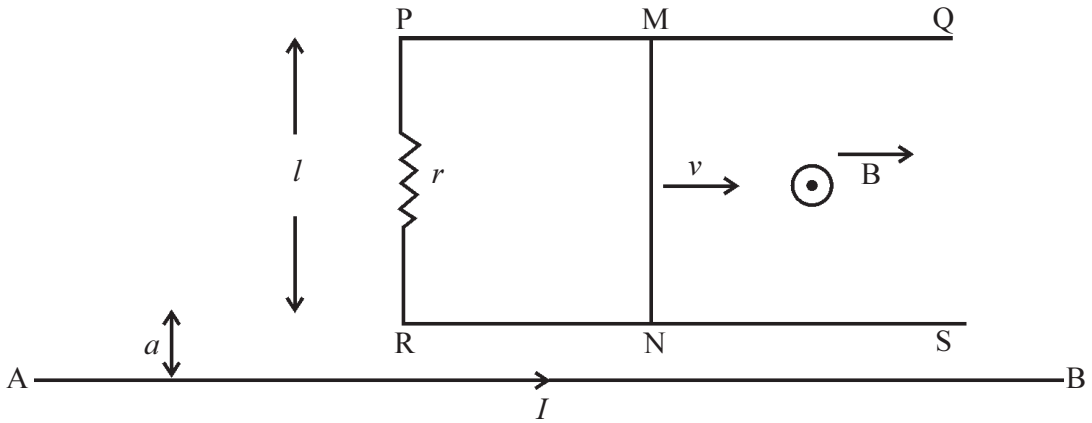
(14) The magnitude of magnetic field at point P at a distance l as shown in figure due to a I current carrying conductor of length l is .....



(A) $\frac{\sqrt{2}\mu_0 I}{\pi l}$ (B) $\frac{\mu_0 I}{4\pi l}$

(C) $\frac{\sqrt{2}\mu_0 I}{8\pi l}$ (D) $\frac{\mu_0 I}{2\sqrt{2}\pi l}$

(15) As shown in figure, two conductor track PQ and RS placed at distance l from each other end



a long stright wire of carrying current l is parall to them. At one end of the track a resistance r is connected between points P and R. To move the rod MN of length l with constant velocity the required force is F than the equation of F = ...

(A) $\frac{v}{r}\left[\frac{\mu_0 I}{2\pi} ln \frac{l}{a+l}\right]^2$ (B) $\frac{v}{r}\frac{\mu_0 I}{2\pi} ln\left[\frac{l}{a+l}\right]$

(C) $\frac{v}{r}\left[\frac{\mu_0 I}{2\pi} ln \frac{a+l}{l}\right]^2$ (D) $\frac{\mu_0 I}{2\pi}\frac{v}{r} ln\left[\frac{a+l}{l}\right]$

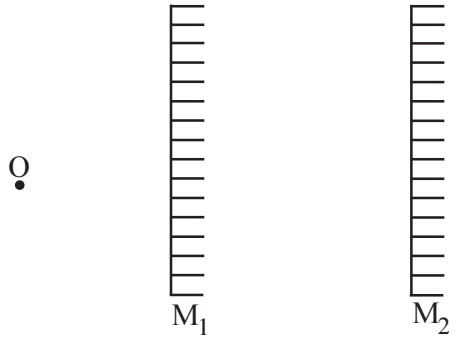
(16) 200 V, 50 Hz A.C. voltage is applied on L–C–R, A.C. series circuit. Where R = 100 Ω. When only capacitor is removed from the circuit the voltage is forward in phase with 60° than the current and if only inductor is removed from the circuit voltage is lacking in phase with 60° than the current, then for L–C–R series circuit I_{rms} = ... A.

(A) 1 (B) 2.82 (C) 4 (D) 2

(17) Two plane mirror are placed at 15 cm away from each other as shown in figure. If the object O is placed at distance 6 cm from the first mirror then the distance of final image from the first mirror is..... cm.

(A) 3 (B) 6

(C) 12 (D) 9



(18) The light ray is incidence at the angle 45° on a equilateral tirangle and move parallel to the base of prism. If the angle of emergence is 45° then find out the refractive index of the material of prism.

(A) $\sqrt{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) 2 (D) $\sqrt{3}$

(19) The work function of Lithium and Copper is 2.3 eV and 4 eV. If ultraviolate rays incident on the metals, which metal produce photoelectric effect ?$h = 6.6 \times 10^{-34}$ Js, c = 3×10^8 ms^{-1}

(A) lithium (B) copper (C) both (D) none of the metal

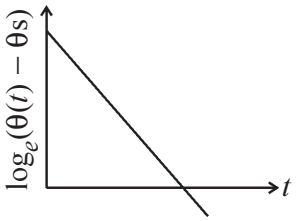
(20) When electron of Hydrogen atom makes transition from n^{th} orbit to $(n-1)$ orbit $(\text{where}^{\cdot}\ n >> 1)$ the frequency of emitted radiation is proponational to ..... .

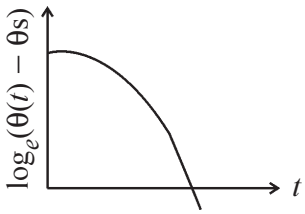
(A) $\frac{1}{n^3}$ (B) $\frac{1}{n}$ (C) $\frac{1}{n^2}$ (D) $\frac{1}{n^{\frac{3}{2}}}$

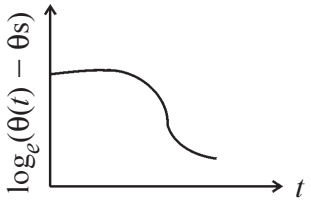
(21) A P–N junction diode has a resistance of 20 Ω when forward biased and 2000 Ω when reverse biased. Find the current in the give circuit.

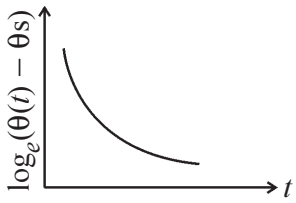
(A) $\frac{1}{10}$ A (B) $\frac{1}{6}$ A (C) $\frac{1}{12}$ A (D) $\frac{1}{2}$ A

(22) A liquid in a beaker has temperature $\theta(t)$ at time t and θs is temperature of surroundings, then according to Newton's law of cooling which is the correct graph between $\log_e(\theta(t) - \theta s) \longrightarrow t$?

(A) 

(B) 

(C) 

(D) 

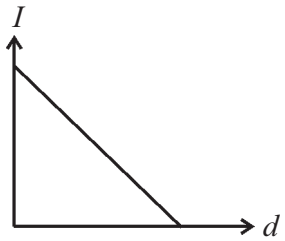
(23) Particle A and B starts their motion from the rest. In the motion of particle A the acceleration in first half time is $5\ ms^{-2}$ and in second half time is $2\ ms^{-2}$. Similarly for particle B, the accelaration in first half time is $2\ ms^{-2}$ and in second half time is $5\ ms^{-2}$. If both the particles move for equal time then ..... particle travel more distance.

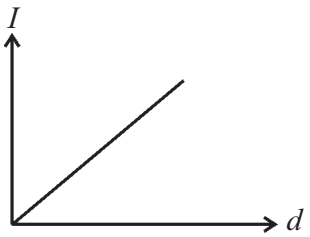
(A) A (B) B (C) Both (D) can not say.

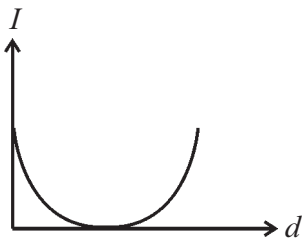
(24) For two indentical ball A and B, initially the ball A is at rest and ball B is move with constant speed v on frictionless surface. If the forces applied on it is F_A and F_B then, ...

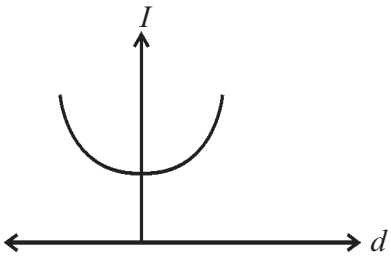
(A) $F_A = 0, F_B \neq 0$ (B) $F_A \neq 0, F_B = 0$ (C) $F_A \neq 0, F_B \neq 0$ (D) $F_A = 0, F_B = 0$

(25) According to the theorem of parallel axes the graph between I and d for a body is ..... .

(A) 

(B) 

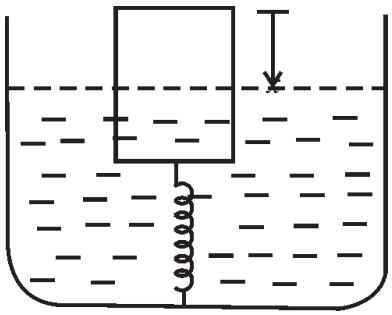
(C) 

(D) 

(26) The weight of a body on the surface of earth is W. Now the body take into the earth from the surface. At any point the weight of the body is $\frac{25}{36}$ W, then distance of the point from the centre of earth is ..... (the radius of earth is R.)

(A) $\frac{11}{36}$ R (B) $\frac{25}{36}$ R (C) $\frac{1}{6}$ R (D) $\frac{5}{6}$ R

(27) A wooden block of length 10 cm of each surface floating on the surface of water. At this time the lower surface of the block just touch to a spring placed in to the water. (see figure) If 325g weight put on the block the upper surface is touch to the water. Then what is the spring constant of spring ?g = 10 ms^{-2}, density of wooden block = 800 kgm^{-3}



(A) 125 Nm^{-1} (B) 62.5 Nm^{-1}

(C) 31.33 Nm^{-1} (D) 187.5 Nm^{-1}

(28) A progressive wave of frequency 1000 Hz is moving along the positive X- direction with a velocity of 700 ms^{-1}. The position of the points having phase difference $\frac{\pi}{3}$ rad with origin is ..... .

(A) 0.81 m, 1.5 m, 2.21 m, ... (B) 0.81 m, 1.62 m, 2.24 m, ...

(C) 0.5 m, 0.12 m, 0.19 m, ... (D) 0.5 m, 1.2 m, 1.9 m, ...

(29) The ratio of magnetic dipole moment of two bar magnet is 13 : 5. If they oscilates in earth magnetic field with 15 oscilation/min with equal poles of both the magnet together. Then they oscilates with ..... oscilation/min when opposite poles are placed near.

(A) 10 (B) 15 (C) 12 (D) $\frac{75}{13}$

(30) A particle move with the speed three times more than electron. The ratio of de-Broglie wave length of this particle and electron is 1.813×10^{-4}. Then the mass of particle is ..... .

(A) 1.675×10^{-27} kg (B) 1.242×10^{-27} kg

(C) 1.115×10^{-27} kg (D) 2.324×10^{-27} kg

Ans. : 1 (A), 2 (C), 3 (B), 4 (A), 5 (B), 6 (B), 7 (C), 8 (D), 9 (B), 10 (A), 11 (B), 12 (D), 13 (D), 14 (C), 15 (C), 16 (D), 17 (B), 18 (A), 19 (A), 20 (A), 21 (B), 22 (A), 23 (A), 24 (D), 25 (D), 26 (A), 27 (B), 28 (A), 29 (A), 30 (A)

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Question Paper: 3

(1) Which one is not a unit "W" ?

(A) Js^{-1} (B) $A^2\,\Omega$ (C) A V (D) $A\,V^{-1}$

(2) A bullet fired from gun makig an angle of 30° with horizontal, collides at distance 3 km on the surface. Then the target upto how much maximum distance can be fired with the help of this gun

(A) 5 (B) 3.464

(C) 4.158 (D) 8.20

(3) Fuel of mass 360 kg is filled in a rocket of mass 60 kg. When half fuel burnt out after 30 minutes, the velocity of rocket is 3 kms^{-1}. Find the thrust acting on a rocket.

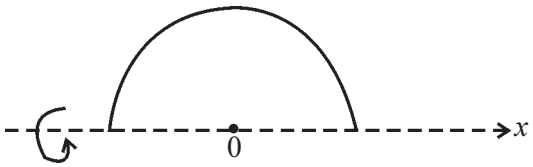
(A) 400 N (B) 300 N

(C) 60 N (D) 30 N

(4) A chain of mass 8 kg and length 9 m is kept in such a way so that some part is hanging and remaining part is on the table's surface. The work done to pull a chain completely on a table is 160 J. Find the length of hanging part

(A) 2 m (B) 3 m (C) 6 m (D) 9 m

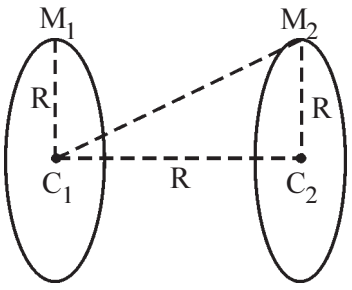
(5) The rod of mass "2M" and length "l" is bent in foam of semi-circle. Then the moment of inertia about X-axis as shown in fig is ..... .



(A) $\frac{Ml^2}{\pi^2}$ (B) $\frac{Ml^2}{4\pi^2}$

(C) $\frac{Ml^2}{8\pi^2}$ (D) $\frac{Ml^2}{2\pi^2}$

(6) Two rings of radii 'R' m is placed on the same axis. The distance between their centre is 'R' m. Their masses are $M_1$and M_2 respectively. The work done in bringing a particle of mass 'm' from centre C_1 to C_2 is ..... .



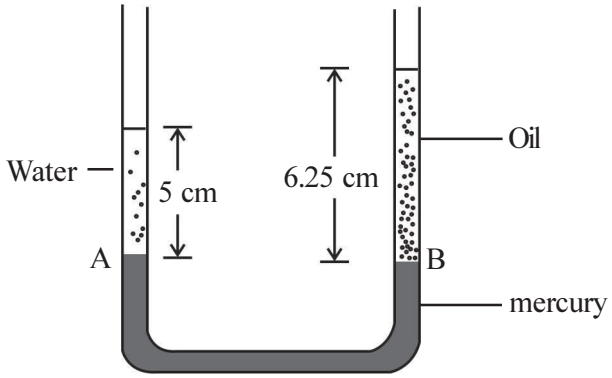
(A) $\frac{G(M_2-M_1)m}{R}$ (B) $\frac{G(M_2-M_1)m(\sqrt{2}+1)}{2R}$

(C) $\frac{G(M_1-M_2)m(\sqrt{2}-1)}{\sqrt{2}R}$ (D) $\frac{G(M_1-M_2)m}{\sqrt{2}}R$

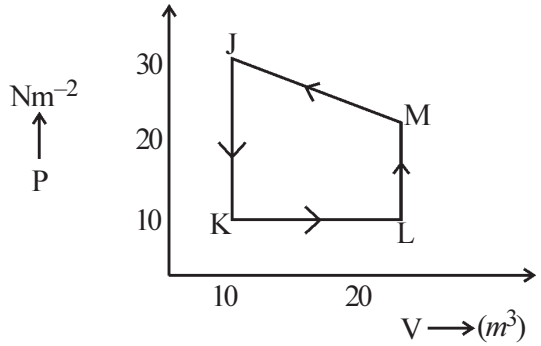
(7) Water,oil and mercury are filled in a U - shaped tube as shown in the figure. Find the relative density of oil.

(A) 0.8 (B) 1.0

(C) 1.25 (D) none of this



(8) Match column -1 and column -2. In column - 1 there's an expansion of an ideal gas and in column - 2 there's a thermodynamic changes.



column - **1**	column - **2**
(a) J $\rightarrow$ K reaction	(p) Q > O
(b) K $\rightarrow$ L reaction	(q) W < O
(c) L $\rightarrow$ M reaction	(r) W > O
(d) M $\rightarrow$ J reaction	(s) Q < O

(A)

	p	*q*	*r*	*s*
a	O	O	•	•
b	•	O	O	O
c	O	O	O	O
d	O	•	•	O

(B)

	p	*q*	*r*	*s*
a	•	O	O	O
b	O	•	O	O
c	O	O	O	•
d	•	O	•	O

(C)

	p	*q*	*r*	*s*
a	•	O	O	O
b	O	•	O	O
c	O	•	O	O
d	O	O	•	•

(D)

	p	*q*	*r*	*s*
a	O	O	O	•
b	•	O	•	O
c	O	O	O	•
d	O	•	O	•

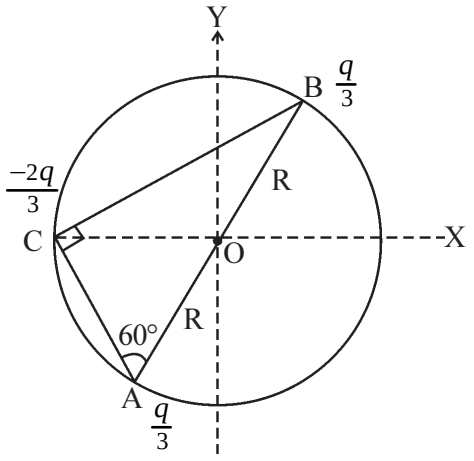
(9) Pressure and density for diatomic gas are 8×10^4 Nm^{-2} and 4 kgm^{-3}. Energy associated with thermal motion of gas is .....J.

(A) 7×10^4 (B) 3×10^4 (C) 5×10^4 (D) 6×10^4

(10) An oscillator of mass 150 g, oscillates in a medium of damping constant 100 dyne cm^{-1}. After 6.909 s, amplitude of its oscillation is decreased how much percentage of its maximum amplitude ? *l*n (0.1) = –2.303

(A) 37 % (B) 63 % (C) 75 % (D) 90 %

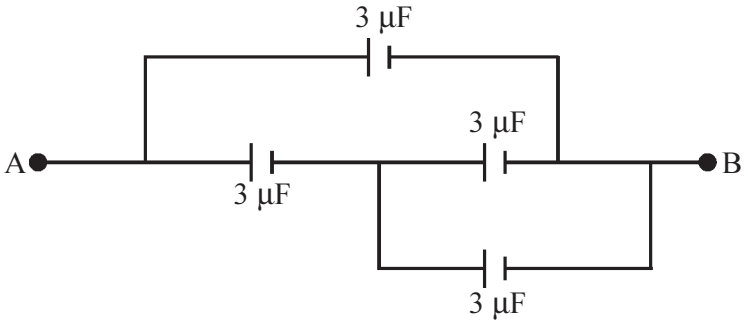
(11) As shown in the figure charges on A, B and C are $\frac{q}{3}$, $\frac{q}{3}$ and $\frac{-2q}{3}$ respectively arranged on the circumference of a circle, so that it makes right angled triangle.Then magnitude of an electric field at the centre is .....



(A) $\frac{q}{8\pi\varepsilon_0 R^2}$ (B) $\frac{q^2}{54\pi\varepsilon_0 R^2}$

(C) $\frac{q}{6\pi\varepsilon_0 R^2}$ (D) O

(12) Find the equivalent capacitance between A and B, as shown in the figure .....



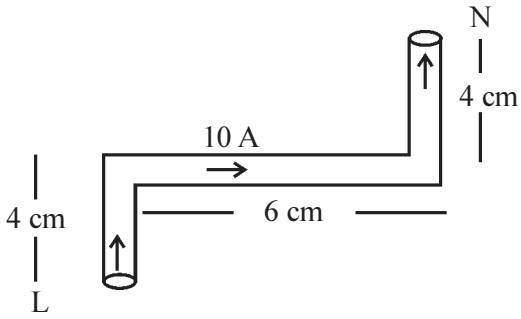
(A) 0.75 μF (B) 6 μF

(C) 3 μF (D) 5 μF

(13) Lengths and cross - sections for two wires are 2 *l*, *l* and A, 2A respectively. They are connected parallel to battery. Find the ratio of their electric current densities

(A) 1:2 (B) 2:1 (C) 1:1 (D) 1:4

(14) A current carrying wire LN is bent as shown in figure, current flowing through is 10 A. It is kept perpendicular to uniform magnetic field, then magnetic force acting on it is ..... N.



(A) Zero (B) 5 (C) 10 (D) 20

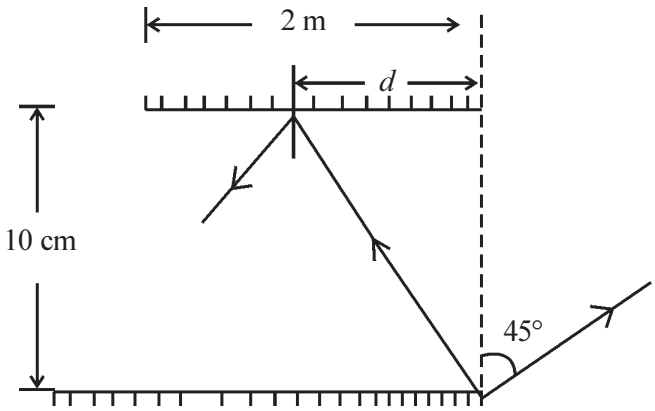
(15) Circular coil having N turns and '*r*' radius are kept in a uniform magnetic field of intensity 'B', this coil of 'R' resistance is rotated at an angle 180° in a small time *'dt'* with respect to any diameter then charge passing through the coil is .....

(A) $\frac{2NB\pi r^2}{R}$ (B) $\frac{NB\pi r^2}{R}$ (C) $\frac{2N^2\pi r^2}{R}$ (D) $\frac{N^2B\pi r^2}{R}$

(16) Self inductance of a coil of an electric fan is L H. For maximum transmission of power at 50Hz, 1 μF capacitor is connected with inductor then L = ... H. ($\pi^2 = 10$)

(A) 5 (B) 0.10 (C) 0.05 (D) 10

(17) Two plane mirrors are arranged parrallel, as shown in the figure. A ray is incident at an angle 45° on the one end of mirror. This ray reflects, how much times until it emergent from the second end ?



(A) 15 (B) 20

(C) 25 (D) 30

(18) Find the dispersive power for a prism made from crown glass. Refractive index for red and violet are 1.56 and 1.68 respectively.

(A) 0.094 (B) 0.294 (C) 0.194 (D) 0.394

(19) 100 nm wavelength and 1 Wm^{-2} intensity are in a ultraviolet light, which incident on photo sensitive surface. 2 % photo electrons are emitted from incident photons. Then the number of emitted photo electrons are ..... from 2.0 cm^2 surface area. $(h = 6.6 \times 10^{-34}$ Js, c = 3×10^8 ms^{-1}

(A) 3.0×10^{12} (B) 1.5×10^{12} (C) 2.02×10^{12} (D) 4.12×10^{12}

(20) Half life of radio active element is 20 minute. Its $\frac{1}{3}$ part decayed in t_1 time and $\frac{2}{3}$ part decayed in t_2 time then $t_1 - t_2$ = ...

(A) 7 minute (B) 14 minute (C) 20 minute (D) 28 minute

(21) In a semi conductor crystal number density of an electron is 5×10^{12} cm^{-3} and number density of holes are 8×10^{13} cm^{-3}. Mobility of an electron and hole are 23,000 cm^2 V^{-1} s^{-1} and 100 cm^2 V^{-1} s^{-1} respectively then what is the resistivity of semi conductor ? $(e = 1.6 \times 10^{-19}$ C)

(A) 1.016 Ω m (B) 0.254 Ω m (C) 0.508 Ω m (D) 0.762 Ω m

(22) Match the physical quantities (column-I) with units (column-II)

column - I		column - II	
(i)	Thermal conductivity	(P)	Wm^{-2} K^{-4}
(ii)	Steafan's constant	(Q)	mK
(iii)	Wien's constant	(R)	kg^{-1} K^{-1}
(iv)	specific heat	(S)	W m^{-1} K^{-1}

(A) (i) - S (ii) - P (iii) - Q (iv) - R

(B) (i) - P (ii) - R (iii) - Q (iv) - S

(C) (i) - S (ii) - P (iii) - R (iv) - Q

(D) (i) - P (ii) - Q (iii) - R (iv) - S

(23) A particle starts the motion (at $t = 0$) from (3, 0) m with velocity $7\,\hat{i}$ ms^{-1}, going in x-y plane with constant acceleration $3\hat{i} + 4\hat{j}$ ms^{-2}. The speed of a particle is ..... ms^{-1} when y - coordinate is 18 *m.*

(A) 28 (B) 20 (C) 4 (D) 14

(24) A glass filled with water is covered by smooth plank and a coin is placed on it. When a plank suddenly pulls, coin dropped in water. It's reason is .....

(A) Inertia of direction (B) Inertia of motion

(C) Inertia of staticness (D) None of these.

(25) Two bodies of mass M and m are tied at the two ends of a massless inextensible string. They are hanged from massless and frictionless pulley. If M > m, then acceleration of centre of mass of the system is ..... .

(A) $\left(\frac{M - m}{M + m}\right)^2 g$ (B) $\frac{M - m}{M + m} g$ (C) $\left(\frac{M + m}{M - m}\right)^2 g$ (D) 0

(26) Mass and radii of two sphere are m, 5m and R, 2R respectively. When they are released moving towards eachother under the gravity only. Before they collides with each other, the distance travelled by a sphere of mass 5*m* is ..... . Initial distance between the centres of the sphere is 9R.

(A) 5 R (B) 4 R (C) 3 R (D) R

(27) For a pipe (In which area of cross - section decreases as length increases) ratio of radii of cross - section should be how much, so that velocity of a liquid at narrow end is 1500 % more than at broad end.

(A) 1 : 2 (B) 225 : 1 (C) 4 : 1 (D) 1 : 2

(28) The length of the string tied between two ends of the rigid support is 100 cm. Normal mode of oscillations are obtained along the string. If the velocity of wave is 19 ms^{-1}, find the value of frequrency and wave length ? (There are 20 loops on string)

(A) f = 380 Hz, λ = 10 m (B) f = 190 Hz, λ = 10 m

(C) f = 380 Hz, λ = 20 m (D) f = 190 Hz, λ = 20 m

(29) A resistance of wire 10 Ω and length 10 m is connected with battery having *emf* 2.1 V and internal resistance 0.5 Ω.What should be the length of wire to balance the daniel cell of *emf* 1.2 V ?

(A) 5 m (B) 8 m (C) 6 m (D) 4 m

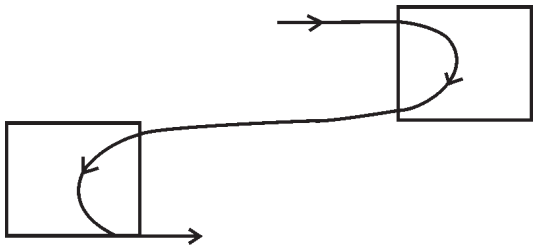
(30) Electron is passing through the uniform magnetic field B_1 and B_2, their paths are as shown in the figure. The path of electron in both region is semi - circle then which option is true ?

(A) B_1 is inside the surface and stronger than B_2

(B) B_1 is inside the surface and weaker than B_2

(C) B_1 is outside the surface and weaker than B_2

(D) B_1 is outside the surface and stronger than B_2



Ans. : 1 (D), 2 (B), 3 (B), 4 (C), 5 (D), 6 (C), 7 (A), 8 (D), 9 (C), 10 (D), 11 (C), 12 (D), 13 (A), 14 (B), 15 (A), 16 (D), 17 (B), 18 (C), 19 (C), 20 (C), 21 (C), 22 (A), 23 (B), 24 (C), 25 (A), 26 (D), 27 (C), 28 (B), 29 (C), 30 (A)

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Question Paper : 4

(1) The length of a cube L = (1.2 ± 0.1) cm then its volume is .....

(A) $(1.728 \pm 0.43)\ cm^3$ (B) $(1.73 \pm 0.3)\ cm^3$

(C) $(1.72 \pm 0.03)\ cm^3$ (D) $(1.73 \pm 0.003)\ cm^3$

(2) The stream of water coming from the hole of a pipe kept on the surface making an angle of 30° with the horizontal direction with velocity 10 ms^{-1}. It fall at a height ..... on the wall which is at a distance 3.4 m from the hole. ($\sqrt{3}$ = 1.7, g = 10 ms^{-2})

(A) 2.53 m (B) 0.855 m (C) 3.4 m (D) 1.23 m

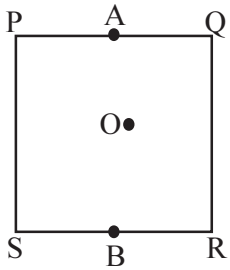
(3) A bullet of mass 200 g, moving with velocity 5 ms^{-1} from the rifle of mass 5 kg. The momentum of rifle in backward direction is ..... Ns.

(A) 0.2 (B) 2 (C) 1 (D) 0.1

(4) A stone freely falls from a 140 m high tower. At what height its kinetic energy is $\frac{3}{4}$ times of its potential energy ?

(A) 70 m (B) 80 m (C) 15 m (D) 60 m

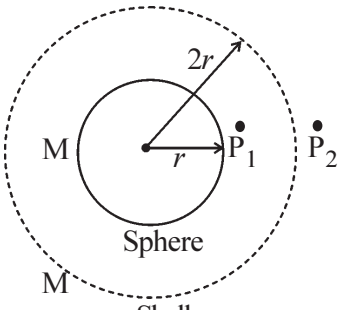
(5) As shown in Figure, centre of thin disc is O. A is mid point of $\overline{PQ}$ and B is mid point of $\overline{SR}$ then



(A) $\sqrt{2I_{PR}} = I_{AB}$ (B) $I_{PS} = 3I_{AB}$

(C) $I_{PR} = I_{AB}$ (D) $I_{PR} = \sqrt{2I_{AB}}$

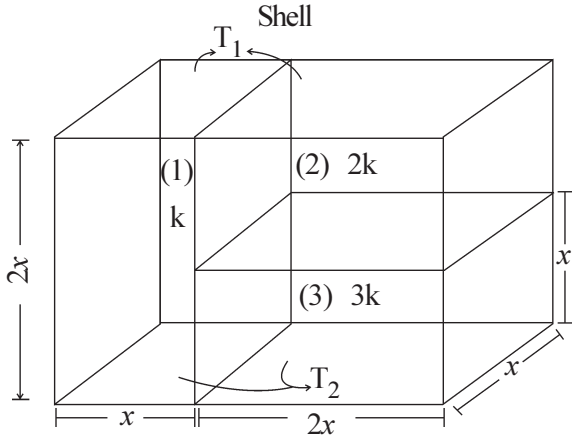
(6) A sphere of mass m and radius r is kept in a thin spherical shell of mass 'M' and radius '$2r$'' so, that their centres coincides. Then gravitational field at a distance $\frac{3}{2}r$ and $\frac{5}{2}r$ from the centre are ..... and ..... respectively



(A) $\frac{4GM}{9r^2}, \frac{8GM}{9r^2}$ (B) $\frac{8GM}{25r^2}, \frac{4GM}{25r^2}$

(C) $\frac{4GM}{3r^2}, \frac{4GM}{5r^2}$ (D) $\frac{4GM}{9r^2}, \frac{8GM}{25r^2}$

(7) Find the resultant thermal conductivity of combination of cubes as shown in figure. (Temp. of upper surface = T_1, Temp. of lower surface =T_2)



(A) 29 k/15

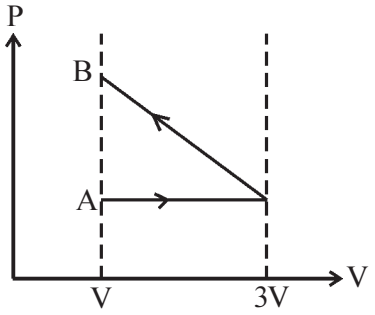
(B) 15 k/29

(C) $\frac{17k}{5}$

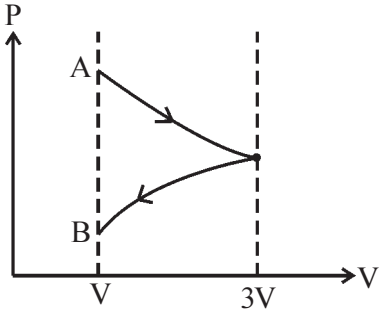
(D) 13 k/15

(8) A 1 mole ideal gas going from initial position A to final position B in two different ways : (i) Isothermal expansion in which volume moves from V to 3V (ii) volume decreases from 3V to V at constant pressure. Which graph of P → V is true ?

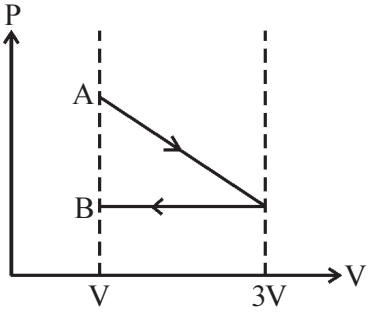
(A)



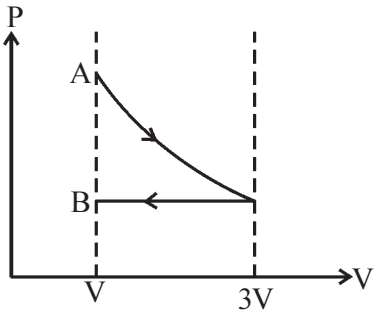
(B)



(C)



(D)



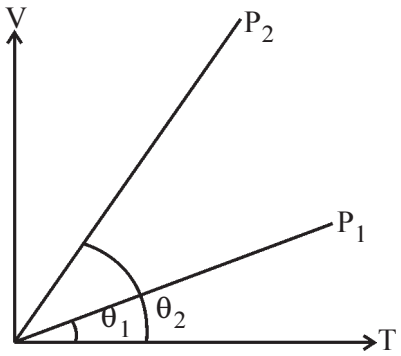
(9) The graph of V →T (Volume → Temperature) for two different constant pressure P_1 and P_2 are as shown in the figure, from the graph .....

(A) $P_1 > P_2$

(B) $P_1 < P_2$

(C) $P_1 = P_2$

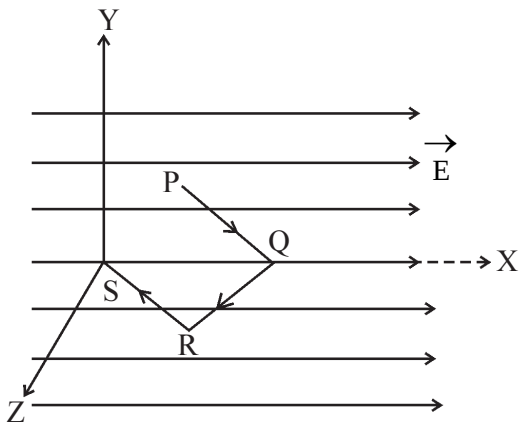
(D) Information is insufficient



(10) The length of path of motion for S.H.O. is 10 cm. Starting from +ve end it completes 1 oscillation in 1 s . After how much time its velocity becomes 5π cms^{-1}

(A) $\frac{1}{6}$ s (B) $\frac{1}{12}$ s (C) $\frac{1}{18}$ s (D) $\frac{1}{24}$ s

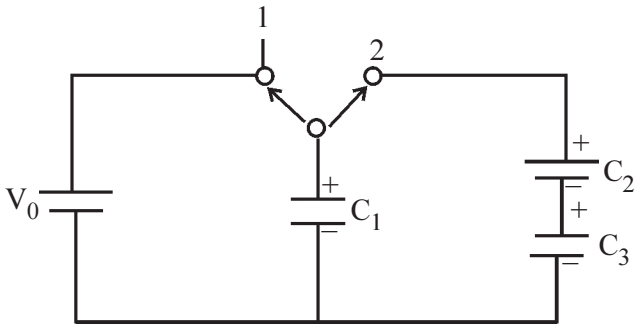
(11) A point charge q moves from point P to point S in X-direction in uniform electric field on a path PQRS as shown as in the figure. Co - ordinates of P, Q, R, S are (a, b, o), $(2a, o, o)$, $(a, -b, o)$ and (o, o, o) respectively. Work done by electric field is .....



(A) $qE\sqrt{(2a)^2 + (b)^2}$ (B) qEa

(C) $-qEa$ (D) $\sqrt{2}qEa$

(12) As shown in figure circuit is initially on switch '1' now, replaces to switch '2' charge on C_1 is Q_1 and charge on C_2 and C_3 is Q_2, then Q_2 = ...



(A) $Q_1 = C_1V_0$, $Q_2 = C_2V_0$

(B) $Q_1 = C_1V_0$, $Q_2 = \frac{C_2C_3V_0}{C_2 + C_3}$

(C) $Q_1 = \frac{V_0C_1[C_1C_2 + C_1C_3]}{C_1C_2 + C_2C_3 + C_3C_1}$

$Q_2 = \frac{V_0[C_1C_2C_3]}{C_1C_2 + C_2C_3 + C_3C_1}$

(D) $Q_1 = \frac{V_0C_1C_2C_3}{C_1C_2 + C_2C_3 + C_3C_1}$

$Q_2 = \frac{V_0C_1[C_1C_2 + C_1C_3]}{C_1C_2 + C_2C_3 + C_3C_1}$

(13) Electric current changes according to time is $I = 3t^2 + 2t$. Charge passing through cross - section of conductor in $t = 2$ s to $t = 3$ s is ..... C (I is in Ampere and t is in s)

(A) 10 (B) 24 (C) 33 (D) 44

(14) A wire of length 'L' is bent in form of circle. Current 'I' is passing through it. When it is kept in a magnetic field of intensity 'B', the torque is maximum then number of turns are .....

(A) possibly big (B) 5

(C) 2 (D) 1

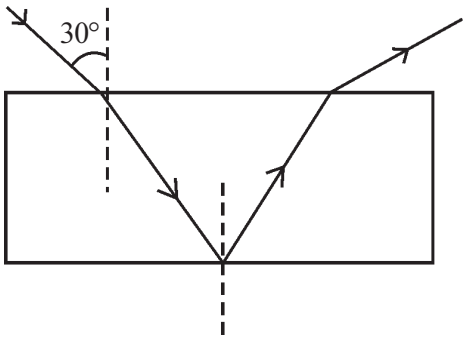
(15) Transformation ratio for a transformer having 90 % efficiency is 5. It's output voltage and output power are 1000 V and 12 kW respectively. The resistance in primary and secondary are 0.9 Ω and 5 Ω respectively, then ratio of power loss in primary to secondary coil is .....

(A) 5 (B) 0.99 (C) 2.77 (D) 5.55

(16) Fully charged capacitor of 1 μF capacitance is connected with chargeless inductor of inductance 100 H at $t = 0$. After a time interval ..... the ratio of energy stored in inductor and capacitor is 1.

(A) 0.785 *m*s (B) 7.85 *m*s (C) 0.785 s (D) 7.85 s

(17) As shown in the figure a ray of light is incident at an angle of 30° with the surface of glass - slab. When it comes out from the slab, it suffers deviation of ..... with original direction of incident ray.



(A) 60° (B) 45°

(C) 120° (D) 90°

(18) A convex lens having refractive index 1.5 and focal length in air is 15 cm, Now it is immersed in a water of refractive index $\frac{4}{3}$ then new focal length = ... cm

(A) 80 (B) 60 (C) 50 (D) 70

(19) Velocity of particle whose mass is three times than rest mass, is ..... (c = velocity of light)

(A) c (B) $\sqrt{\frac{2}{3}}$ c (C) $\frac{2\sqrt{2}}{3}$ c (D) $\frac{c}{2\sqrt{3}}$

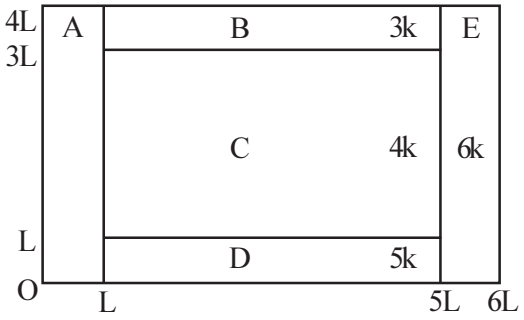
(20) Z^{X^A} emits 3α particles and two positrons. Find the ratio of neutron number and number of protons in final nucleus.

(A) $\frac{A-Z-4}{Z-2}$ (B) $\frac{A-Z-8}{Z-4}$ (C) $\frac{A-Z-4}{Z-8}$ (D) $\frac{A-Z-12}{Z-4}$

(21) In a pure semi conductor no. density of electron is $6 \times 10^{19}\ m^{-3}$. Find the number of holes in a size 1 cm × 1cm × 1 mm.

(A) 12×10^{12} (B) 6×10^{12} (C) 6×10^{13} (D) 12×10^{13}

(22) A combination of slabs are made with slabs of different length and different thermal conductivies (A, B, C, D and F) as shown in figure. All the slabs having same cross-sectional area. Heat flows vertically from left to right, then in a steady thermal state .....



(a) Heat passing through A and E slabs are equal

(b) Heat passing through slab E is maximum

(c) Temp. difference for the ends of E slab is minimum

(d) Heat passing through slab C = Heat passing through slab B + Heat passing through slab D.

(A) *a*, *b* (B) *a*, *c*, *d* (C) *a*, *b*, *c*, *d* (D) *b*, *c*, *d*

(23) A satellite revolves in a elliptical orbit around the planet. If its maximum and minimum velocities are $4 \times 10^4\ ms^{-1}$ and $2 \times 10^4\ ms^{-1}$ respectively and maximum distance from planet is 3×10^4 *km,* then find its minimum distance.

(A) 3×10^7 m (B) 6×10^7 m (C) 1.5×10^7 m (D) 9×10^7 m

(24) α_1 and α_2 for two materials are $9 \times 10^{-4}\ C^{\circ -1}$ and $-6 \times 10^{-4}\ C^{\circ -1}$ respectively. Resistivity for first material is (ρ_{20}), = $3 \times 10^{-8}\ \Omega m$. For a mixture of these two resistivity does not change with temperature then for second material (ρ_{20}) = ... Reference temp. is 20 °C. Resistivity of mixture is given by addition of these two.

(A) $4.5 \times 10^{-8}\ \Omega$ m (B) $2.25 \times 10^{-8}\ \Omega$ m (C) $2.4 \times 10^{-8}\ \Omega$ m (D) $3.5 \times 10^{-8}\ \Omega$ m

(25) A RADAR work at a wavelength 25 cm. If beat frequency between incident and reflected signal is 2 kH*z* for an aeroplane. What is the velocity of an aeroplane ?

(A) 700 kmh^{-1} (B) 900 kmh^{-1} (C) 800 kmh^{-1} (D) 500 kmh^{-1}

(26) The work function of a metal is 2 *e*V. The maximum wave length of light for the emission of photo electron from it is .....

($h = 6.6 \times 10^{-34}$ Js, $c = 3 \times 10^{8}$ ms^{-1})

(A) 220 nm (B) 400 nm (C) 310 nm (D) 540 nm

(27) A height of T.V. tower is 100 m. If average population density is 1000/km^2, how much people can watch broadcasting of this T.V. station ($Re = 6.4 \times 10^{6}$m)

(A) 40.192 lakhs (B) 50 lakhs (C) 35.32 lakhs (D) 28.182 lakhs

(28) In vernier 9th division of secondary, coincides with 8th division of primary then least count (L C) of this vernier is .....

(A) $\frac{1}{8}$ *mm* (B) $\frac{8}{9}$ *mm* (C) $\frac{1}{9}$ *mm* (D) $\frac{1}{17}$ *mm*

(29) In an experiment of simple pendulum, length of the string is 112 cm. If oscillation starts with an amplitude of 4 cm, then angular displacement (initial) θ is approximate .....

(A) 3° (B) 5° (C) 8° (D) 2°

(30) The graph of $\log(\theta - \theta p)$ versus time is .....

(A) exponentially decreases according to time (B) straight line with positive shape

(C) straight line with negative slope (D) exponentially increases with time.

Ans. : 1 (A), 2 (C), 3 (C), 4 (B), 5 (C), 6 (D), 7 (A), 8 (D), 9 (A), 10 (B), 11 (C), 12 (C), 13 (B), 14 (D), 15 (D), 16 (A), 17 (C), 18 (B), 19 (C), 20 (C), 21 (B), 22 (B), 23 (C), 24 (A), 25 (B), 26 (C), 27 (A), 28 (C), 29 (D), 30 (C)

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Question Paper : 5

(1) For different possible connection of two resistance $R_1 = (3.0 \pm 0.1)\ \Omega$ and $R_2 = (6.0 \pm 0.2)\ \Omega$

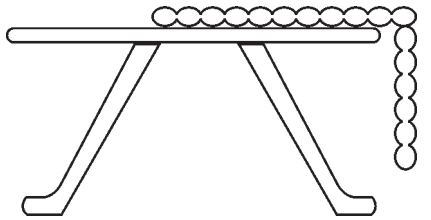
(A) possible maximum value $(9.0 \pm 0.2)\ \Omega$ (B) possible maximum value $(18 \pm 0.3)\ \Omega$

(C) possible minimum value $(2.0 \pm 0.1)\ \Omega$ (D) possible minimum value $(2.0 \pm 0.2)\ \Omega$

(2) A stone fall freely, collide with a glass plate placed at 60 m height from the horizontal after time *t* and loose the half velocity. If it touch the ground after $\frac{t}{2}$ time the total distance travel by the stone is .....

(A) 120 m (B) 140 m (C) 100 m (D) 80 m

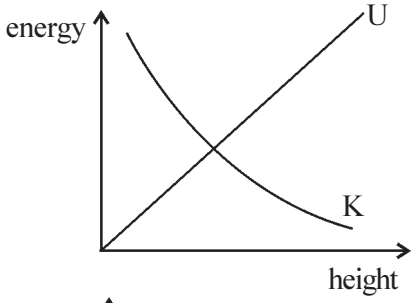
(3) A chain of length 3 m put on a table in such a way that its $\frac{1}{3}$ portion hanging from the edge of table. If the chain is in equilibrium then co - efficient of friction between the surface of table and chain is .....



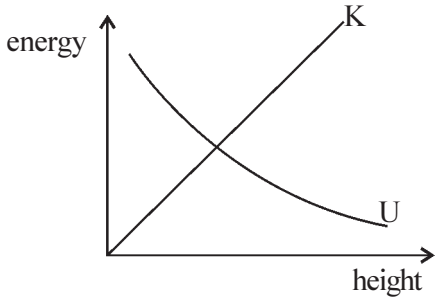
(A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) 3 (D) 2

(4) Which graph shows the correct relation between kinetic energy (K), potential energy (U) and the height from the earth surface (*h*) from the given graphs ?

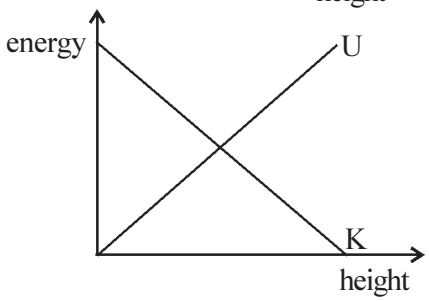
(A)



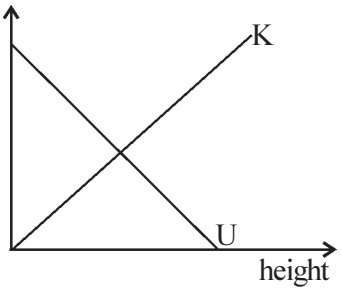
(B)



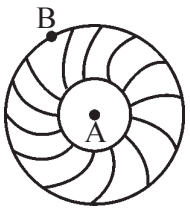
(C)



(D)



(5) The inner and outer radius of a hollow cylindier is R_1 and R_2 respectively as shown it figure. If it placed at the horizontal surface then the ratio of force acting at point A and B, $\frac{F_1}{F_2}$ = ...



(A) 1 (B) $\frac{R_1^2}{R_2^2}$ (C) $\frac{R_2}{R_1}$ (D) $\frac{R_1}{R_2}$

(6) A particle of mass m thrown upward from the earth surface with the kinetic energy one fourth then its escape energy, then the maximum height gain by the particle from the earth surface is ..... (Radius of earth = R)

(A) R (B) $\frac{R}{2}$ (C) $\frac{R}{3}$ (D) $\frac{R}{4}$

(7) In winter the thickness of ice layer in dal lake of Kashmir is *x*. If the time to becomes the layer three times then the initial is t_1 and for four times is t_2 then $\frac{t_1}{t_2}$ = ...

(A) $\frac{9}{16}$ (B) $\frac{8}{15}$ (C) $\frac{3}{4}$ (D) $\frac{1}{3}$

(8) A carnot engine, having an efficiency of $n = \frac{1}{10}$, used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is .....

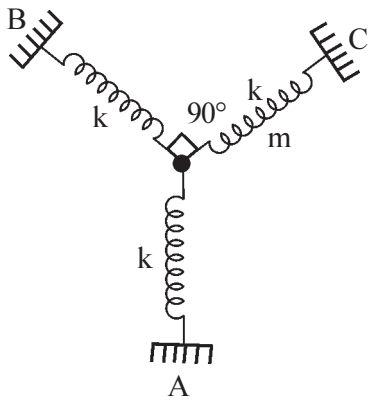
(A) 100 J (B) 99 J (C) 90 J (D) 1 J

(9) Three containers of the same volume contain three different gases. The mass of the molecules are m_1, m_2 and m_3 and the number of molecules in their respective containers are N_1, N_2 and N_3. The gas pressure in the containers are P_1, P_2 and P_3 respectively. All the gases are now mixed and put in one of the containers. The pressure P of mixture will be .....

(A) $P < (P_1 + P_2 + P_3)$ (B) $P = \frac{P_1 + P_2 + P_3}{3}$

(C) $P = P_1 + P_2 + P_3$ (D) $P > (P_1 + P_2 + P_3)$

(10)



A particle of mass m is attached to three indentical spring of force constant k as shown in figure. If the particle of mass m is pushed slightly agniast the spring A and released then what is the time period of oscillations ?

(A) $T = 2\pi \sqrt{\frac{2m}{k}}$ (B) $T = 2\pi \sqrt{\frac{m}{2k}}$

(C) $T = 2\pi \sqrt{\frac{3m}{k}}$ (D) $T = 2\pi \sqrt{\frac{m}{3k}}$

(11) A string of length *l* and mass m oscillates with frequency f. It is given by the equation $f = \frac{p}{2l}\sqrt{\frac{F}{m}}$. If p is number of loops produced in the string then dimensional formula of m is .....

(A) $M^1 L^{-1} T^0$ (B) $M^1 L^{-3} T^0$ (C) $M^1 L^{-2} T^0$ (D) $M^1 L^{-1} T^{-1}$

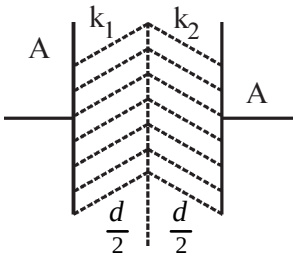
(12) In section -1 different types of capacitors shawn in figure and in section -2 the equations of its equivalent capacitance is given. Join the appropriate :

Section-1 Section -2

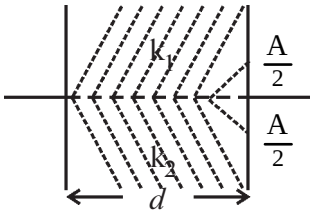
(a)

(p) $C = \frac{A\varepsilon_o}{d-t}$

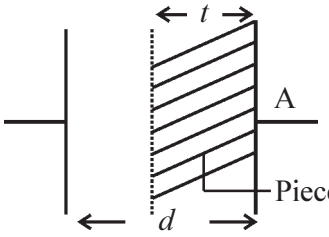
(b)



(q) $C = \frac{A\varepsilon_o}{d}$

(c) 

(r) $C = \dfrac{2A\varepsilon_0}{d\left[\dfrac{1}{K_1}+\dfrac{1}{K_2}\right]}$

(d) 

(s) $C = \dfrac{2A\varepsilon_0(k_1+k_2)}{2d}$

(A) (*a*) — *q*, (*b*) — *p*, (*c*) — *r*, (*d*) — *s*

(B) (*a*) — *q*, (*b*) — *r*, (*c*) — *s*, (*d*) — *p*

(C) (*a*) — *q*, (*b*) — *r*, (*c*) — *p*, (*d*) — *s*

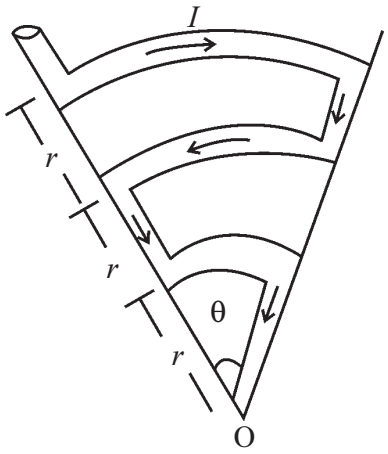
(D) (*a*) — *r*, (*b*) — *q*, (*c*) — *s*, (*d*) — *p*

(13) Assertion : The electric bulbs glows immediately when switch is on.

Reason : The drift velocity of electrons in a metallic wire is very high.

(A) *a* (B) *b* (C) *c* (D) *d*

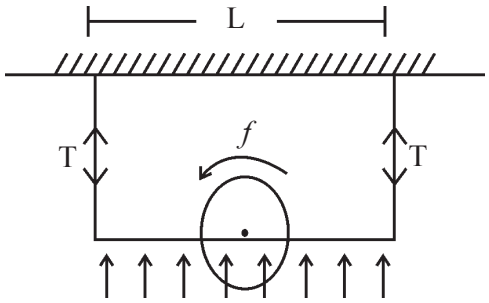
(14) The magnetic field at point 'O'



(A) $\dfrac{5\mu_0 I\theta}{24\pi r}$ (B) $\dfrac{\mu_0 I\theta}{24\pi r}$

(C) $\dfrac{11\mu_0 I\theta}{24\pi r}$ (D) Zero

(15) As shown in figure a rod of length L hanging from a rigid support with a light string. This rod passing from the centre of ring of radius 50 cm as shown in figure. 0.6 C charge in uniformly distributed on circumference of ring. When this arrangement put into uniform magnetic field the ring rotate with frequency 10 s^{-1} then the torque applied on the ring is .....Nm



(A) $6\hat{i}$ (B) $3\hat{k}$ (C) $3\hat{i}$ (D) $6\hat{k}$

(16) A AC voltage source connected with R-C series circuit for first case (1) absence of dielectric medium between two plates of capacitor and for second case (2) A dielectric medium of dielectric constant 4 present between the plates. Then for both the case which is the comparisions between the current I_R flowing from resistance R and potential difference V_C between two plates of capacitor ?

(A) $I_{R(1)} < I_{R(2)}, V_{C(1)} < V_{C(2)}$ (B) $I_{R(1)} < I_{R(2)}, V_{C(1)} > V_{C(2)}$

(C) $I_{R(1)} > I_{R(2)}, V_{C(2)} > V_{C(2)}$ (D) $I_{R(1)} > I_{R(2)}, V_{C(1)} < V_{C(2)}$

(17) The image formed by a concave mirror of focal length 15 cm is double than the linear dimension of the object, if image is virtual then object distance is ..... cm.

(A) 7.5 (B) 4.5 (C) 30 (D) 22.5

(18) The distance between object and image is 'D'. If magnification is 'm' then focal length of lens is .....

(A) $\frac{(m-1)D}{m}$ (B) $\frac{mD}{m+1}$ (C) $\frac{(m-1)D}{m^2}$ (D) $\frac{mD}{(m+1)^2}$

(19) The ratio of energy of a photon of X-ray having 3 Å wavelength with the energy of an electron having same de Broglie wavelength is ..... (Take $h = 6.6 \times 10^{-34}$ Js, $c = 3 \times 10^8$ ms^{-1})

(A) 83.4 (B) 165.8 (C) 42.6 (D) 249

(20) If the binding energy of X, A and B is 7.4 MeV, 8.2 MeV, and 8.2 MeV respectively, then how much energy is released in this prosses ? (Here binding energy per nucleon is given) $X^{200} \rightarrow A^{110} + B^{90}$

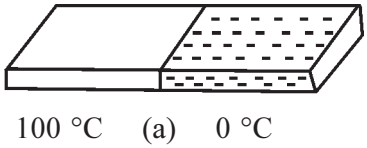
(A) 200 Me V (B) 160 MeV (C) 110 MeV (D) 90 MeV

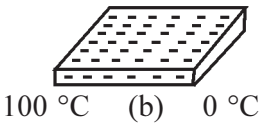
(21) The current gain of a common emitter amplifier is 59. If emitter current is 6.0 mA, then base current and collector current is .....

(A) 0.1 mA, 5.9 mA (B) 0.15 mA, 6.0 mA

(C) 0 A, 0 A (D) 5.9 mA, 0.15 mA

(22) If two rectangular blocks are connected as shown in figure (a) at a temperature difference 100 °C, then the heat propogated in 2 minutes is 10 J. If they are connected as shown in figure (b) then in what time 30 J heat will propogate ?





(A) 1.5 min (B) 2.5 min

(C) 3.5 min (D) 4.5 min

(23) The light incident perpendicularly on a diffraction grating. If angle is 32° for first order, then what is the angle for second order ?

(A) 48° (B) 84° (C) 64° (D) not possible

(24) The mass of two isobar $_{29}Cu^{64}$ and $_{30}Zn^{64}$ is 63.92984 and 63.92925 respectively then .....

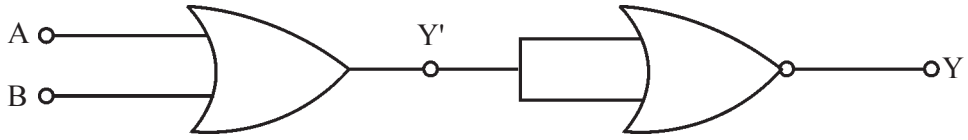
(A) Both isobar are steady

(B) Zn^{64} is Radio -active and it gives - Cu^{64} by β decay

(C) Cu^{64} is Radio -active and it gives - Zn^{64} by γ decay

(D) Cu^{64} is Radio -active and it gives -Zn^{64} by β decay

(25) The following configuration is equivalent to which gate ?



(A) AND gate (B) OR gate (C) NOR gate (D) AND gate

(26) The current gain of common emitter transistor amplifier is 50. If collecter resistance and input resistance is 5 kΩ & 1 kΩ respectively then calculate the output voltage. Input voltage is 0.01 V.

(A) 25 V (B) 2.5 V (C) 0.25 V (D) 5.0 V

(27) If the distance covered by a transmitting antenna is 12.8 km then the height of antenna is ..... . (Radius of earth = 6400 km).

(A) 6.4 m (B) 12.8 m (C) 3.2 m (D) 16 m

(28) The sides of the cube are measured by vernier callipers. (Nine divisions of main scale is equal to 10 division of vernier scale and the main scale division is 1 *m*m.) The main scale reading is 10 division and first division of vernier scale is coincide with main scale, if the mass of cube 2.736 g, then it density in gcm^{-3} upto 3 significant number is ..... ?

(A) 2.66×10^{-6} g cm^{-3} (B) 2.66×10^{-3} g cm^{-3}

(C) 2.66×10^{3} g cm^{-3} (D) 2.66 g cm^{-3}

(29) When the 'wedge and scale' experiment is performed at the equator, we get $m = M\left(\frac{y_e}{x_e}\right)$. If the same experiment is performed at the poles, then

(A) $m = M\left(\frac{y_e}{x_e}\right)$ (B) $m = M\left(\frac{y_e}{x_e}\right)\cdot\left(\frac{R_e}{R_p}\right)$

(C) $m = M\left(\frac{y_e}{x_e}\right)\cdot\left(\frac{R_p}{R_e}\right)$ (D) $m = M\left(\frac{y_e}{x_e}\right)\cdot\left(\frac{R_p}{R_e}\right)^2$

(30) The different solutions *x*, *y*, *z* of same mass have temperature 12 °C, 19 °C and 28 °C respectively. When *x* and *y* are mixed its temperature is 16 °C and when *y* and *z* are mixed its temperature is 23 °C, then when *x* and *z* are mixed what is the temperature of the mixture ?

(A) 20.3 °C (B) 21.6 °C (C) 18.5 °C (D) 23.25 °C

Ans. : 1 (D), 2 (B), 3 (B), 4 (C), 5 (D), 6 (C), 7 (B), 8 (C), 9 (C), 10 (C), 11 (A), 12 (B), 13 (C), 14 (A), 15 (B), 16 (B), 17 (A), 18 (D), 19 (D), 20 (B), 21 (A), 22 (A), 23 (D), 24 (D), 25 (C), 26 (B), 27 (B), 28 (D), 29 (A), 30 (A)

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JEE Question Paper : 2013

(1) A uniform cylinder of length L and mass M having cross-sectional area A is suspended with its length vertical, from a fixed point by a massless spring, such that it is half submerged in a liquid of density σ at equilibrium position. The extension x_0 of the spring when it is in equilibrium is : .....

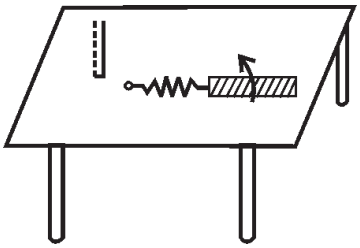
(A) $\frac{Mg}{k}$

(B) $\frac{Mg}{k}\left(1-\frac{LA\sigma}{M}\right)$

(C) $\frac{Mg}{k}\left(1-\frac{LA\sigma}{2M}\right)$

(D) $\frac{Mg}{k}\left(1+\frac{LA\sigma}{M}\right)$

(2) A metallic rod of length 'l' is tied to a string of length $2l$ and made to rotate with angular speed ω on a horizontal table with one end of the string fixed. If there is a verticle magnetic field 'B' in the region, the *e.m.f* induced across the ends of the rod is : .....



(A) $\frac{2B\omega l^2}{2}$

(B) $\frac{3B\omega l^2}{2}$

(C) $\frac{4B\omega l^2}{2}$

(D) $\frac{5B\omega l^2}{2}$

(3) This question has statement-I and statement-II. Of the four choice given after the statements. Choose the one that best describes the two statements.

Statement-I : A point particle of mass m moving with speed v collides with stationary point particle of mass M. If the maximum energy loss possible is given as $f\left(\frac{1}{2}mv^2\right)$ then $f = \left(\frac{m}{M+m}\right)$.

Statement-II : Maximum energy loss occurs when the particle get stuck together as a result of the collision.

(A) Statement-I is true, statement-II is true, statement-II is a correct explanation of statement-I.

(B) statement-I is true, statement-II is not a correct explanation of statement-I.

(C) Statement-I is true, Statement-II is false.

(D) Statement-I is false, Statement-II is true.

(4) Let $[\varepsilon_0]$ denote the dimensional formula of the permittivity of vacuum. If M = mass, L = length, T = time and A = electric current, then :

(A) $\varepsilon_0 = M^{-1} L^{-3} T^2 A$

(B) $\varepsilon_0 = M^{-1} L^{-3} T^4 A^2$

(C) $\varepsilon_0 = M^{-1} L^2 T^{-1} A^{-2}$

(D) $\varepsilon_0 = M^{-1} L^2 T^{-1} A$

(5) A projectile is given an initial velocity of $\left(\hat{i} + 2\hat{j}\right)$ ms^{-1}, where $\hat{i}$ is along the ground and $\hat{j}$ is along the verticle. If g = 10 ms^{-2}, the equation of its trajectory is :

(A) $y = x - 5x^2$ (B) $y = 2x - 5x^2$ (C) $4y = 2x - 5x^2$ (D) $4y = 2x - 25x^2$

(6) The amplitude of a damped oscillator decreases to 0.9 times its original magnitude in 5s. In another 10 s it will decrease to α times its original magnitude. Where α equals :

(A) 0.7 (B) 0.81 (C) 0.729 (D) 0.6

(7) Two capacitors C_1 and C_2 are charged to 120 V and 200 V respectively. It is found that by connecting them together the potential on each one can be made zero. Then :

(A) $5C_1 = 3C_2$ (B) $3C_1 = 5C_2$ (C) $3C_1 + 5C_2 = 0$ (D) $9C_1 = 4C_2$

(8) A sonometer wire of length 1.5 m is made of steel. The tension in it produces an elastic strain of 1%. What is the fundamental frequency of steel if density and elasticity of steel are 7.7×10^3 kg m^{-3} and 2.2×10^{11} N m^{-2} respectively ?

(A) 188.5 Hz (B) 178.2 Hz (C) 200.5 Hz (D) 770 Hz

(9) A circular loop of radius 0.3 cm lies parallel to a much bigger circular loop of radius 20 cm. The centre of the small loop is on the axis of the bigger loop. The distance between their centres is 15 cm. If a current of 2.0 A flows through the smaller loop, then the flux linked with bigger loop is :

(A) 9.1×10^{-11} weber (B) 6×10^{-11} weber

(C) 3.3×10^{-11} weber (D) 6.6×10^{-9} weber

(10) Diameter of a plano - convex lens is 6 cm and thickness at the centre is 3 *m*m. If speed of light in material of lens is 2×10^8 ms^{-1}, the focal length of the lens is :

(A) 15 cm (B) 20 cm (C) 30 cm (D) 10 cm

(11) What is the minimum energy required to launch a satellite of mass m from the surface of a planet of mass M and radius R in a circular orbit at an altitude of 2R ?

(A) $\frac{5GmM}{6R}$ (B) $\frac{2GmM}{3R}$ (C) $\frac{GmM}{2R}$ (D) $\frac{GmM}{3R}$

(12) A diode detector is used to detect an amplitude modulated wave of 60 % modulation by using a condenser of capacity 250 pico farad in paralled with a load resistance 100 kilo ohm. Find the maximum modulated frequency which could be detected by it.

(A) 10.62 MHz (B) 10.62 kHz (C) 5.31 MHz (D) 5.31 kHz

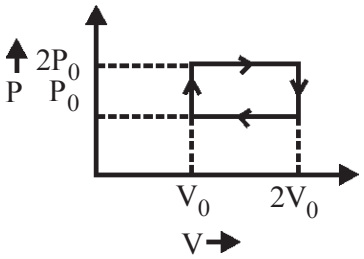
(13) A beam of unpolarised light of intensity I_0 is passed through a polaroid A and then through another polaroid B which is oriented so that its principal plane makes an angle of 45° relative to that of A. The intensity of the emergent light is :

(A) I_0 (B) $\frac{I_0}{2}$ (C) $\frac{I_0}{4}$ (D) $\frac{I_0}{8}$

(14) The supply voltage to a room is 120 V. The resistance of the lead wires is 6 Ω. A 60 W bulb is already switched on. What is the decrease of voltage across the bulb, when a 240 W heater is switched on in parallel to the bulb ?

(A) zero V (B) 2.9 V (C) 13.3 V (D) 10.04 V

(15) The above P–V diagrame represents the thermodynamic cycle of an engine,operating with an ideal monoatomic gas. The amount of heat, extracted from the source in a single cycle is :



(A) P_0V_0 (B) $\left(\frac{13}{2}\right) P_0V_0$

(C) $\left(\frac{11}{2}\right) P_0V_0$ (D) $4P_0V_0$

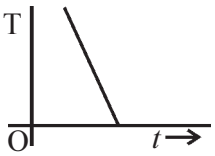
(16) A loop of radius *r* and mass *m* rotating with an angular velocity ω_0 is placed on a rough horizontal surface. The initial velocity of the centre of the loop is zero. What will be the velocity of the centre of the loop when it ceases to slip ?

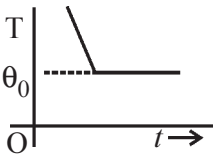
(A) $\frac{r\omega_0}{4}$ (B) $\frac{r\omega_0}{3}$ (C) $\frac{r\omega_0}{2}$ (D) $r\omega_0$

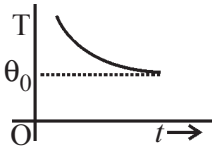
(17) An ideal gas enclosed in a vertical cylinderical container supports a freely moving piston of mass M. The piston and the cylinder have equal cross sectional area A.When the piston is in equilibrium, the volume of the gas is V_0 and its pressure is P_0. The piston is slightly displaced from the equilibrium position and released.Assuming that the system is completely isolated from its surrounding, the piston executes a simple harmonic motion with frequency :

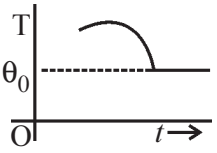
(A) $\frac{1}{2\pi}\ \frac{A\gamma P_0}{V_0M}$ (B) $\frac{1}{2\pi}\ \frac{V_0MP_0}{A^2\gamma}$ (C) $\frac{1}{2\pi}\sqrt{\frac{A^2\gamma P_0}{MV_0}}$ (D) $\frac{1}{2\pi}\ \sqrt{\frac{MV_0}{A\gamma P_0}}$

(18) If piece of metal is heated to temperature θ and then allowed to cool in a room which is at temperature 60 the graph between the temperature T of the metal and time *t* will be closest to :

(A) 

(B) 

(C) 

(D) 

(19) This question has statement I and statement II. Of the four choice given after the statements, choose the one that best describe the two statements.

Statement I : Higher the range, greater is the resistance of ameter.

Statement II : To increase the range of ameter, additional shunt needs to be used across it.

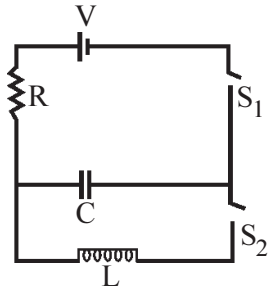
(A) Statement-I is true, statement-II is true, statement-II is not the correct explanation of Statement-I

(B) Statement-I is true, statement-II is true, satement-II is not the correct explanation of statement-I

(C) Statement-I is true, statement-II is false.

(D)Statement-I is false, statement-II is true.

(20) In an LCR circuit as shown below both switches are open initially. Now switch S_1 is closed, S_2 kept open. (q is charge on the capacitor and $\tau = RC$ is Capacitively time constant). Which of the following statement is correct ?



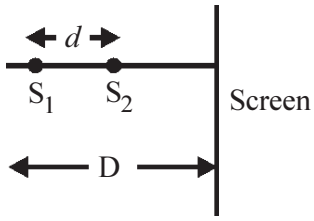
(A) Work done by the battery is half of the energy dissipated in the resistor

(B) At $t = \tau$, $q = CV / 2$

(C) At $t = 2\tau$, $q = CV\,(1 - e^{-2})$

(D) At $t = \frac{\tau}{2}$, $q = CV\,(1 - e^{-1})$

(21) Two coherent point sources S_1 and S_2 are separated by a small distance 'd' as shown. The fringes obtained on the screen will be :



(A) points (B) straight lines

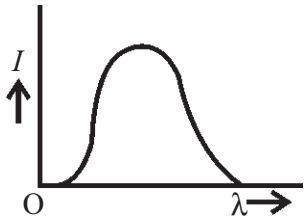
(C) semi - circles (D) concentric circles

(22) The magnetic field in a travelling electromegnetic wave has a peak value of 20 nT. The peak value of electric field strength is :

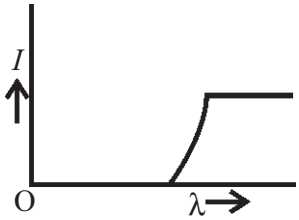
(A) 3 Vm^{-1} (B) 6 Vm^{-1} (C) 9 Vm^{-1} (D) 12 Vm^{-1}

(23) The anode voltage of a photocell is kept fixed. The wavelength λ of the light falling on the cathode is gradually changed. The plate current I of the photocell varies as :

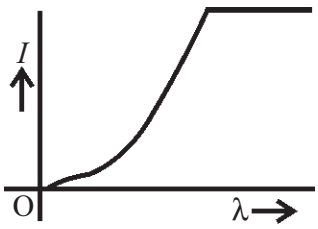
(A)



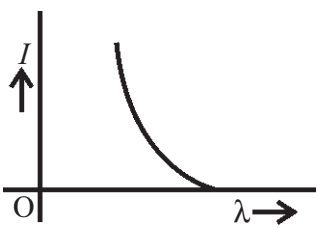
(B)



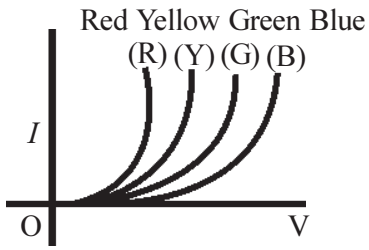
(C)

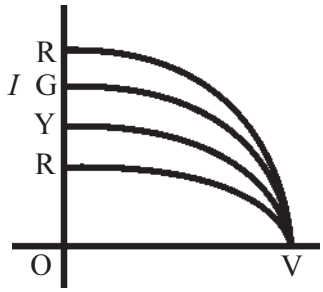


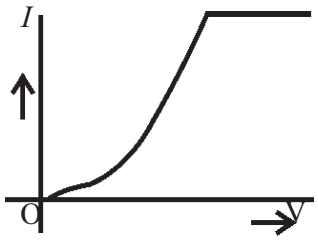
(D)

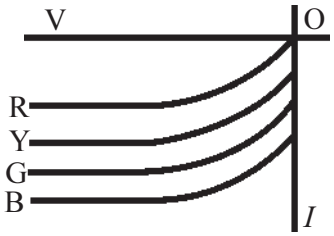


(24) The $I - V$ characteristic of an LED is :

(A) 

(B) 

(C) 

(D) 

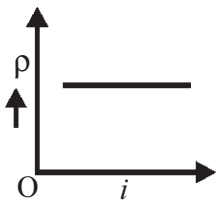
(25) Assume that a drop of liquid evaporates by decrease in its surface energy, so that its temperature remains unchanged. What should be the minimum radius of the drop for this to be possible ? The surface tension is T, density of liquid is ρ and L is its latent heat of vaporization.

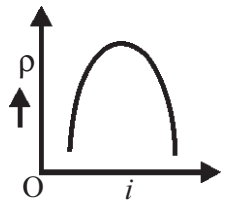
(A) $\frac{\rho L}{T}$ (B) $\sqrt{\frac{T}{\rho L}}$ (C) $\frac{T}{\rho L}$ (D) $\frac{2T}{\rho L}$

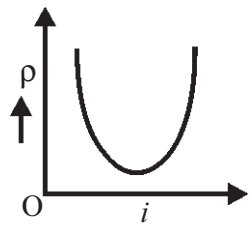
(26) In a Hydrogen like atom electron makes transition from an energy level with quantum number n to another with quantum number $(n-1)$. If $n >> 1$, the frequency of radiation emitted is proprtional to :

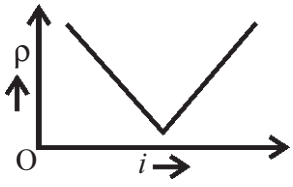
(A) $\frac{1}{n}$ (B) $\frac{1}{n^2}$ (C) $\frac{1}{n^{\frac{3}{2}}}$ (D) $\frac{1}{n^3}$

(27) The graph between angle of deviation (ρ) and angle of incidence (i) for a triangular prism is represented by :

(A) 

(B) 

(C) 

(D) 

(28) Two charges, each equal to q, are kept at $x = -a$ and $x = a$ on the X-axis.A particle of mass m and charge $q_0 = \frac{q}{2}$ is placed at the origin. If charge q_0 is given a small displacement ($y << a$) along the Y-axis, the net force acting on the particle is proportional to:

(A) y (B) $-y$ (C) $\frac{1}{y}$ (D) $-\frac{1}{y}$

(29) Two short bar magnets of length 1 cm each have magnetic moments 1.20 Am^2 and 1.00 Am^2 respectively. They are placed on a horizontal table parallel to each other with their N poles pointing towards the South. They have a common magnetic equator and are separated by a distance of 20.0 cm. The value of the resultant horizontal magnetic induction at the mid - point O of the line joining their centres is close to

(Horizontal component of earth's magnetic induction is 3.6×10^{-5} Wb m^{-2})

(A) 3.6×10^{-5} Wbm^{-2}

(B) 2.56×10^{-4} Wb m^{-2}

(C) 3.50×10^{-4} Wbm^{-2}

(D) 5.80×10^{-4} Wb m^{-2}

(30) A charge Q is uniformly distributed over a long rod AB of length L as shown in the figure. The electric potential at the point O lying at a distance L from the end A is :

(A) $\frac{Q}{8\pi\varepsilon_0 L}$

(B) $\frac{3Q}{4\pi\varepsilon_0 L}$

(C) $\frac{Q}{4\pi\varepsilon_0 L \ln 2}$

(D) $\frac{Q\ln 2}{4\pi\varepsilon_0 L}$

Ans. : 1 (C), 2 (D), 3 (D), 4 (B), 5 (B), 6 (C), 7 (B), 8 (B), 9 (A), 10 (C), 11 (A), 12 (B), 13 (C), 14 (D), 15 (A), 16 (C), 17 (C), 18 (C), 19 (D), 20 (C), 21 (D), 22 (B), 23 (D), 24 (A), 25 (D), 26 (D), 27 (C), 28 (A), 29 (B), 30 (D)

JEE Question Paper : 2014

(1) The pressure that has to be applied to the ends of a steel wire of length 10 cm to keep its length constant when its temperature is raised by 100 °C is :(For steel Young's modulus is 2×10^{11} N m^{-1} and coefficient of thermal expansion is 1.1×10^{-5} K^{-1})

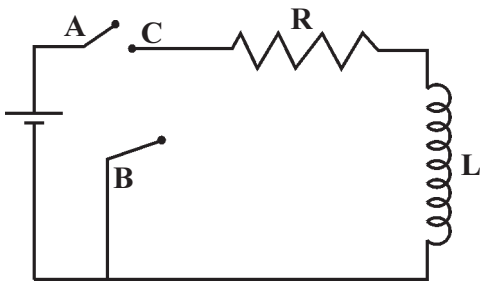
(A) 2.2×10^9 P*a*

(B) 2.2×10^7 P*a*

(C) 2.2×10^6 P*a*

(D) 2.2×10^8 P*a*

(2) In the circuit shown here, the point 'C' is kept connected to point 'A' till the current flowing through the circuit, becomes constant. Afterward, suddenly, point 'C' is disconnected from point 'A' and connected to point 'B' at time $t = 0$. Ratio of the voltage across resistance and the inductor at $t = L/R$ will be equal to :



(A) 1

(B) −1

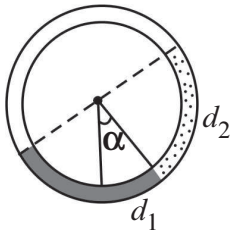
(C) $\frac{1-e}{e}$

(D) $\frac{e}{1-e}$

(3) The radiation corresponding to $3 \rightarrow 2$ transition of Hydrogen atom falls on a metal surface to produce photoelectrons. These electrons are made to enter a magnetic field of 3×10^{-4} T. If the radius of the largest circular path followed by these electrons is 10.0 *m*m, the work function of the metal is close to :

(A) 1.1 *e*V (B) 0.8 *e*V (C) 1.6 *e*V (D) 1.8 *e*V

(4) There is circular tube in a vertical plane. Two liquids which do not mix and of densities d_1 and d_2 are filled in the tube. Each liquid subtends 90° angle at centre. Radius joining their interface makes an angle α with vertical. Ratio $\frac{d_1}{d_2}$ is : .



(A) $\frac{1+\cos\alpha}{1-\cos\alpha}$

(B) $\frac{1+\tan\alpha}{1-\tan\alpha}$

(C) $\frac{1+\sin\alpha}{1-\cos\alpha}$

(D) $\frac{1+\sin\alpha}{1-\sin\alpha}$

(5) A bob of mass m attached to an inextensible string of length *l* is suspended from a vertical support. The bob rotates in a horizontal circle with an angular speed ω rad s^{-1} about the vertical. About the point of suspension :

(A) angular momentum changes in magnitude but not in direction.

(B) angular momentum changes in direction but not in magnitude.

(C) angular momentum changes both in direction and magnitude.

(D) angular momentum is conserved.

(6) A thin convex lens made from crown glass ($\mu = \frac{3}{2}$) has focal length *f*. When it is measured in two different liquids having refractive indices $\frac{4}{3}$ and $\frac{5}{3}$ it has the focal length f_1 and f_2 respectively. The correct relation between the focal length is :

(A) $f_1 > f$ and f_2 becomes negative

(B) $f_2 > f$ and f_1 becomes negative

(C) f_1 and f_2 both become negative

(D) $f_1 = f_2 < f$

(7) A green light is incident from the water to the air - water interface at the critical angle (θ). Select the correct statement.

(A) The spectrum of visible light whose frequency is less than that of green light will come out to the air medium.

(B) The spectrum of visible light whose frequency is more than that of green light will come out to the air medium.

(C) The entire spectrum of visible light will come out of the water at various angles to the normal.

(D) The entire spectrum of visible light will come out of the water at an angle of 90° to the normal.

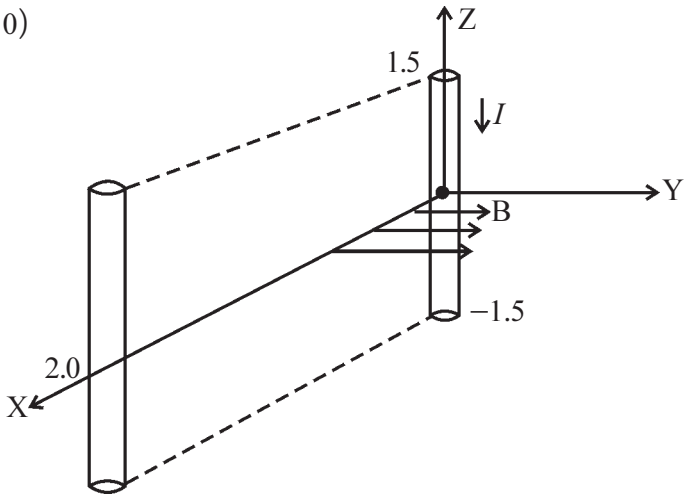
(8) A block of mass m is placed on a surface with a vertical cross section given by $y = \frac{x^3}{6}$. If the coefficient of friction is 0.5, the maximum height above the ground at which the block can be placed without slipping is :

(A) $\frac{2}{3}$ m (B) $\frac{1}{3}$ m (C) $\frac{1}{2}$ m (D) $\frac{1}{6}$ m

(9) The coercivity of a small magnet where the ferromagnet gets demagnetized is 3×10^3 Am^{-1}. The current required to be passed in a solenoid of length 10 cm and number of turns 100, so that the magnet gets demagnetized when inside the solenoid, is :

(A) 60 *m*A (B) 3 A (C) 6 A (D) 30 *m*A

(10)



A conductor lies along the Z-axis at $-1.5 \le Z < 1.5$ m and carries a fixed current of 10.0 A in $-\hat{a}\,z$ direction (see figure). For a field $\vec{B} = 3.0 \times 10^{-4} e^{-0.2x}\ \hat{a}\,y$T, find the power required to move the conductor at constant speed to x = 2.0 m, y = 0 m in 5×10^{-3} s. Assume parallel motion along the X- axis.

(A) 2.97 W (B) 14.85 W (C) 29.7 W (D) 1.57 W

(11) Two beams, A and B, of plane polarized light with mutually perpendicular planes of polarization are seen through a polaroid. From the position when the beam A has maximum intensity (and beam B has zero intensity), a rotation of polaroid through 30° makes the two beams appear equally bright. If the initial intensities of the two beams are I_A and I_B respectively, then $\frac{I_A}{I_B}$ equals :

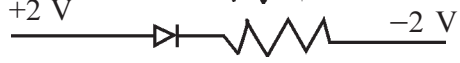
(A) $\frac{3}{2}$ (B) 1 (C) $\frac{1}{3}$ (D) 3

(12) The forward biased diode connection is :

(A) 

(B) 

(C) 

(D) 

(13) Assume that an electric field $\vec{E} = 30x^2\hat{i}$ exists in space. Then the potential diference $V_A - V_O$ where V_O is the potential at the origin and V_A the potential at x = 2 m is :

(A) −120 V (B) −80 V (C) 80 V (D) 120 V

(14) Match list - 1(electromagnetic wave type) with List -II (Its association / application)and select the correct option from the choices given below the lists :

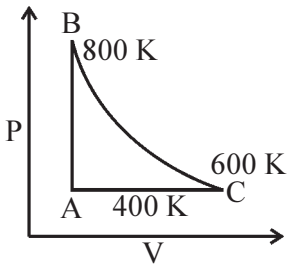
List-I	**List** -II
(a) Infrared waves	(i) To treat muscular strain
(b) Radio waves	(ii) For broadcasting
(c) X - rays	(iii) To detect fracture of bones
(d) Ultraviolet rays	(iv) Absorbed by the ozone layer of the atmosphere

	(a)	(b)	(c)	(d)
(A)	(i)	(ii)	(iv)	(iii)
(B)	(iii)	(ii)	(i)	(iv)
(C)	(i)	(ii)	(iii)	(iv)
(D)	(iv)	(iii)	(ii)	(i)

(15) The current voltage relation of diode is given by $I = (e^{1000V/T} - 1)$ *m*A, where the applied voltage V is in volts and the temperature T is in Kelvin. If a student makes an error measuring ± 0.01 V while measuring the current of 5 *m*A at 300 K. What will be the error in the value of current in *m*A?

(A) 0.02 (B) 0.5 (C) 0.05 (D) 0.2

(16) One mole of diatomic ideal gas undergoes a cyslic process ABC as shown in figure.The process BC is adiabatic. The temperature at A, B and C are 400 K, 800 K and 600 K respectively. Choose the correct statement :



(A) The change in internal energy in the process CA is 700 R.

(B) The change in internal energy in the process AB is −350 R.

(C) The change in internal energy in the process BC is −500 R.

(D) The change in internal energy in whole cyclic process is 250 R.

(17) A pipe of length 85 cm is closed from one end. Find the number of possible natural oscillations of air column in the pipe whose frequencies lie below 1250 H*z*.The velocity of sound in air is 340 ms^{-1}.

(A) 8 (B) 6 (C) 4 (D) 12

(18) In a large building there are 15 bulbs of 40 W, 5 bulbs of 100 W, 5 fans of 80 W and 1 heater of 1 kW. The voltage of the electric mains is 220 V. The minimum capacity of the main fuse of the building will be :

(A) 10 A (B) 12 A (C) 14 A (D) 8 A

(19) Four particles, each of mass 'M' and equidistant from each other, move along a circle of radius R under the action of their mutual gravitational attraction. The speed of each particle is :

(A) $\sqrt{2\sqrt{2}\frac{GM}{R}}$ (B) $\sqrt{\frac{GM}{R}(1+2\sqrt{2})}$ (C) $\frac{1}{2}\sqrt{\frac{GM}{R}(1+2\sqrt{2})}$ (D) $\sqrt{\frac{GM}{R}}$

(20) From a tower of height H, a particle is thrown vertically upwards with a speed u. The time taken by the particle to hit the ground is n times that taken by it to reach the highest point of its path. The relation between H, u and n is :

(A) g H = $(n-2)^2u^2$ (C) g H = $(n-2)u^2$

(B) $2g$ H = nu^2 $(n-2)$ (D) $2g$ H = n^2u^2

(21) A student measured the length of a rod and wrote it as a 3.50 cm. Which instrument did he use to measure it ?

(A) A vernier calliper where the 10 divisions in vernier scale matches with 9 division in main scale and main scale has 10 divisions in 1 cm .

(B) A screw gauge having 100 divisions in the circular scale and pitch as 1 mm.

(C) A screw gauge having 50 divisions in the circular scale and pitch as 1mm.

(D) A meter scale.

(22) A parellel plate capacitor is made of two circular plates separated by a distance of 5 mm and with a dielectric of dielectric constant 2.2 between them. When the electric field in the dielectric is 3×10^4 Vm^{-1}, the charge density of the positive plate will be close to :

(A) 3×10^{-7} Cm^{-2} (B) 3×10^4 Cm^{-2} (C) 6×10^4 Cm^{-2} (D) 6×10^{-7} Cm^{-2}

(23) An open glass tube is immersed in mercury in such a way that a length of 8 cm extends above the mercury level. The open end of the tube is then closed and sealed and the tube is raised vertically up by additional 46 cm. What will be length of the air column above mercury in the tube now ?

(atmospheric pressure = 76 cm of Hg)

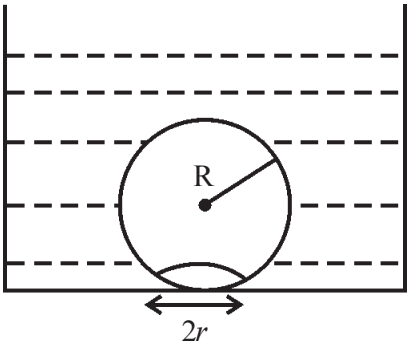
(A) 22 cm (B) 38 cm (C) 6 cm (D) 16 cm

(24) A particle moves with simple harmonic motion in a straight line. In first t s, after starting from rest in travels distance a and in next t s it travels $2a$ in same direction then :

(A) time period of oscillations is $8t$ (C) amplitude of motion is $4a$

(B) time period of oscillation is $6t$ (D) amplitude of motion is $3a$

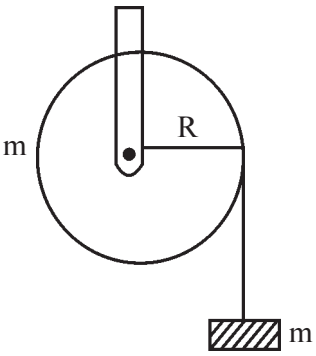
(25) On heating water, bubbles being formed at the bottom of the vessel detatch and rise. Take the bubbles to be spheres of radius R and making a circular contact of radius r with the bottom of the vessel. If $r \ll$ R, and the surface tension of water is T, value of r just before bubbles detatch is ..... (density of water is ρ_w).



(A) $R^2\sqrt{\frac{\rho_w g}{6T}}$ (C) $\sqrt{\frac{3\rho_w g}{6T}}$

(B) $R^2\sqrt{\frac{\rho_w g}{T}}$ (D) $R^2\sqrt{\frac{2\rho_w g}{3T}}$

(26) A mass 'm' is supported by a massless string wound around a uniform hollow cylinder of mass m and redius R. If the string does not slip on the cylinder, with what acceleration will the mass fall on release ?



(A) $\frac{g}{2}$ (C) $\frac{5g}{6}$

(B) g (D) $\frac{2g}{3}$

(27) During the propagation of electromagnetic waves in a medium :

(A) Electric energy density is half of the magnetic energy density.

(B) Electric energy density is equal to the magnetic energy density.

(C) Both electric and magnetic energy densities are zero.

(D) Electric energy density is double of the magnetic energy density.

(28) Three rods of Copper, Brass and Steel are welded together to form a Y-shaped structure. Area of cross - section of each rod = 4 cm^2. End of copper rod is maintained at 100 °C where as ends of brass and steel are kept at 0 °C. Length of the Copper, Brass and Steel rods are 46, 13 and 12 cm respectively. The rods are thermally insulated from surrounding except at ends. Thermal conductivities of Copper, Brass and Steel are 0.92, 0.26 and 0.12 CGS units respectively. Rate of heat flow through Copper rod is :

(A) 2.4 cal s^{-1} (B) 4.8 cal s^{-1} (C) 6.0 cal s^{-1} (D) 1.2 cal s^{-1}

(29) Hydrogen ($_1H^1$), Deuterium ($_1H^2$), singly ionised Helium $(_2H^4)^+$ and doubly ionised Lithium $(_3Li^6)^{++}$ all have one electron around the nucleus.Consider an electron transition from $n = 2$ to $n = 1$. If the wave length of emitted radiation are λ_1, λ_2, λ_3 and λ_4 respectively then approximately which one of the following is correct ?

(A) $\lambda_1 = 2\lambda_2 = 2\lambda_3 = \lambda_4$ (C) $\lambda_1 = 2\lambda_2 = 3\lambda_3 = 4\lambda_4$

(B) $\lambda_1 = \lambda_2 = 4\lambda_3 = 9\lambda_4$ (D) $4\lambda_1 = 2\lambda_2 = 2\lambda_3 = \lambda_4$

(30) When a rubber- band is stretched by a distance x, it exerts a restoring force of magnitude $F = ax + bx^2$, where a and b are constants. The work done in stretching the unstretched rubber - band by L is :

(A) $\frac{1}{2}(aL^2 + bL^3)$ (B) $\frac{aL^2}{2} + \frac{bL^3}{3}$ (C) $\frac{1}{2}\left(\frac{aL^2}{2} + \frac{bL^3}{3}\right)$ (D) $aL^2 + bL^3$

Ans. : 1 (D), 2 (B), 3 (A), 4 (B), 5 (B), 6 (A), 7 (A), 8 (D), 9 (B), 10 (A), 11 (C), 12 (D), 13 (B), 14 (C), 15 (D), 16 (C), 17 (B), 18 (B), 19 (C), 20 (B), 21 (A), 22 (D), 23 (D), 24 (B), 25 (D), 26 (A), 27 (B), 28 (B), 29 (B), 30 (B)

JEE Question Paper : 2015

(1) As an electron makes a transition from an excited state to the ground state of a Hydrozen - like atom\ion :

(A) kinetic energy, potential energy and total energy decrease.

(B) kinetic energy decrease, potential energy increase but total energy remains same.

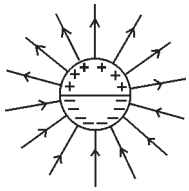
(C) kinetic energy and total energy decrease but potential energy increases.

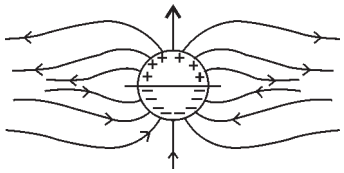
(D) its kinetic energy increase but potential energy and total energy decrease.

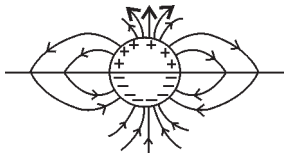
(2) The period oscillation of a simple pendulum is $T = 2\pi\sqrt{\frac{L}{g}}$. Measured value of L is 20.0 cm known to 1 *m*m acccuracy and time for 100 oscillations of the pendulum is found to be 90 s using a wrist watch of 1 s resolution, The accuracy in the determination of *g is :*

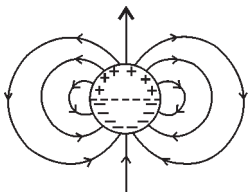
(A) 3 % (B) 1 % (C) 5 % (D) 2 %

(3) A long cylinderical shell carries positive surface charge σ in the upper half and negative surface charge $-\sigma$ in the lower half. The electric field lines around the cylinder will look like figure given in : (figure are schematic and not drawn to scale)

(A) 

(B) 

(C) 

(D) 

(4) A signal of 5 kHz frequency is amplitude modulated on a carrier wave of frequency 2 MHz. The frequencies of the resultant signal is/are :

(A) 2005 kHz and 1995 kHz

(B) 2005 kHz, 2000 kHz and 1995 kHz

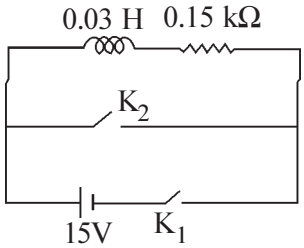
(C) 2000 kHz and 1995 kHz

(D) only 2 MHz

(5) Consider a spherical shell of radius R at temperature T. The black body radiation inside it can be considered as an ideal gas of photons with internal energy per unit volume $E = \frac{U}{V} \propto T^4$ and pressure $P = \frac{1}{3}\left(\frac{U}{V}\right)$. If the shell now undergoes an adiabatic expension, the relation between T and R is :

(A) $T \propto e^{-3R}$ (B) $T \propto \frac{1}{R}$ (C) $T \propto \frac{1}{R^3}$ (D) $T \propto e^{-R}$

(6) An inductor (L = 0.03 H) and a resistor (R = 0.15 kΩ) are connected in series to a battery of 15 V emf in circuit shown below. The key K_1 has been kept closed for a long time. Then at $t = 0$, K_1 is opened and key K_2 is closed simultaneously. At $t = 1ms$ the current in the circuit will be : ($e^5 \cong 150$)



(A) 67 *m*A (C) 0.67 *m*A

(B) 6.7 *m*A (D) 100 *m*A

(7) A pendulum made of a uniform wire of cross sectional area A has time period T. When an additional mass M is added to its bob, the time period changes to $T_{M.}$ If the Young's modulus of the material of the wire is Y then $\frac{1}{Y}$ is equal to :(g = gravitational acceleration)

(A) $\left[\left(\frac{T_M}{T}\right)^2 - 1\right] \frac{Mg}{A}$ (C) $\left[1 - \left(\frac{T}{T_M}\right)^2\right] \frac{A}{Mg}$

(B) $\left[1 - \left(\frac{T_M}{T}\right)^2\right] \frac{A}{Mg}$ (D) $\left[\left(\frac{T_M}{T}\right)^2 - 1\right] \frac{A}{Mg}$

(8) A red LED emits light at 0.1 W uniformly around it. The amplitude of the electric field of the light at a distance of 1 m from the diode is :

(A) 2.45 Vm^{-1} (B) 5.48 Vm^{-1} (C) 7.75 Vm^{-1} (D) 9.73 Vm^{-1}

(9) Two coaxial solenoids of different radii carry current I in the same direction. Let $\vec{F}_1$ be the magnetic force on the inner solenoid due to the outer one and $\vec{F}_2$ be the magnetic force on the outer solenoid due to the inner one. Then :

(A) $\vec{F}_1$ is radially inwards and $\vec{F}_2$ is radially outwards

(B) $\vec{F}_1$ is radially inwards and $\vec{F}_2 = 0$

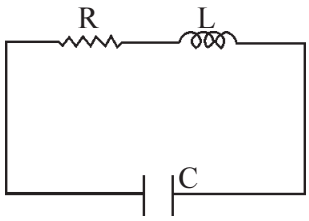
(C) $\vec{F}_1$ is radially outwards and $\vec{F}_2 = 0$

(D) $\vec{F}_1 = \vec{F}_2 = 0$

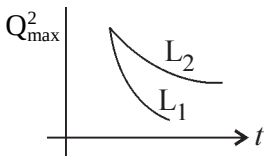
(10) Consider an ideal gas confined in an isolated closed chamber. As the gas undergoes an adiabatic expansion, the average time of collision between molecules increases as $V^{q,}$ where V is the volume of the gas. The value of q is : $\left(\gamma = \frac{C_p}{C_v}\right)$

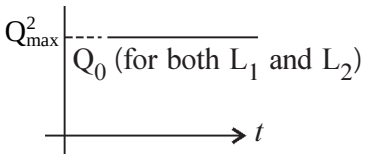
(A) $\frac{3\gamma - 5}{6}$ (B) $\frac{\gamma + 1}{2}$ (C) $\frac{\gamma - 1}{2}$ (D) $\frac{3\gamma + 5}{6}$

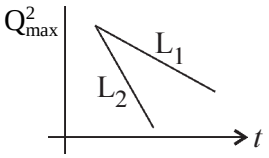
(11) An LCR circuit is equivalent to a damped pendulum. In an LCR circuit the capacitor is charged to Q_0 and then connected to the L and R as shown below :

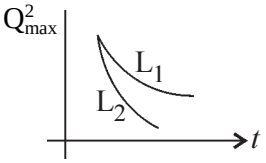


If a student plots of the square of maximum charge $\left(Q_{max}^2\right)$ on the capacitor with time (t) for two different values L_1 and L_2 $(L_1 > L_2)$ of L then which of the following represents this graph correctly ?(plots are schematic and not drawn to scale)

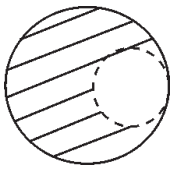
(A) 

(C) 

(B) 

(D) 

(12) From a solid sphere of mass M and radius R, a spherical portion of radius $\frac{R}{2}$ is removed, as shown in the figure. Taking gravitational potential V = 0 at $r = \infty$, the potential at the centre of the cavity thus formed is :(G = gravitational constant)

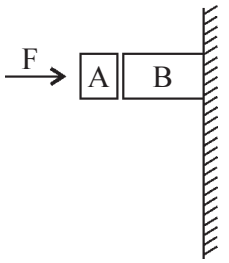


(A) $\frac{-GM}{R}$ (B) $\frac{-2GM}{3R}$ (C) $\frac{-2GM}{R}$ (D) $\frac{-GM}{2R}$

(13) A train is moving on a straight track with speed 20 ms^{-1}. It is blowing its whistle at the frequency of 1000 Hz. The percentage change in the frequency heard by a person standing near the track as the train passes him is (speed of sound = 320 ms^{-1}) closed to :

(A) 12 % (B) 18 % (C) 24 % (D) 6 %

(14) Given in the figure are two blocks A and B of weight 20 N and 100 N respectively. These are being pressed against a wall by a force F as shown. If the coefficient of friction between the blocks is 0.1 and between blocks B and the wall is 0.15, the frictional force applied by the wall on block B is :



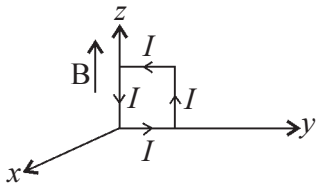
(A) 80 N (B) 120 N (C) 150 N (D) 100 N

(15) Distance of the centre of mass of a solid uniform cone from its vertex is z_0. If the radius of its base is R and its height is h then z_0 is equal to :

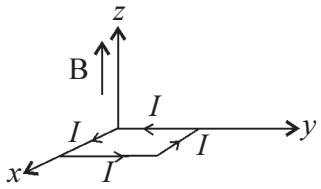
(A) $\frac{3h}{4}$ (B) $\frac{5h}{8}$ (C) $\frac{3h^2}{8R}$ (D) $\frac{h^2}{4R}$

(16) A rectangular loop of sides 10 cm and 5 cm carrying a current I of 12A is placed in different orientations as shown in the figures below:

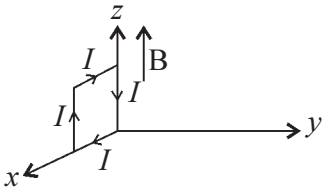
(a)



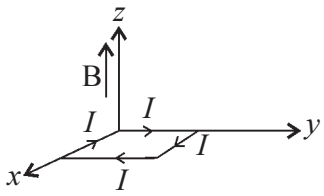
(b)



(c)



(d)



If there is a uniform magnetic field of 0.3 T in the positive z-direction, in which orient on the loop would be in (i) stable equilibrium and (ii) unstable equilibrium ?

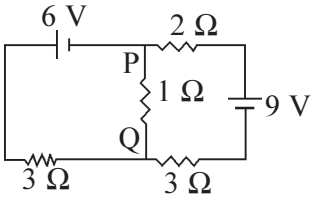
(A) (*a*) and (*c*) respectively

(B) (*b*) and (*d*) respectively

(C) (*b*) and (*c*) respectively

(D) (*a*) and (*b*) respectively

(17) In the circuit shown, the current in the 1 Ω resistors is :



(A) 0 A

(B) 0.13 A from Q to P

(C) 0.13 A from P to Q

(D) 1.3 A from P to Q

(18) A uniformly charged solid sphere of radius R has potential V_0 (mesured with respect to ∞)on its surface. For this sphere the equipotential surfaces with potentials $\frac{3V_0}{2}$, $\frac{5V_0}{4}$, $\frac{3V_0}{4}$ and $\frac{V_0}{4}$ have radius R_1, R_2, R_3, and R_4 respectively. Then

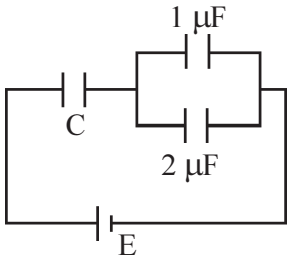
(A) $R_1 \neq 0$ and $(R_2 - R_1) > (R_4 - R_3)$

(B) $R_1 = 0$ and $R_2 < (R_4 - R_3)$

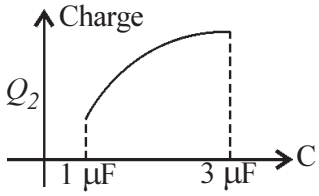
(C) $2R < R_4$

(D) $R_1 = 0$ and $R_2 > (R_4 - R_3)$

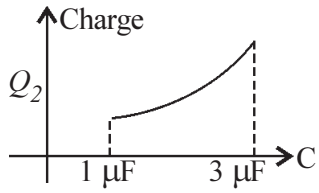
(19) In the given circuit, charge Q_2 on the 2μF capacitor changes as C is varied from 1μF to 3μF. Q_2 as a function of 'C' is given properly by : (figures are drawn schematically and are not to scale)



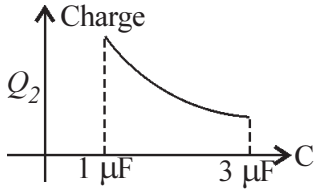
(A)



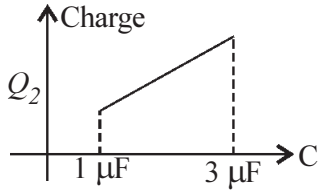
(B)



(C)



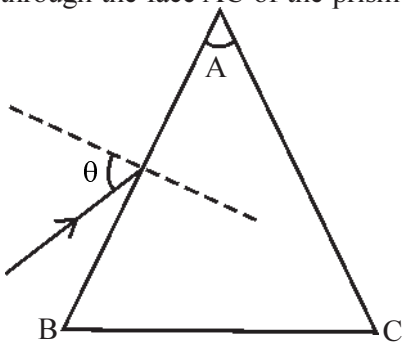
(D)



(20) A particle of mass m moving in the *x*-direction with speed $2v$ is hit by another particle of mass 2m moving in the *y*-direction with speed v. If the collision is perfectly inelastic, the percentage loss in the energy during the collision is close to :

(A) 50 % (B) 56 % (C) 62 % (D) 44 %

(21) Monochromatic light is incident on a glass prism of angle A. If the refractive index of the material of the prism is μ, a ray incident at an angle θ on the face AB would get transmitted through the face AC of the prism provided :



(A) $\theta < \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(B) $\theta > \cos^{-1}\left[\mu \sin\left(A + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(C) $\theta < \cos^{-1}\left[\mu \sin\left(A + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(D) $\theta > \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(22) From a solid sphere of mass M and radius R a cube of maximum possible volume is cut. Moment of inertia of cube about an axis passing through its center and perpendicular to one of its faces is :

(A) $\frac{MR^2}{16\sqrt{2}\pi}$ (B) $\frac{4MR^2}{9\sqrt{3}\pi}$ (C) $\frac{4MR^2}{3\sqrt{3}\pi}$ (D) $\frac{MR^2}{32\sqrt{2}\pi}$

(23) Match List -I (Fundamental experiment) with List -II (its conclusion) and select the correct option from the choice given below the list :

	List - **I**		List - **II**
(*a*)	Franck -Hertz Experiment	(i)	Particle nature of light
(*b*)	Photo-electric experiment	(ii)	Discrete energy levels of atom
(*c*)	Davision- Germer Experiment	(iii)	Wave nature of electron
		(iv)	Structure of atom

(A) (*a*) (ii) (*b*) (iv) (*c*) (iii)

(B) (*a*) (ii) (*b*) (i) (*c*) (iii)

(C) (*a*) (iv) (*b*) (iii) (*c*) (ii)

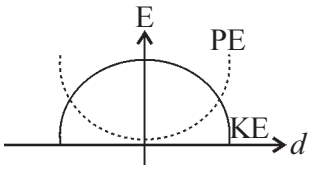
(D) (*a*) (i) (*b*) (iv) (*c*) (iii)

(24) When 5V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is 2.5×10^{-4} ms^{-1}. If the electron density in the wire is 8×10^{28} m^{-3}, the resistivity of the material is close to :

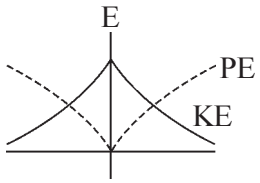
(A) 1.6×10^{-7} Ω m (B) 1.6×10^{-6} Ω m (C) 1.6×10^{-5} Ω m (D) 1.6×10^{-8} Ω m

(25) For a simple pendulum, a graph is plotted between its kinetic energy (KE) and potential energy (PE) against its displacement d. Which one of the following represents these correctly ? (graph are schematic and not drawn to scale)

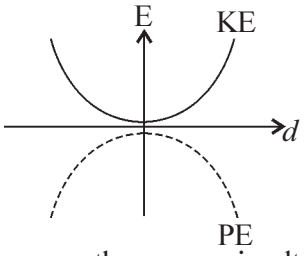
(A)



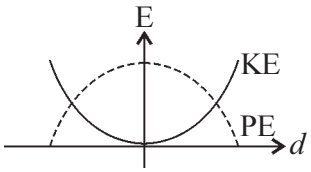
(C)



(B)



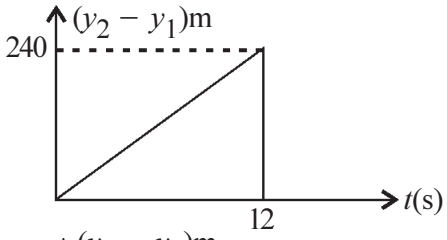
(D)



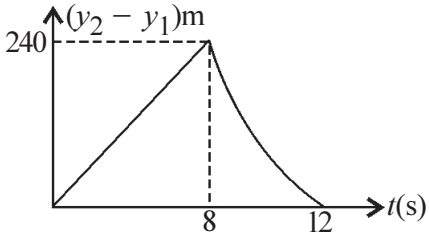
(26) Two stones are thrown up simultaneously from the edge of a cliff 240 m high with initial speed of 10 ms^{-1} and 40 ms^{-1} respectively. Which of the following graph best represents the time variation of relative position of the second stone with respect to the first ? (Assume stones do not rebound after hitting the ground and neglet air resistance, take $g = 10$ $ms^{-2)}$

(The figures are schematic and not drawn to scale)

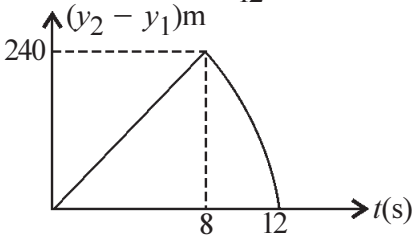
(A)



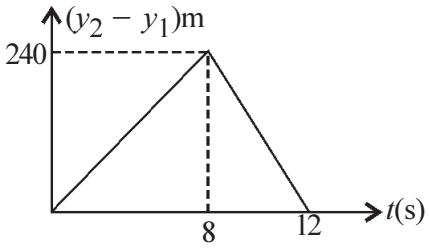
(C)



(B)



(D)



(27) A solid body of constant heat capacity 1 $J°C^{-1}$ is being heated by keeping it in contact with reservoirs in two ways :

(i) Sequentially keeping in contact with 2 reservoirs such that each reservoir supplies same amount of heat.

(ii) Sequentially keeping in contact with 8 reservoirs such that each reservoirs supplies same amount of heat.

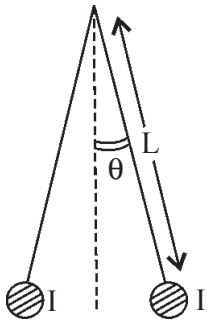
In both the cases body is brought from initial temperature 100 °C to final temperature 200 °C. Entropy change of the body in the two cases respectively is :

(A) *ln* 2, *ln* 2 (B) *ln* 2, 2*ln* 2 (C) 2*ln* 2, 8*ln* 2 (D) *ln* 2, 4*ln* 2

(28) Assuming human pupil to have a radius of 0.25 cm and a comfortable viewing distance of 25 cm, the minimum separation between two object that human eye can resolve at 500 nm wavelength is :

(A) 30 μm (B) 100 μm (C) 300 μm (D) 1 μm

(29) Two long current carrying thin wires, both with current *I,* are held by insulating threads of length L and are in equilibrium as shown in the figure, with threads making an angle 'θ' with the vetical. If wires have mass 'λ' per unit length then the value of *I* is : (*g* = gravitational acceleration)



(A) $2\sin\theta\sqrt{\frac{\pi\lambda g L}{\mu_0\cos\theta}}$ (B) $2\sqrt{\frac{\pi g L}{\mu_0}\tan\theta}$ (C) $\sqrt{\frac{\pi\lambda g L}{\mu_0}\tan\theta}$ (D) $\sin\theta\sqrt{\frac{\pi\lambda g L}{\mu_0\cos\theta}}$

(30) On a hot summer night, the refractive index of air is smallest near the ground and increases with height from the ground. When a light beam is directed horizontally, the Huyges principle leads us to conclude that as it travels, the light beam :

(A) goes horizontally without any deflection

(B) bends downwards

(C) bends upwards

(D) become narrower

Ans. : 1 (D), 2 (A), 3 (C), 4 (B), 5 (B), 6 (C), 7 (D), 8 (A), 9 (D), 10 (B), 11 (D), 12 (A), 13 (A), 14 (B), 15 (A), 16 (B), 17 (B), 18 (B), 19 (A), 20 (B), 21 (D), 22 (B), 23 (B), 24 (C), 25 (A), 26 (B), 27 (error in question), 28 (A), 29 (A), 30 (C)

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