PHYSICS

BOOKS - TS EAMCET PREVIOUS YEAR PAPERS

QUESTION PAPER 2019

Physics

1. Albert Einstein was confermed with the Nobel prize in physics for his work on

A. special theory of relativity

B. Bose-Einstein Statistics

C. photoelectric effect

D. general relativity

Answer: C

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2. A quantity z, to be estimated has a dependency on the variables a, b and c as $z = ab^2c^{-2}$. The percentage of error in the

measurement of a, b and c are respectively, 2.1% , 1.3% and 2.2% . The percentage of error in the measurement of z would then be

A. $5.6\ \%$

B. $1.6\ \%$

C. $1.0\ \%$

D. $9.1\ \%$

Answer: D

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3. The nature of a graph drawn for a freely falling body with time on the x-axis and speed on the y-axis is (Assuming initial speed to be zero.)

A. a straight line with positive y-axis intercept.

B. a straight line passing through the origin.

C. a parabola.

D. a straight line parallel to y-axis with positive x-axis intercept.

Answer: B

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4. A particle A moves along the line, $y = 30$m with a constant velocity, v parallel to x-axis. At the moment particle A passes the y-axis, a particle B starts from the origin with zero initial speed and a constant acceleration,

$a = 0.40m/\sec^2$. The angle between a and y-axis is 60°. If the particles A and B collide after sometimes, then the value of |v| will be

A. 2 m/s

B. 3 m/s

C. 4 m/s

D. 5 m/s

Answer: B

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5. A ball moves one-fourth $\left(\frac{1^{th}}{4}\right)$ of a circle of radius R in time T. Let v_1 and v_2 be the magnitudes of mean speed and mean velocity vector. The ratio $\frac{v_1}{v_2}$ will be

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

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

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

D. $\frac{\pi}{2\sqrt{2}}$

Answer: D

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6. A 4 kg object has a velocity, $3.0\hat{i}$m/s at some instant. Eights seconds later, its velocity is $\left(8.0\hat{i} + 10.0\hat{j}\right)$ m/s. Assuming that the object is subjected to a constant net force, the magnitude of the force is

A. $\frac{5\sqrt{5}}{2}N$

B. $\frac{5\sqrt{3}}{8}N$

C. $\frac{8\sqrt{5}}{3}N$

D. $\frac{10\sqrt{3}}{7}N$

Answer: A

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7. A block of mass 10 kg, initially at rest, makes a downward motion on 45° inclined plane. Then the distance travelled by the block after 2s is

(Assume the coefficient of kinetic friction to be 0.3 and $g = 10ms^{-2}$)

A. $7\sqrt{2}m$

B. $\frac{9}{\sqrt{2}}m$

C. $10\sqrt{2}m$

D. $5\sqrt{2}m$

Answer: A

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8. Conservative forces are defined as the force for which,

A. work done depends only on the initial and final positions.

B. work done depends on the initial and final positions and also on the path taken.

C. work done depends only on the path taken.

D. work done depends only on the initial position.

Answer: A

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9. A rocket motor consumes 100 kg of fuel per second exhausting it with a speed of 5 km/s. The speed of the rocket when its mass is reduced to $\frac{1^{th}}{20}$ of its initial mass, is (Assume initial speed to be zero and ignored gravitational and viscous forces.)

A. 20 km/s

B. 40 ln (2) km/s

C. 5 ln (20) km/s

D. 10 ln (10) km/s

Answer: C

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10. Ball A of mass 50 gm and speed 10 m/s collides with other ball B of mass 10 gm and speed 15 m/s travelling in opposite direction with each other. Determine the final speed of ball B, if the coefficient of restitution is $\frac{2}{5}$.

A. $\frac{40}{3}$ m/s

B. $\frac{75}{3} m / s$

C. $\frac{91}{8}$ m/s

D. $\frac{85}{6} m / s$

Answer: D

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11. A solid sphere of mass 5 kg rolls on a plane surfaces. Find its kinetic energy at an instant when its centre moves with speed 4 m/s .

A. 56 J

B. 45 J

C. 75 J

D. 105 J

Answer: A

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12. A body of mass 0.3 kg hangs by a spring with force constant of 50 N/m . The amplitude of oscillations is damped and reaches $\frac{1}{e}$ of its

original value in about 100 oscillations. If ω and ω' are the angular frequencies of undamped and damped oscillations respectively, then percentage of $\left(\frac{\omega - \omega'}{\omega}\right)$ is

A. $\left(\frac{1}{800\pi}\right)$

B. $\left(\frac{\pi^2}{600}\right)$

C. $\left(\frac{1}{800\pi^2}\right)$

D. $\left(\frac{\pi}{400}\right)$

Answer: C

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13. If a planet of mass 6.4×10^{23} kg can be compressed into a sphere such that the escape velocity from its surface is 8×10^4 m/s, then what should be the radius of the sphere ? (Gravitational constant, $G = 6.6 \times 10^{-11} \mathrm{Nm}^{-2} kg^{-2}$)

A. 40.4 km

B. 13.2 km

C. 20.4 km

D. 6.8 km

Answer: B

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14. A horizontal aluminium rod of diameter 4 cm projected 6 cm from a wall . An object of mass 400π kg is suspended from the end of the rod. The shearing modulus of aluminium is $3.0 \times 10^{10} N/m^2$. The vertical deflection of the end of the rod is ($\because g = 10 m/s^2$)

A. 0.01 mm

B. 0.02 mm

C. 0.03 mm

D. 0.04 mm

Answer: B

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15. A water tank kept on the ground has an orifice of 2mm diameter on the vertical side. What is the minimum height of the water above the orifice for which the output flow of

water is found to be turbulent? (Assume, $g = 10m/s^2, \rho_{\text{water}} = 10^3 kg/m^3,$ viscosity $= 1$ centi-poise)

A. 3 cm

B. 4 cm

C. 5 cm

D. 2 cm

Answer:

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16. A copper ball of radius 3.0mm falls in an oil tank of viscosity 1kg/ms. Then, the terminal velocity of the copper ball will be (Density of oil $= 1.5 \times 10^3 kg/m^3$, Density of copper $= 9 \times 10^3 kg/m^3$ and $g = 10m/s^2$.)

A. 18×10^{-2} m/s

B. 25×10^{-2} m/s

C. 15×10^{-2} m/s

D. 20×10^{-2} m/s

Answer: C

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17. The wavelength of the radiation emitted by a black body is 1 mm and Wien's constant is 3×10^{-3} mK. Then the temperature of the black body will be

A. 3 K

B. 30 K

C. 300 K

D. 3000 K

Answer: A

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18. A hot placed in air cools down to a lower temperature. The rate of decrease of temperature is proportional to the temperature difference from the surrounding. The body loses 60% and 80% of maximum heat it can loose in time t_1 and t_2 respectively. The ratio t_2 / t_1 will be

A. $\frac{\ln(10)}{\ln(2)}$

B. $\frac{\ln(8)}{\ln(6)}$

C. $\frac{\ln(1)}{\ln(3)}$

D. $\frac{\ln(5)}{\ln\left(\frac{5}{2}\right)}$

Answer: D

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19. A cannot engine with efficiency η operates between two heat reservoirs with

temperatures T_1 and T_2 , where $T_1 > T_2$. If only T_1 is changed by $0.4\,\%$, the change in efficiency is $\Delta\eta_1$, whereas if only T_2 is changed by $0.2\,\%$, the efficiency is changed by $\Delta\eta_2$. The ratio $\frac{\Delta\eta_1}{\Delta\eta_2}$ is approximately.

A. -2

B. -4

C. $+3$

D. $+4$

Answer: A

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20. An ideal gas in a closed container is heated so that the final rms speed of the gas particles increases by 2 times the initial rms speed. If the initial gas temperature is $27^\circ C$, then the final temperature of the ideal gas is :

A. $1200^\circ C$

B. $927^\circ C$

C. $827^\circ C$

D. $1473^\circ C$

Answer: B

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21. Consider two tuning forks with natural frequency 250 Hz. One is moving away and another is moving towards a stationary observer at same speed. If the observer hears beats of frequency 5 Hz, then the speed of the tuning fork is : (Given, speed of sound wave is 350 m/s .)

A. 2.5 m/s

B. 3.5 m/s

C. 5.0 m/s

D. 2.0 m/s

Answer: B

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22. A drone fitted with siren in flying directly away from the drone operator and towards a distant building at a speed of 15 m/s. The siren

produces sound of frequency 780 Hz. What is the frequency that the operator hears in the echo reflected that the operator hears in the echo reflected from the building . [Speed of sound is 340 m/s.]

A. 766 Hz

B. 800 Hz

C. 816 Hz

D. 840 Hz

Answer: C

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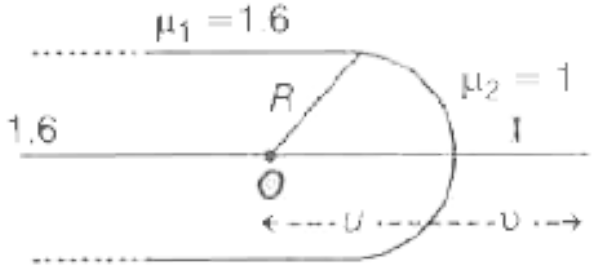
23. A point object O is placed on the axis of a cylindrical piece of glass of refractive index 1.6 as shown in the figure. One surface of the glass piece is convex with radius of curvature 3mm. The point appeared to be at 5 mm on the axis when viewed along the axis and from right side of convex surface. The distance of the point object from the convex surface is :



A. 4 mm

B. 6 mm

C. 3 mm

D. 2.5 mm

Answer: A

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24. The limit of resolution of a telescope is 2.5×10^{-7} rad. If the telescope is used to detect light of wavelength 500 nm coming

from a star, the diameter of the objective lens used by telescope is

A. 244 cm

B. 258 cm

C. 228 cm

D. 264 cm

Answer: A

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25. A non-conducting solid sphere has radius R and uniform charge density. A spherical cavity of radius $\frac{R}{4}$ is hollowed out of the sphere. The distance between center of cavity is $\frac{R}{2}$. If the charge of the sphere is Q after the creation of the cavity and the magnitude of electric field at the center of the cavity is $E = K\left(\frac{Q}{4\pi \in_0 R^2}\right)$, determined the approximate value of K.

A. 0.32

B. 0.78

C. 0.51

D. 0.45

Answer: C

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26. A metal plate of thickness 2mm and area $36\pi cm^2$- is slide into a parallel plate capacitor of plate spacing 6 mm and area $36\pi cm^2$. The metal plate is at a distance 3 mm from one of the plates. What is the capacitance of this

arrangement ?

$$\left(\text{Let}\frac{1}{4\pi\ \in_0} = 9 \times 10^9 Nm^2C^{-2}\right)$$

A. 8 pF

B. 15 pF

C. 25 pF

D. 20 pF

Answer: C

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27. For the circuit shown in the figure, calculate the resistance between the points A and B.

A. 0.5 R

B. R

C. 15 R

D. 6/5 R

Answer: B

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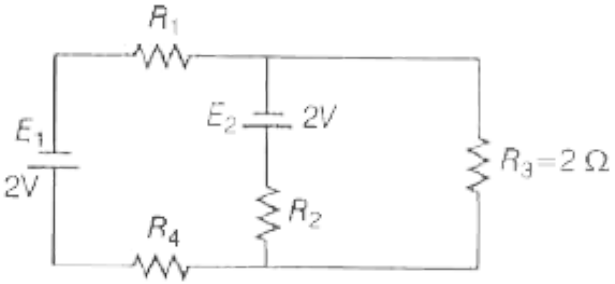
28. If the resistances are chosen for the circuit shown in figure in such a way that no current flows through the battery with emf E_1, the voltage V_2 across R_2 and the current I_3 flowing through R_3 are respectively,



A. $V_2 = -4V, l_3 = \frac{5}{2}A$

B. $V_2 = +4V, l_3 = \frac{5}{2}A$

C. $V_2 = -3V, l_3 = 1A$

D. $V_2 = +3V, l_3 = 2A$

Answer: C

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29. A semi-circular loop of radius 30 cm wire carries current 6 A. An uniform magnetic field 0.5 T is present perpendicular to the plane of the loop. What is the magnitude of force exerted on the wire ?

A. 0.9 N

B. 1.8 N

C. 0.8 N

D. 1.4 N

Answer: B

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30. A dielectric circular disc of radius R carries a uniform surface charge density σ. If it

rotates about its exis with angular velocity ω, the magnetic field at the cente of disc is :

A. $\frac{\mu_0 \sigma \omega R^2}{2\pi}$

B. $\frac{\mu_0 \sigma \omega R}{2}$

C. $\frac{\mu_0 \sigma \omega R^2}{4}$

D. $\frac{\mu_0 \sigma \omega R^2}{2\sqrt{2}}$

Answer: B

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31. The earth's magnetic field at the geometric poles is $\sqrt{10} \times 10^{-5}$ T. The magnitude of the field at a point on the earth's surface where the radius makes an angle θ with the axis of earth's assumed magnetic dipole is 5×10^{-5} T. The magnitude of θ in degree is :

A. 30°

B. 60°

C. 45°

D. 75°

Answer: C

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32. Consider a current in a circuit falls from 6.0 A to 1.0 A in 0.2 s. If an average emf of 150 V is induced by the circuit, then the self inductance of the circuit is

A. 2H

B. 6H

C. 4H

D. 8H

Answer: B

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33. A series LCR circuit with $L = 0.5$ H and $R = 10\Omega$ is connected to an AC supply with rms voltage and frequency equal to 2000 V and $\frac{150}{\pi}$ Hz, respectively. The magnitude of the capacitance is varied so that current amplitude in the circuit becomes maximum.

The rms voltage difference across the inductor is

A. 3000 V

B. 2500 V

C. 2000 V

D. 2600 V

Answer: A

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34. The magnetic field of an electromagnetic-wave obeys the relation in a certain region is $B = 10^{-12}\sin\left(5 \times 10^{t}\right)$T, where t is the time. Then, the induced emf, in a 300 turns in coil of area $20cm^2$ oriented perpendicular to the field is

A. $-2 \times 10^{-5}\cos\left(5 \times 10^{-6}t\right)V$

B. $-3 \times 10^{-6}\cos\left(5 \times 10^{6}t\right)V$

C. $-2.5 \times 10^{-6}\cos\left(5 \times 10^{6}t\right)V$

D. $-3.3 \times 10^{-6}\cos\left(5 \times 10^{6}t\right)V$

Answer: B

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35. The wavelength of a charged particle of mass 8.0×10^{-31}kg, charge $1.6 \times 10^{-19}C$ and kinetic energy 3 keV will be (Planck constant, $h = 6.4 \times 10^{-34} Js$)

A. $0.4Å$

B. 2.1 Å

C. 1.0 Å

D. 1 Å

Answer: A

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36. Let λ_P and λ_L be the longest wavelengths observed in the Paschen and Lyman series respectively. Choose the correct option

A. $4 < \frac{\lambda_P}{\lambda_L} < 6$

B. $7 < \frac{\lambda_P}{\lambda_L} < 8$

C. $15 < \frac{\lambda_P}{\lambda_L} < 16$

D. $30 < \frac{\lambda_P}{\lambda_L} < 32$

Answer: C

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37. A radioactive nucleus can decay in two different processes with half life 0.7 hr and 0.3 hr .

The

A. 14

B. 18

C. 24

D. 26

Answer: B

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38. Assertion (A) Si and GaAs are the preferred materials for solar cells.

Reason (R) Both these materials have energy

band gaps much below the energy level corresponding to the maximum solar irradiance in the solar spectrum.

The correct answer is

A. (A) is correct but (R) is incorrect.

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

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

D. Both (A) and (R) are incorrect.

Answer: A

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39. The truth table of a logic gate is given below. Then identify the gate.

Input		Output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

A. NOT gate

B. OR gate

C. AND gate

D. NAND gate

Answer: D

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40. A transmitting antenna has a height 20 m. What will be the height of receiving antenna, if the maximum distance between them for satisfactory communication in line-of-sight

(LOS) mode is 40 km ? (The earth radius is 6400 km.)

A. 25 m

B. 30 m

C. 60 m

D. 45 m

Answer: D

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41. A physical quantity obtained from the ratio of the coefficient of thermal conductivity to the universal gravitational constant has a dimensional formula $[M^{2a}L^{4b}T^{2c}K^{d}]$, then the value of $\frac{a+b}{c+b}-d$ is

A. $+\frac{3}{2}$

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

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

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

Answer: D

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42. A body starting from rest at t = 0 moves along a straight line with a constant acceleration. At t = 2s, the body reverses its direction keeping the acceleration same. The body returns to the initial position at t = t_0. Then t_0 is

A. 4 s

B. $\left(4+2\sqrt{2}\right)$s

C. $\left(2+2\sqrt{2}\right)$s

D. $\left(4+4\sqrt{2}\right)$ s

Answer: B

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43. A thin uniform rod of length L is resting against a wall and the floor as shown in the figure. Its lower end A is pulled towards left with a constant velocity v. Then the downward velocity v' of the other end B when the rod

makes an angle θ with the floor is

A. v

B. v cos θ

C. v sin θ

D. v cotθ

Answer: D

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44. Two boys conducted experiments on the projectile motion with stopwatch and noted some readings. As one body throws a stone in air at the same angle with the horizontal, the other boy observes that after 4 s, then stone is moving at an angle 30° to the horizontal and after another 2 s it is travelling horizontally. the magnitude of the initial velocity of the stone is (Acceleration due to gravity,

g = 10 ms^{-2}.)

A. $40\sqrt{3}ms^{-1}$

B. $20\sqrt{3}ms^{-1}$

C. $10\sqrt{3}ms^{-1}$

D. $50\sqrt{3}ms^{-1}$

Answer: A

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45. A force of $\left(2.6\hat{i}+1.6\hat{j}\right)$ N acts on a body of mass 2 kg. If the velocity of the body at time, t = 0 is $\left(3.6\hat{i}-4.8\hat{j}\right)ms^{-1}$, the time at

which the body will just have a velocity along x-axis only is

A. 1s

B. 2s

C. 3s

D. 6s

Answer: D

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46. The force required to move a body up a rough inclined plane is double the force required to prevent the body from sliding down the plane. If the angle of inclination of the plane is 60°, then the coefficient of friction is

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

B. $\frac{1}{\sqrt{2}}$

C. $\frac{1}{\sqrt{3}}$

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

Answer: C

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47. A particle moves in the x-y plane under the action of a force,

$$F = K\left[\frac{x}{(x^2+y^2)^{\frac{3}{2}}}\hat{i} + \frac{y}{(x^2+y^2)^{\frac{3}{2}}}\hat{j}\right]$$

where, K is a

constant. Work done by the force when the particel moves from (0,a) to (a, 0) along a circular path of radius a about the origin is

A. $\frac{2K\pi}{a}$

B. $\frac{K\pi}{a}$

C. $\frac{K\pi}{2a}$

D. 0

Answer: D

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48. A disc of mass 100 g slides down from rest on an inclined plane of 30° and come to rest after travelling a distance of 1m along the

horizontal plane. If the coefficient of friction is 0.2 for both inclined and horizontal planes, then the work done by the frictional force over the whole journey, approximately, is

(Acceleration due to gravity, g = 10 ms^{-1})

A. 0.106 J

B. 0.05 J

C. 0.306 J

D. 0.2 J

Answer: C

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49. Two indentical discs are moving with the same kinetic energy. One rolls and the other slides. The ratio of their speeds is

A. $1:2$

B. $1:1$

C. $2:3$

D. $\sqrt{2}:\sqrt{3}$

Answer: D

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50. A tangential force F acts at the top of a thin spherical shell of mass m and radius R. The acceleration of the shell if it rolls without slipping is

A. $\frac{5F}{6m}$

B. $\frac{6F}{5m}$

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

D. $\frac{F}{6m}$

Answer: B

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51. A simple pendulum is placed inside a lift, which is moving with a uniform acceleration. If the time periods of the pendulum while the lift is moving upwards and downwards are in the ratio 1 : 2, then the acceleration of the lift is (Acceleration due to gravity, g = 10 ms^{-2})

A. $6ms^{-2}$

B. 0 ms^{-2}

C. $3ms^{-2}$

D. 2 ms^{-2}

Answer: A

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52. Two bodies each of mass m are hung from a balance scale pans differ in a vertical height by h. If the mean density of the earth is ρ, the error in weighing is

A. $\frac{4\pi\rho Gmh}{3}$

B. $\frac{3\pi\rho Gmh}{4}$

C. $\frac{8\pi\rho Gmh}{3}$

D. $\frac{3\pi\rho Gmh}{8}$

Answer: C

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53. A one metre steel wire of negligible mass and area of cross-section 0.01 cm^{-2} is kept on a smooth horizontal table with one end fixed.A

ball of mass 1 kg is attached to the other end. The ball and the wire are rotating with an angular velocity of ω. If the elongation of the wire is 2 mm, then ω is

(Young's modulus of steel = $2 \times 10^{11} Nm^{-2}$)

A. 5 rad s^{-1}

B. 10 rad s^{-1}

C. 15 rad s^{-1}

D. 20 rad s^{-1}

Answer: D

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54. A cylindrical tank has a hole of area 2 cm^2 at its bottom, if water is poured into the tank from a tube above it at the rate of 100 $cm^3 s^{-1}$, then the maximum height upto (Acceleration due to gravity, g = 10 ms^{-2})

A. 2.5 cm

B. 1.25 cm

C. 5.5 cm

D. 3.5 cm

Answer: B

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55. The densities of wood and benzene at 0°C are 880 kg m^{-3} and 900 kg m^{-3}, respectively. The coefficient of volume expansion is $12 \times 10^{-3} C^{-10}$ for wood and $1.5 \times 10^{-30} C^{-1}$ for benzene. Then the temperature at which a piece of wood just sinks in benzene is

A. $88^\circ C$

B. $90^\circ C$

C. 83.3 C

D. $90.3^\circ C$

Answer: C

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56. A window used to thermally insulate a room from outside consists of two parallel glass sheets each of area 2.6 m^2 and thickness

1 cm separated by 5 cm thick stagnant air. In the steady state, the room glass interface is at 18° C and the glass-outdoor interface is at and air are respectively 0.8$Wm^{-1}K^{-1}$ and 0.08 $Wm^{-1}K^{-1}$, the rate of flow of heat through the window is

A. 15 W

B. 40 W

C. 60 W

D. 80 W

Answer: D

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57. Five moles of hydrogen initially at STP is compressed adiabatically so that its temperature becomes 673 K. The increase in internal energy of the gas , in kilo joule is (R= 8.3 J / mol-K, γ= 1.4 for diatomic gas)

A. 80.5 kJ

B. 21.55 kJ

C. 41.50 kJ

D. 65.55 kJ

Answer: C

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58. One mole of a monatomic ideal gas undergoes the process A $\rightarrow$ B in the given p-V diagram. Specific heat capacity in the process is

A. $\frac{13R}{3}$

B. $\frac{13R}{6}$

C. $\frac{7R}{3}$

D. $\frac{2R}{3}$

Answer: B

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59. If the speed of sound in a mixture of 2 moles of Helium and 2 moles of Hydrogen at temperature $\frac{972}{5}$ K is n $\times 100ms^{-1}$, then

the value of n is

(Take , R = $\frac{25}{3} Jmol^{-1}K^{-1}$)

A. 9

B. 10

C. 100

D. 90

Answer: A

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60. A siren placed at a railway platfere is emitting a sound of frequency 5 kHZ. A passenger sitting in a moving train A records the frequency of the siren as 5.5 kHz.

During his return journey by train B he records the frequency of the siren as 6 kHz. The ratio of the speed of train B to that of train A is

A. $\frac{242}{252}$

B. 2

C. $\frac{5}{6}$

D. $\frac{11}{6}$

Answer: B

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61. The speed of a transverse wave travelling in a wire of length 50 cm, cross-sectional area 1 mm^2 and mass 5 g is 80 ms^{-1}. The Young's modulus of the material of the wire is $4 \times 10^{11} Nm^{-2}$. The extension in the length of the wire is

A. 8×10^{-5}m

B. 8×10^{-4} m

C. 16×10^{-8} m

D. 16×10^{-4}m

Answer: A

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62. An object is fixed at the bottom of a vessel and water is filled in the vessel upto a height of 10 cm. A plane mirror is placed at a height

of 7 cm from the surface of water in such a way that its reflecting surface faces the water. The distance of the image from the mirror is (Refractive index of water, n = 1.33)

A. 7.5 cm

B. 7cm

C. 14.5 cm

D. 21.8 cm

Answer: C

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63. The angular deviation of 5th order dark fringe is 12° in a single slit experiment. If the width of the slit is 9 μm then the wavelength of the incident light is

A. 4862 Å

B. 5892 Å

C. 6022 Å

D. 3768 Å

Answer: D

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64. Three infinitely long charged sheets are placed as shown in the figure. The electric force acting on a charge - q placed at the point P is

(σ= surface charge density, ε_0 = permittivity of the free space)

A. $+\frac{2\sigma}{\varepsilon_0}\hat{k}$

B. $-\frac{2\sigma}{\varepsilon_0}\hat{k}$

C. $+\frac{4\sigma}{\varepsilon_0}\hat{k}$

D. $-\frac{4\sigma}{\varepsilon_0}\hat{k}$

Answer: B

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65. Assertion (A) Half of the charge of an electron does not exist.

Reason (R) Electric charge is quantized.

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

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

C. (A) is correct but (R) is not correct

D. (A) is not correct but (R) is correct .

Answer: A

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66. The potential difference between two points A(2,1,0)m and B(0,2,4) m in an electric field (x$\hat{i} - 2y\hat{j} + z\hat{k}$) Vm^{-1} is

A. 2V

B. 3V

C. 1V

D. 6V

Answer: B

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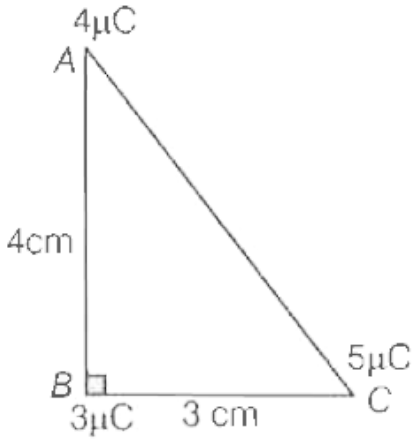
67. Three point charges of $3\mu C, 4\mu C,$ and $5\mu C$ are arranged at the three corners of a right angled triangle ABC as shown in the figure. The work done in moving the charges at A and C, so that the three charges are located at the three corners of an equilateral triangle of side 3 cm is



A. 0.3 J

B. 1.1 J

C. 2.2 J

D. 3.3 J

Answer: D

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68. Four resistors A, B ,C and D form a wheatstone bridge as shown in the figure the bridge is balanced when C = 100 Ω if A and B

are interchagned , the bridge balances for C = 121 Ω The value of D is

A. 10Ω

B. 100Ω

C. 110Ω

D. 120Ω

Answer: C

View Text Solution

69. In the circuit shown, if the current through the reisistor R is $\frac{1}{5}$ A, the value of R is

A. 2Ω

B. 3Ω

C. 5Ω

D. 1Ω

Answer: D

View Text Solution

70. An electron accelerated through a potential difference V, passes through a uniform transverse magnetic field and experiences a force F. if the accelerating potential is increased to 2V, the electron in the same magnetic field will experience a force .

A. F

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

C. $\sqrt{2}$F

D. 2F

Answer: C

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71. A coil in the shape of an equilateral triangle of side 2 cm is suspended from a vertex such that it hangs in a vertical plane between the poles of a permanent magnet producing a horizontal magnetic field of 100×10^{-3} T. the magnetic field is parallel to the plane of the coil. for the moment of cuple acting on the

coil to be $2\sqrt{3} \times 10^{-5}$ Nm, the current to be passed through the coil is

A. 0.5 A

B. $1A$

C. $2A$

D. $4A$

Answer: B

Watch Video Solution

72. A metal rod is subjected to cycles of magnetisation at the rate of 42 Hz. Denstiy of the metal is 6×10^3 kg m^{-3} and its specific heat capacity is 0.1×10^{-3} cal $kg^{-1} \circ C^{-1}$. If the area of of its B-H loop corresponds to energy density of $10^{-2} Jm^{-3}$, then the rise in its temperature in one minute is

A. 5° C

B. 10° C

C. 15° C

D. $20^\circ C$

Answer: B

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73. A coil is placed in a time varying magneitc field. The power dissipated due to current induced in the coil is P_1. If the number of turns is doubled and radius of the wire is halved, the power dissipated is P_2. Then $P_1 : P_2$ is

A. $1:4$

B. $3:2$

C. $2:1$

D. $4:1$

Answer: A

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74. If the emf of an AC source is given by 6 sin $\omega t + 4 \sin 2\omega t$, V then rms values of the emf is

A. $\sqrt{10}$V

B. $\sqrt{26}$V

C. $\sqrt{32}$V

D. $\sqrt{20}$V

Answer: B

View Text Solution

75. A lamp delivers a luminous flux of 100 w to an absorber of area 1 cm^2. The force due to radiation pressure is

A. 3.3×10^{-4} N

B. 16.5×10^{-7}N

C. 3.3×10^{-6} N

D. 3.3×10^{-7}N

Answer: D

Watch Video Solution

76. An electron of charge e and mass m moving with an initial velocity $v_0 \hat{i}$ is subjected to all electric field $E_0 \hat{j}$. The de-Broglie

wavelength of the electron at a time t is

(Initial de-Broglie wavelength of the electron = λ_0)

A. λ_0

B. $\lambda_0\sqrt{1+\frac{e^2E_0^2t^2}{m^2v_0^2}}$

C. $\frac{\lambda_0}{\sqrt{1+\frac{e^2E_0^2t^2}{m^2v_0^2}}}$

D. $\frac{\lambda_0}{\sqrt{1+\frac{e^2E_0^2t^2}{mv_0^2}}}$

Answer: C

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77. Match the following List-1 with List-II in connection with Bohr's atomic model.

A. $\begin{pmatrix} A & B & C & D \\ i & ii & ii & iv \end{pmatrix}$

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

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

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

Answer: A

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78. Half-life of a radioactive substance is 18 minutes. The time interval between its 20% decay and 80% decay in minutes is

A. 6

B. 9

C. 18

D. 36

Answer: D

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79. In a transistor , the value of α veries between $\frac{20}{21}$ and $\frac{100}{101}$. Then the value of β varies between

A. 1 and 10

B. 0.95 and 0.99

C. 20 and 100

D. 200 and 300

Answer: C

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80. A TV tower has a height of 5 m in a region of population density $\frac{1000}{\pi}$ per square Kilometer. Number of people that can receive the transmission is nearly, (in thousands)

A. 128

B. 64

C. 256

D. 32

Answer: B

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81. Assertion (A) The number 0.00764 has three significant figures.

Reason (R) If the number is less than 1, the zeros on the right of the decimal point but to the left of the first non-zero digit are not significant.

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

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

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

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

Answer: A

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82. A car moving with a velocity $6.25ms^{-1}$ is decelerated with $2.5\sqrt{v}ms^{-2}$ (v is instantaneous velocity). Time taken by the car to come to rest is

A. 2s

B. 3s

C. 2.5s

D. 4s

Answer: A

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Watch video solution

83. A bullet fired from a gun falls at a distance half of its maximum range. The angle of projection of the bullet is

A. 45°

B. 60°

C. 30°

D. 15°

Answer: D

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84. A body is projected at an angle of 45° from a point on the ground at a distance of 30 m from the foot of a vertical pole of height 20m. The body just crosses the top of the pole and strikes the ground at a distance s from the foot of the pole on the other side of the pole. Then, s

A. 20 m

B. 30 m

C. 50 m

D. 60 m

Answer: D

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85. An explosion blows a stationary rock into three parts. Two of masses 1kg and 2kg moves at right angles to one another with velocities $12ms^{-1}$ and $8ms^{-1}$, respectively. If the

velocity of third part is $4ms^{-1}$, the mass of the rock is

A. 8 kg

B. 5 kg

C. 17 kg

D. 3 kg

Answer: A

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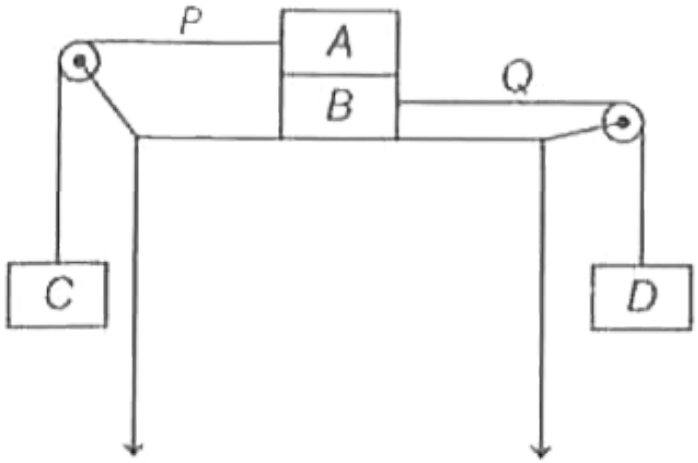
86. Four blocks A, B, C and D of masses 6 kg, 3 kg, 6 kg and 1kg respectively are connected by light strings passing over frictionless pulleys as shown in the figure. The strings P and Q are horizontal. The coefficient of friciton between the horizontal surface and the block B is 0.2 and the blocks A and B move together. If the system is released from rest then the tension in string Q is (Acceleration due to gravity,

$g = 10ms^{-2}$)



A. 48 N

B. 24 N

C. 12 N

D. 6 N

Answer: C

Watch Video Solution

87. A constant power of 7 W is supplied on a toy car of mass 15 kg. The distance travelled by the car when its velocity increases from $3ms^{-1}$ to $5ms^{-1}$ is

A. 56m

B. 7 m

C. 61 m

D. 70 m

Answer: D

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88. A body A moving with momentum P collides one-dimensionally with another stationary body B of same mass. During impact, A gives impulse J to B. Then which of the following is/are correct ?

(a) The total momentum of A and B is P before and after impact and (P - J) during the impact.

(b) During the impact, B gives impulse of

magnitude J to A.

(c) The coefficient of restitution is $\left[\frac{2J}{P} - 1\right]$

(d) The coefficient of restitution is $\left[\frac{2J}{P} + 1\right]$

A. Only (a) is correct

B. (a) and (c) are correct

C. (b) and (c) are correct

D. Only (c) is correct

Answer: C

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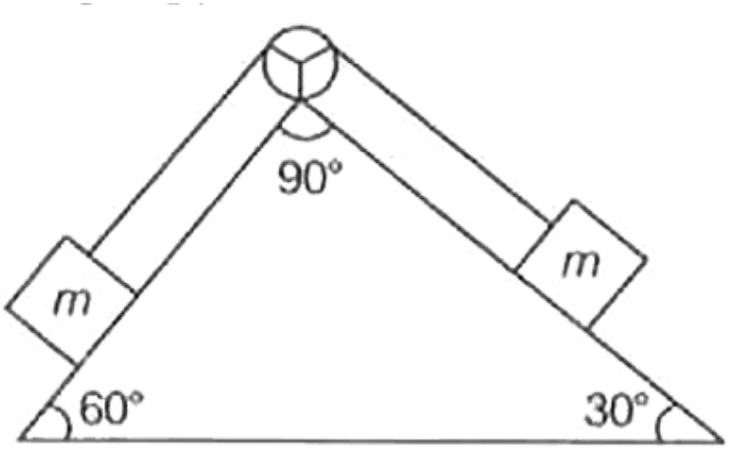
89. In the figure shown, the blocks have equal masses. Friction, mass of the string and the mass of the pulley are negligible. The magnitude of the acceleration of the centre of mass of the blocks is (Acceleration due to gravity = g).



A. $\left(\frac{\sqrt{3}-1}{\sqrt{2}}\right)g$

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

C. $(\sqrt{3}-1)g$

D. $\left(\frac{\sqrt{3}-1}{4\sqrt{2}}\right)g$

Answer: D

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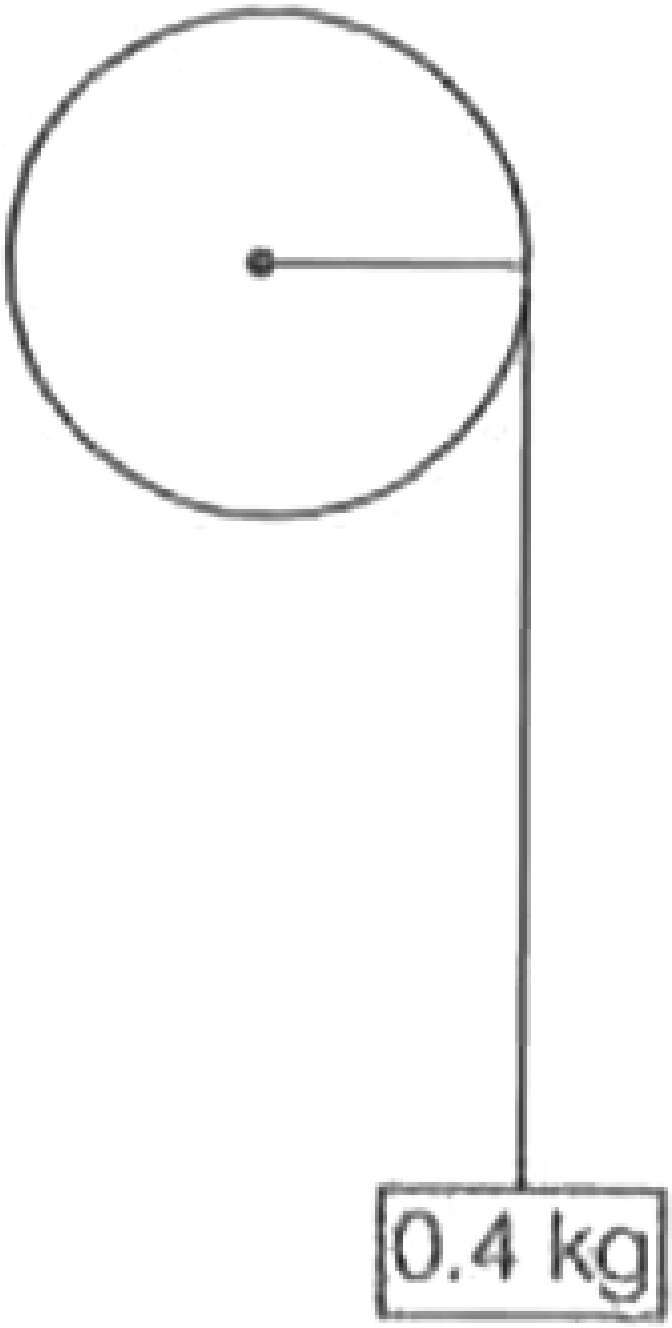
90. A wheel of radius 8 cm is attached to a support so as to rotate about a horizontal axis through its centre. A string of negligible mass wrapped arounf its circumference carries a

mass of 0.4 kg attached to its free end. When the mass is released, it descends through 1m in 10 seconds, then its moment of inertia is

(Acceleration due to gravity, $g = 10ms^{-2}$)


0.4 kg

A. $1.277kgm^2$

B. $2.177kgm^2$

C. $21.77kgm^2$

D. $12.77kgm^2$

Answer: A

Watch Video Solution

91. A body of mass 1kg is suspended from a spring of negligible mass. Another body of mass 500g moving vertically upwards hits the

suspended body with a velocity of $3ms^{-1}$ and gets embedded in it. If the frequency of oscillation of the system of the two bodies after collision is $\frac{10}{\pi}Hz$, the amplitude of the motion and the spring constant are respectively,

A. $5cm, 300Nm^{-1}$

B. $10cm, 300Nm^{-1}$

C. $10cm, 600Nm^{-1}$

D. $5cm, 600Nm^{-1}$

Answer: D

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92. The gravitational field in a region is given by $E = \left(5\hat{i} + 12\hat{j}\right) Nkg^{-1}$. If a particle of mass 2kg is moved from the origin to the point (12 m, 15 m) in this region, the change in gravitational potential energy is

A. $-450J$

B. $-480J$

C. $-240J$

D. $-500J$

Answer: B

Watch Video Solution

93. A uniform wire of length 10 m and diameter 0.6 mm is stretched by 6 mm with certain force. If the Poisson's ratio of the material of the wire is 0.3, then the change in diameter of the wire is

A. $108 \times 10^{-8}m$

B. $108 \times 10^{-6} m$

C. $10.8 \times 10^{-8} m$

D. $1.08 \times 10^{-8} m$

Answer: C

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94. Two tubes of same length and diameters 4mm and 8mm are joined together to form a U-shaped tube open at both the ends. If the U-tube contains water, then the difference

between the levels of water in the two lims of the tube is

(Surface tension of water at the temperature of experiment is $7.3 \times 10^{-2} Nm^{-1}$, angle of contact $= 0^{\circ}$, density of water $= 1.0 \times 10^{3} kgm^{-3}$ and acceleration due to gravity $= 10 ms^{-2}$)

A. 3.65 mm

B. 36.5 mm

C. $0.365 mm$

D. 365 mm

Answer: A

Watch Video Solution

95. A uniform metal bar of length 10 m with a crack at its midpoint is clamped between two rigid supports. The bar buckles upward due to temperature rise of $40^{\circ}C$. If the coefficient of linear expansion of the metal is $2.5 \times 10^{-6}.^{\circ} C^{-1}$, the maximum displacement of the mid-point of the bar is

A. $11.3cm$

B. $22.3cm$

C. $33.3cm$

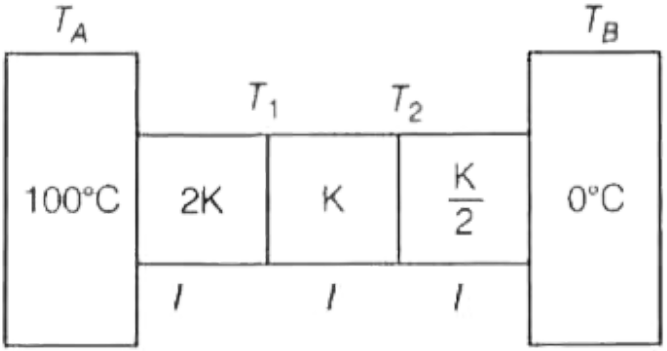
D. $44.\ cm$

Answer: B

Watch Video Solution

96. Three rods each of length l and cross sectional area A joined in series between two heat reservoirs as shown in the figure. Their

conductivities are 2K, K and $\frac{K}{2}$, respectively. Assuming that the conductors are insulated from surroundings, the temperatures T_1 and T_2 of the junctions in steadly state condition are respectively.



A. $\frac{600}{7}.^{\circ}C, \frac{400}{7}.^{\circ}C$

B. $\frac{600}{7}.^{\circ}C, \frac{700}{4}.^{\circ}C$

C. $\frac{500}{6}.^{\circ}C, \frac{600}{5}.^{\circ}C$

D. $\frac{600}{4}.^{\circ} C, \frac{400}{7}.^{\circ} C$

Answer: A

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97. Two heat engines X and Y of same efficiency are connected in series in such a way that the sink of X works as source of Y. X receives heat at 900 K and rejects some heat to its sink at TK and in turn Y rejects heat to its sink at 400 K, then the temperature T is

A. 550 K

B. 600 K

C. 650 K

D. 700 K

Answer: B

 Watch Video Solution

98. The specific heat capacities of an ideal gas at the constant pressure and at constant volume are $620 Jkg^{-1}K^{-1}$ and

$420 Jkg^{-1}K^{-1}$ respectively. The density of the gas at STP is approximately,

A. $2.88 kgm^{-3}$

B. $4.86 kgm^{-3}$

C. $3.88 kgm^{-3}$

D. $1.86 kgm^{-3}$

Answer: D

Watch Video Solution

99. Three closed vessels A, B and C are at the same temperature T and contain gases. Vessel A contains only O_2, B contains only N_2 and C contains a mixture of equal quantities of O_2 and N_2. If the rms speed of O_2 molecules in vessel A is v_1 and that of N_2 molecules in vessel B is v_2 then the rms speed of O_2 molecules in vessel C is

A. $\frac{(v_1 + v_2)}{2}$

B. v_1

C. $(v_1 v_2)$

D. $\frac{v_1}{2}$

Answer: B

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100. Match the following List I with List II.

List I		List II	
(A)	Transverse wave	(i)	Vibrations parallel to the direction of propagation
(B)	Longitudinal wave	(ii)	Vibrations perpendicular to the direction of propagation
(C)	Beats	(iii)	Superposition of waves travelling in the opposite directions
(D)	Stationary waves	(iv)	Superposition of waves travelling in same direction

The correct answer is

A. A-(ii), B-(i), C -(iii), D -(iv)

B. `A -(ii), B - (i), C - (iv), D - (iii)

C. A-(iii), B- (iv), C - (i), D -(ii)

D. A-(iv), B - (i), C - (ii), D - (iii)

Answer: B

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101. A police car moving at $22ms^{-1}$ chases a motor cyclist. The police man sounds horn at 176 Hz. While both of them move towards a

stationary siren of frequency 165 Hz. If the number of beats heard by the motor cyclist per second is zero, then the speed of motorcycle is (Speed of sound in air $= 330ms^{-1}$)

A. $33ms^{-1}$

B. $22ms^{-1}$

C. $44ms^{-1}$

D. $11ms^{-1}$

Answer: B

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102. When an object is moved along the principle axis of a concave mirror placed in air, the image coincides with the object if the object is 50 cm from the mirror. If the mirror is placed at a depth of 20 cm in a transparent medium, the image coincides with the object when the object is 40 cm from the mirror. The refractive index of the liquid is

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

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

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

D. $\frac{5}{3}$

Answer: C

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103. In a Young's double slit experiment, light of wavelength 5900 Å is used. When the slits are 2 mm apart, the fringe width is 1.3mm. If the slit separation is increased to one and half

times the previous value, then the fringe width will be

A. $0.9mm$

B. $0.8mm$

C. $1.8mm$

D. $1.6mm$

Answer: B

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104. Two particles with charges $+3.72\mu C$ and $+1.86\mu C$ are some distance apart. If 20% of the charge is transferred from particle to second particle then the electrostatic force between them is

A. decreases by 12%

B. increases by 12%

C. increases by 4%

D. decreases by 4%

Answer: B

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105. ABC is a right triangle in which AB = 3 cm, BC = 4 cm and right angle is at B. Three charges $+15\mu C + 12\mu C$ and $-20\mu C$ are placed respectively at A, B and C. The force acting on the charge at B is

A. 1250 N

B. 3500 N

C. 1200 N

D. 2250 N

Answer: D

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106. A spherical capacitor has outer sphere of radius 5 cm and inner sphere of radius 2 cm. When the inner sphere is earthed, its capacity is C_1 and when the outer sphere is earthed its capacity is C_2. Then $\frac{C_1}{C_2}$ is

A. $\frac{5}{2}$

B. $\frac{2}{5}$

C. $\frac{7}{3}$

D. $\frac{3}{7}$

Answer: A

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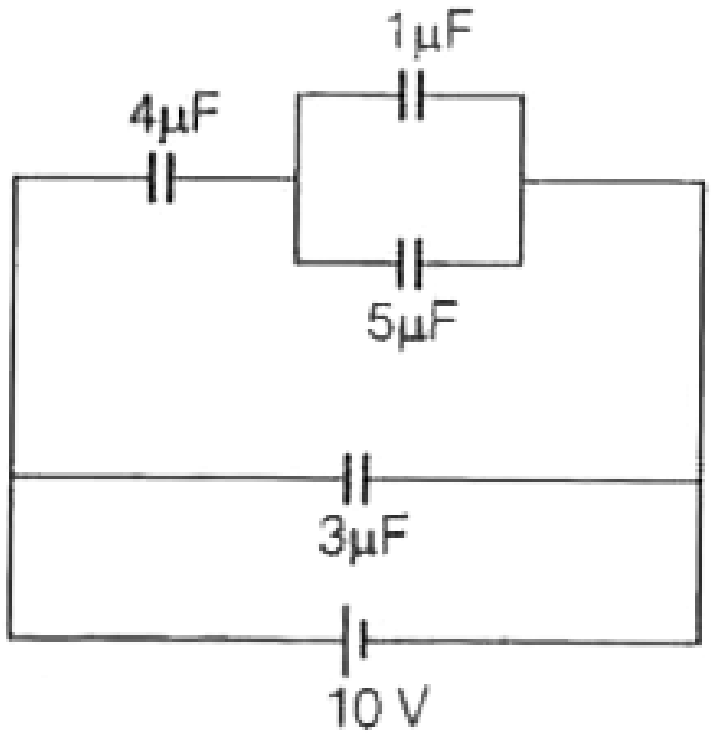
107. The charge on $4\mu F$ capacitor, in the given circuit is



A. $24\mu C$

B. $100\mu C$

C. $2.4\mu C$

D. $30\mu C$

Answer: A

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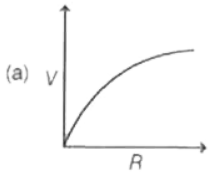
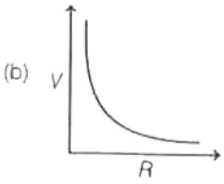
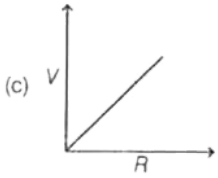
108. A cell of emf ε and internal resistance r is connected across a variable load resistance R. The graph drawn between its terminal voltage and resistance R is

A. 

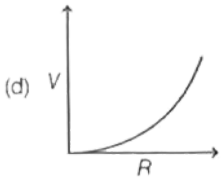
B.



C.



D.



Answer: A

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109. In a meter-bridge if the left and right gaps are connected with 2Ω and 3Ω resistances, respectively then the bridge is balanced. The resistance to be connected with 3Ω resistance to get the balancing point at midpoint of the bridge wire is

A. 3Ω in series

B. 3Ω in parallel

C. 6Ω in series

D. 6Ω in parallel

Answer: D

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110. Magnetic field at the centre of a circular loop of area A is B. Then the magnetic moment of the loop is

(μ_0 -permeability of the free space)

A. $\frac{BA^2}{\mu_0\pi}$

B. $\frac{Ba\sqrt{A}}{\mu_0}$

C. $\frac{Ba\sqrt{A}}{\mu_0\pi}$

D. $\frac{2BA\sqrt{A}}{\mu_0\sqrt{\pi}}$

Answer: D

 Watch Video Solution

111. A circular coil of radius 10cm with 100 turns carrying a current of 0.5A lies in a magetic field of 2 T such that the normal drawn to the plane of the coil makes an angles θ with the direction of the field. Work done in

rotating the coil to change the angle θ from 0° to 180° is

A. πJ

B. $2\pi J$

C. $4\pi J$

D. $8\pi J$

Answer: B

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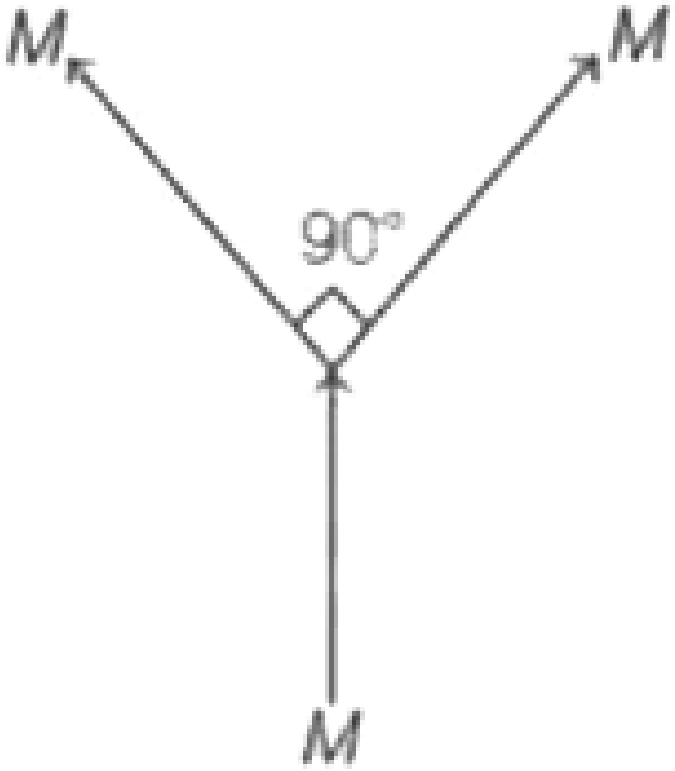
112. The resultant magnetic moment of three magnetic dipoles, each of the magnetic moment M shown in the arrangement is



A. $\sqrt{2}M$

B. $\left(\sqrt{2}+1\right)$ M

C. $\left(\sqrt{2}-1\right)$ M

D. M

Answer: B

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113. A long solenoid with 2000 turns per meter has a small loop of radius 3cm placed inside the solenoid normal to its axis. If the current through the solenoid increases steadily from

1.5 A to 5.5 A in $\frac{\pi^2}{100}$ s, the induced emf in the loop is

A. 0.144 mV

B. 0.288 mV

C. 0.072 mV

D. 0.316 mV

Answer: B

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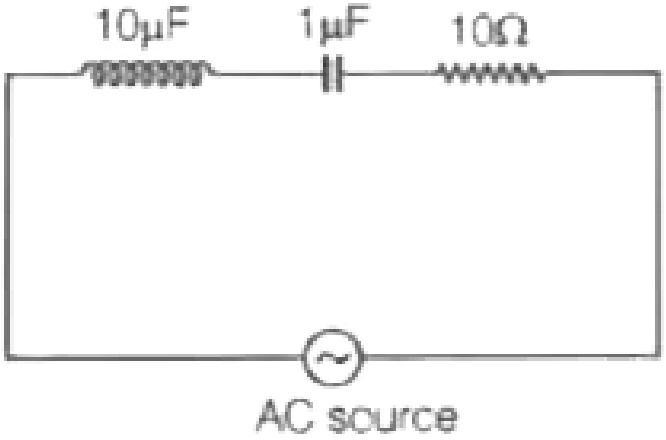
114. In the given circuit, the angular frequency of the voltage source is $70 \times 10^3 rads^{-1}$. The circuit effectively behaves like,



A. purely resistive circuit

B. series RL circuit

C. series RC circuit

D. series LC circuit with R=0

Answer: C

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115. A parallel plate capacitor consists of two circular plates each of radius 2cm, separated by a distance of 0.1mm. If the potential difference across the plates is varying at the rate of $5 \times 10^6 Vs^{-1}$, then the value of displacement current is

A. 5.56 A

B. 5.56 mA

C. 0.556 mA

D. 2.28 mA

Answer: C

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116. Light of wavelength 488 nm is produced by an argon laser which is used in the photoelectric effect. When light from this

spectral line is incident on the emitter, the stopping (cut - off) potential of photoelectrons is 0.38 V. Find the work function of the material from which the emitter is made.

A. 2.16 eV

B. 216 eV

C. 21.6 eV

D. 0.216 eV

Answer: A

Watch Video Solution

117. If the first excitation potential of a hypothetical hydrogen like atom is 15 V, then the third excitation potential of the atom is

A. 13.6 V

B. $\frac{4}{75}$ V

C. $\frac{15}{16}$ V

D. $\frac{75}{4}$ V

Answer: A

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118. The energy released when one nucleus of $._{92}u^{235}$ undergoes fission is 188 MeV. The energy released when 100g of undergoes fission is $._{92}u^{235}$

A. 3.55×10^{12} J

B. 7.71×10^{12} J

C. 3.55×10^{13} J

D. 7.71×10^{13} J

Answer: D

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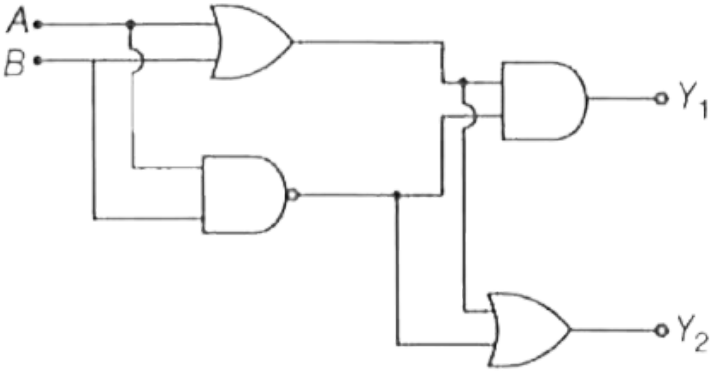
119. The value of Y_1 and Y_2, respectively in the following logic circuit if both A and B are 1.



A. 1, 1

B. 1, 0

C. 0, 1

D. 0, 0

Answer: B

120. If E_c and E_m are peak values of carrier and modulating signals, respectively then for 100% modulation,

A. $E_c = \frac{E_m}{2}$

B. $\frac{E_c^2}{2} = E_m^2$

C. $E_c = E_m$

D. $E_c = 2E_m$

Answer: C

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