PHYSICS

BOOKS - TS EAMCET PREVIOUS YEAR PAPERS

AP EAMCET SOLVED PAPER 2019

Physics

1. Two intervals of time are measured as $\Delta t_1 = (2.00 \pm 0.02)s$ and $\Delta t_2 (4.00 \pm 0.02)s$

. The value of $\sqrt{(\Delta t_1)(\Delta t_2)}$ with correct significant figures and error is

A. $(2.828 \pm 0.01)s$

B. $(2.83 \pm 0.01)s$

C. $(2.828 \pm 0.0075)s$

D. $(2.83 \pm 0.0075)s$

Answer: B

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2. The speed of a particle changes from $\sqrt{5}ms^{-1}$ to $2\sqrt{5}ms^{-1}$ in a time t. The magnitude of change in its velocity is $5ms^{-1}$ the angle between the initial and final velocities of the particle is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D

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3. If the maximum height and range of a projectile are 3 m and 4 m respectively, then the velocity of the projectile is (Take, $g = 1oms^{-2}$)

A. $20\sqrt{\frac{6}{5}}ms^{-1}$

B. $10\sqrt{\frac{3}{2}}ms^{-1}$

C. $10\sqrt{\frac{2}{3}ms^{-1}}$

D. $20\sqrt{\frac{5}{6}}ms^{-1}$

Answer: C

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4. A body is projected at an angle other than 90° with the horizontal with same velocity. If the time of ascent of the body is ls, then the masimum height it can reach is (Take, $g = 10ms^{-2}$)

A. 5 m

B. 10 m

C. 2.5 m

D. 75 m

Answer: A

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5. The position- time (x - t) graph of a moving baby of mass 2 kg is shown in the figure. The impulse on the body at $t = 4s$ is

A. $1.5kg - ms^{-1}$

B. $-1.5kg - ms^{-1}$

C. $1kg - ms^{-1}$

D. $2kg - ms^{-1}$

Answer: B

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6. A block of mass m is lying on a rough inclined pla ne having an inclination

$\alpha = \tan^{-1}\left(\frac{1}{5}\right)$. The inclined plane is moving horzontally with a constant acceleration of $a = 2ms^{-2}$ as shown in the figure. The minimum value of coefficient of friction, so that the block remains stationary with respect to the inclined plane is (Take, $g = 10ms^{-2}$)

A. $\frac{2}{9}$

B. $\frac{5}{12}$

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

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

Answer: B

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7. Potential energy of a body of mass 1 kg free to move along X - axis is given by $U(x) = \left(\frac{x^2}{2} - x\right) J$. If the total mechanical energy of the body is 2 J , then the maximum speed of the body is (Assume only conservative force acts on the body)

A. $\sqrt{5}ms^{-1}$

B. $5ms^{-1}$

C. $3.5ms^{-1}$

D. $\sqrt{8}ms^{-1}$

Answer: A

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8. A cylindrical well of radius 2.5 m has water upto a height of 14 m from the bottom. If the water level is at a depth of 6 m from the top of

the well, then the time taken (in minutes) to empty the well using a motor of 10 HP is approximately, (Take, $g = 10ms^{-2}$)

A. 30

B. 80

C. 98

D. 90

Answer: B

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9. A flywheel of mass 1 kg and radius vector $\left(2\hat{i}_{\hat{j}}+2\hat{k}\right)$ m is at rest. When a force $\left(3\hat{i}+2\hat{j}-4\hat{k}\right)$ N acts on it tangentially, it can rotate freely. Then , its angular velocity after $4.5s$ is

A. $\frac{2}{9}\sqrt{261}\ \text{rad}\ \ s^{-1}$

B. $\frac{3}{2}\sqrt{261}\ \text{rad}\ \ s^{-1}$

C. $\sqrt{261}\ \text{rad}\ \ s^{-1}$

D. $\frac{5}{9}\sqrt{261}\ \text{rad}\ \ s^{-1}$

Answer: C

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10. Three identical spheres each of diameter $2\sqrt{3}$ m are kept on a horizontal surface such that each sphere touches the other two spheres. If one of the sphere is removed, then the shift in the position of the centre of mass of the system is

A. 12 m

B. 1 m

C. 2 m

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

Answer: B

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11. For a particle executing simple harmonic motion, the displacement - time $(x - t)$ graph is as shown in the figure. The acceleration of the particle at $t = \frac{4}{3}s$ is

A. $-\frac{\sqrt{3}}{32}\pi^2 cms^{-2}$

B. $\frac{32}{\sqrt{3}}\pi^2 cms^{-2}$

C. $+\frac{\sqrt{3}}{32}\pi cms^{-2}$

D. $+\frac{32}{\sqrt{3}}\pi cms^{-2}$

Answer: A

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12. Two Masses 90 kg and 160 kg are separated by a distance of 5 m. The magnitude of intensity of the gravitational field at a point which is at a distance 3 m from the 90 kg mass

and 4 m from the 160 kg mass is (Universal gravitational constant, $G = 6.67 \times 10^{-11} N - m^2 kg^{-2}$).

A. $94.3 \times 10^{-10} Nkg^{-1}$

B. $9.43 \times 10^{-10} Nkg^{-1}$

C. $9.43 \times 10^{-12} Nkg^{-1}$

D. $94.3 \times 10^{-12} Nkg^{-1}$

Answer: B

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13. The following four wires are made of the same material. If same tension is applied to each, the wire having largest extension is

A. length 0.5 m, diameter 0.5 mm.

B. length 1 m, diameter 1 mm.

C. length 2 m, diameter 2 mm.

D. length 3 m , dimeter 3 mm,

Answer: A

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14. A liquid drop of density ρ is floating half immersed in a liquid of surface tension S and density $\frac{\rho}{2}$. If the surface tension S of the liquid is numerically equal to 10 times of acceleration due to gravity, then the diameter of the drop is :

A. $\sqrt{\frac{20}{\rho}}$

B. $\sqrt{\frac{80}{\rho}}$

C. $\sqrt{\frac{60}{\rho}}$

D. $\sqrt{\frac{40}{\rho}}$

Answer: B

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15. A block of metal is heated to a temperature much higher then the room temperature and placed in an evacuated cavity. The curve which correctly represents the rate of cooling (T is temperature of the block and t is the time)

A. 

B. 

C. 

D. 

Answer: B

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16. A solid copper sphere of density ρ specific heat capacity C and radius r is initially at 200K. It is suspended inside a chamber whose walls are at 0 K. The time required (in μ s) for the temperature of the sphere to drop to 100

K is

(σ is Stefan's constant and all the quantities are in SI units.)

A. $48\frac{r\rho C}{\sigma}$

B. $\frac{1}{48}\frac{r\rho C}{\sigma}$

C. $\frac{27}{7}\frac{r\rho C}{\sigma}$

D. $\frac{7}{27}\frac{r\rho C}{\sigma}$

Answer: B

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17. Match the temperatures of the source and sink (T_1 and T_2 respectively) of a Carnot heat engine given in List - I with the corresponding efficiencies given in List - II.

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

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

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

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

Answer: D

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18. A hammer of mass 200 kg strikes a steel block of mass 200 g with a velocity 8 ms^{-1} . If $23\ \%$ of the energy is utilized to heat the steel block, the rise in temperature of the block is (Specific heat capacity of steel, $= 460 Jkg^{-1}K^{-2}$)

A. 8 K

B. 16 K

C. 12 K

D. 24 K

Answer: B

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19. At a temperature of 314 K and a pressure of 100 kPa , the speed of sound in a gas is 1380 ms^{-1}. The radius of each gas molecule is 0.5Å . The frequency of sound at which the wavelength of sound wave in the gas becomes equal to the mean free path of the gas

molecules is

(Boltzmann constant $= 1.38 \times 10^{-23} JK^{-1}$.

)

A. 1000 MHz

B. $1000\sqrt{2}$ MHz

C. $\frac{1000}{\sqrt{2}}$ MHz

D. 500 MHz

Answer: B

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20. At a temperature of $27^{\circ}C$, two identical organ pipes produce notes of frequency 140 Hz. If the temperature of one pipe is raised to 57.75°, then the number of beats produced pre second is

A. 7

B. 5

C. 3

D. 9

Answer: A

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21. A source of sound S in the from of a block kept on a smooth horizontal surface is connected to a spring, as shown in the figure. If the spring oscillates with an amplitude of 50 cm along horizontal between the wall and the observer O, the maximum frequency heard by the observer is $12.5\,\%$ more than the minimum frequency heard by him. If the mass of the source of sound is 100 g, the force constant of the spring is

(Speed of sound in air is 340 ms^{-1})

A. 40 Nm^{-1}

B. 80 Nm^{-1}

C. 160 Nm^{-1}

D. 320 Nm^{-1}

Answer: C

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22. A girl of height 150 cm with her eye level at 140 cm stands in front of plane mirror of height 75 cm fixed to a wall. The lower edge of the mirror is at a height of 85 cm above her feet level. The height of her image the girl can see in the mirror is

A. 130 cm

B. 140 cm

C. 120 cm

D. 150 cm

Answer: C

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23. Unpolarised light from air incidents on the surface of a transparent medium of refractive index 1.414 such that the reflected light is completely polarised. Match the angles given in List - I with the corresponding values given in List - II

The correct match is codes

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

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

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

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

Answer: D

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24. The electric field intensity at a point on the axis of an electric dipole in air is 4 NC^{-1} .Then the electric field intensity at a point on

the equatorial line which is at a distance equal to twice the distance on the axial line and if the dipole is in a medium of dielectric constant 4 is

A. 1 NC^{-1}

B. $\frac{1}{8}NC^{-1}$

C. 16 NC^{-1}

D. $\frac{1}{16}NC^{-1}$

Answer: D

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25. Two small spheres of each charge q, mass m and material density d are suspended from a fixed point with the help of inextensible light thread. When the spheres are in air, the angle between the threads is 90°. When the spheres are suspended in a liquid of density $\frac{2}{3}d$, the angle between the threads is 60°. The value of dielectric constant of the liquid is

A. $6\sqrt{3}$

B. $2\sqrt{5}$

C. $5\sqrt{3}$

D. $7\sqrt{2}$

Answer: A

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26. The potential difference $(V_A - V_B)$ in the arrangement shown in the figure is $(q = 1\mu C, x = 2cm, y = 3cm)$

A. $5.4 \times 10^5 V$

B. $2.7 \times 10^5 V$

C. $5.4 \times 10^2 V$

D. $2.7 \times 10^2 V$

Answer: A

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27. In a parallel plate capacitor the separation between plates is 3 x. This separation is filled by two layers of dielectrics, in which on layer

has thickness x and dielectric constant $3k$, the other layer is of thickness $2x$ and dielectric constant `5 k . It the plates of the capacitor are connected to a battery , then the ratio of potential difference across the dielectric layers is

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

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

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

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

Answer: D

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28. Assertion (A) When a wire of aluminium and another wire of silicon are heated from room temperature to $80^{\circ}C$, the conductivity of aluminium increases and that of silicon decreases.

Reason (R) Aluminium has positive temperature coefficient of resistivity and silicon has negative temperature coefficient of resistivity.

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

B. Both (A) and (R) 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: D

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29. The walls of a closed cubical box of edge 60 cm are made of material of thickness 1 mm and thermal conductivity, 4×10^{-4} cal $s^{-1} cm^{-1} {}^{\circ} C^{-1}$ The interior of the box is maintained $1000^{\circ} C$ above the outside temperature by a heater placed inside the box and connected across 400 V DC supply. The resistance of the heater is

A. 4.41Ω

B. 44.1Ω

C. 0.441Ω

D. 441Ω

Answer: C

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30. A galvanometer of resistance $G\Omega$, is shunted by a resistance $S\Omega$. To keep the main current in the circuit unchanged, the resistance to be connected in series with the galvanometer is

A. $\frac{G^2}{S+G}$

B. $\frac{S}{S+G}$

C. $\frac{S^2}{S+G}$

D. $\frac{SG}{S+G}$

Answer: A

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31. A proton and an α -particle are simultaneously projected in opposite direction into a region of uniform magnetic field of 2 mT perpendicular to the direction of the field.

After some time it is found that the velocity of proton has changed in direction by 90°. Then at this time, the angle between the velocity vectors of proton and α - particle is

A. 60°

B. 90°

C. 45°

D. 180°

Answer: C

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32. A bar magnet placed in a uniform magnetic field making an angle θ with the field experiences a torque. If the angle made by the magnet with the field is doubled, the torque experienced by the magnet increases by $41.4\,\%$. The initial angle made by the magnet with the magnetic field is

A. 60°

B. 30°

C. 90°

D. 45°

Answer: D

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33. A metal rod AB of length 50 cm is moving at a velocity 8 ms^{-1} in a magnetic field of 2 T. If the field is at 60° with the plane of motion as shown in the figure, then the potentials V_A and V_B are related by

A. $V_A - V_B = 8V$

B. $V_A - V_B = 4V$

C. $V_B - V_A = 8V$

D. $V_B - V_A = 4V$

Answer: B

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34. In the given electrical circuit, if the switch S is closed then the maximum energy stored in

the inductor is

A. 2 J

B. 9 J

C. 12 J

D. 6 J

Answer: A

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35. Which of the following is/are the property/properties of a monochromatic electromagnetic wave propagating in the free space?

1. Electric and magnetic fields will have a phase difference $\frac{\pi}{2}$.

2. The energy of the wave is distributed equally between electric and magnetic fields.

3. The pressure exerted by the wave is the product of its speed and energy density.

4. The speed of the wave is equal to the ratio of the magnetic field to the electric field

A. 1 and 2

B. Only 2

C. 2 and 3

D. Only 4

Answer: B

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36. The maximum kinetic energy of a photoelectron liberated from the surface of lithium with work function 2.35 eV by

electromagnetic radiation whose electric component varies with time as:

$E = a[1 + \cos(2\pi f_1 t)]\cos 2\pi f_2 t$ (where a is a constant) is $\left(f_1 = 3.6 \times 10^{15} Hz, \text{ and } f_2 = 1.2 \times 10^{15}\right.$ Hz and planck's constant $h = 6.6 \times 10^{-34}$ Js)

A. 2.64 eV

B. 7.55 eV

C. 12.53 eV

D. 17.45 eV

Answer: D

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37. Magnetic moment due to the motion of the electron in nth energy state of hydrogen atom is proportional to .....

A. n^{-2}

B. n

C. n^2

D. n^3

Answer: B

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38. The rate of disintegration of a radioactive sample is R and the number of atoms present at any time t is N. When $\frac{R}{N}$ is taken along Y-axis and t is taken along X-axis, the correct graphs is

A. 

B. 

C. 

D. 

Answer: D

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39. For an LED to emit light in visible region of the electromagnetic spectrum, it can have energy band gap in the range of,

(Plank's constant, $h = 6.6 \times 10^{-34}$ Js and speed of light, $e = 3 \times 10^{8} ms^{-1}$ in vacuum)

A. 0.1 eV to 0.4 eV

B. 0.9 eV to 1.6 eV

C. 1.7 eV to 3.1 eV

D. 0.5 eV to 0.8 eV

Answer: C

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40. A transmitting antenna of height 20 m and the receiving antenna of height h are separated by a distance of 40 km for satisfactory communication in line of sight

(Los) mode. Then the value of his

(Give, radius of earth is 6400 km.

A. 40 m

B. 45 m

C. 30 m

D. 25 m

Answer: B

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41. If A represents density, B represents velocity, C represents specific heat capacity and D represents wavelength, then the quantity having the dimensions of product of A, B, C and D is

A. Stefan's constant

B. Botltzmann's constant

C. thermal conductivity

D. universal gas constant

Answer: C

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42. A ball dropped from a building of height 12 m falls on a slab of 1 m height from the ground and makes a perfect elastic collision. Later the ball falls on a wooden table of height 0.5 m, makes inelastic collision and falls on the ground. If the coefficient of restitution between the ball and the table is 0.5, then the velocity of the ball while touching the ground is about

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

A. $15.5ms^{-1}$

B. $14.5ms^{-1}$

C. $9.2ms^{-1}$

D. $8.2ms^{-1}$

Answer: D

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43. Two food packets are thrown with the same velocity in the same direction with different angles of projection simultaneously.

The angle of projection of one packet is 15°. At the same moment one boy starts running from rest from the point of projection with an acceleration of $10ms^{-2}$ to catch them. If he caught one packet at a distance of 20 m and other packet in $\frac{1}{2}s$ later the first packet, then the angle of projection of the second packet is (Acceleration due to gravity, $g = 10ms^{-2}$)

A. $\frac{1}{2}\sin^{-1}\left(\frac{25}{32}\right)$

B. $\frac{1}{2}\sin^{-1}\left(\frac{8}{9}\right)$

C. $\frac{1}{2}\sin^{-1}\left(\frac{7}{8}\right)$

D. $\frac{1}{2}\sin^{-1}\left(\frac{5}{6}\right)$

Answer: A

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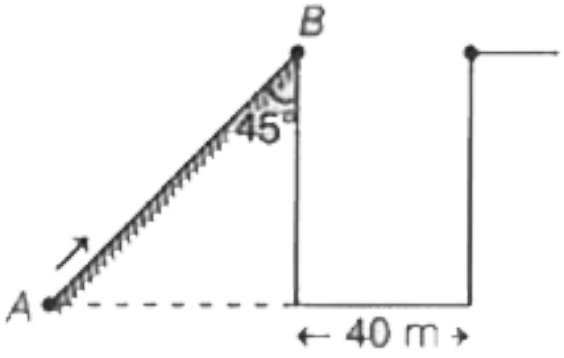
44. A body is projected up a smooth inclined plane of length $20\sqrt{2}m$ from point A as shown in the figure. The top of B of the inclined plane is connected to a well of diameter 40 m. If the body just manages to cross the well then the velocity of projection is

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



A. $40ms^{-1}$

B. $40\sqrt{2}ms^{-1}$

C. $20ms^{-1}$

D. $20\sqrt{2}ms^{-1}$

Answer: D

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45. A body is acted on by a force given by $F = \left(15 + 3t^2\right)N$. The impulse received by the body during the first 2 seconds is

A. 28 Ns

B. 38 Ns

C. 30 Ns

D. 19 Ns

Answer: B

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46. A body starts sliding down from the top of an inclined plane at an angle θ with the horizontal direction. The first one third of the incline is smooth, the next one third has coefficient of friction $\frac{\mu}{2}$ and the last one third has coefficient of friction μ.

If the body comes to rest at the bottom of the plane then the value of μ is

A. $\frac{\tan\theta}{2}$

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

C. $\tan\theta$

D. 2tantheta`

Answer: D

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47. A motor pump a liquid of density ρ through a pipe of cross-sectional area A. If the liquid moves with a speed v in this pipe, then

the rate of kinetic energy imparted to the liquid is proportional to

A. v^2

B. v^3

C. v^4

D. $\sqrt{v}$

Answer: B

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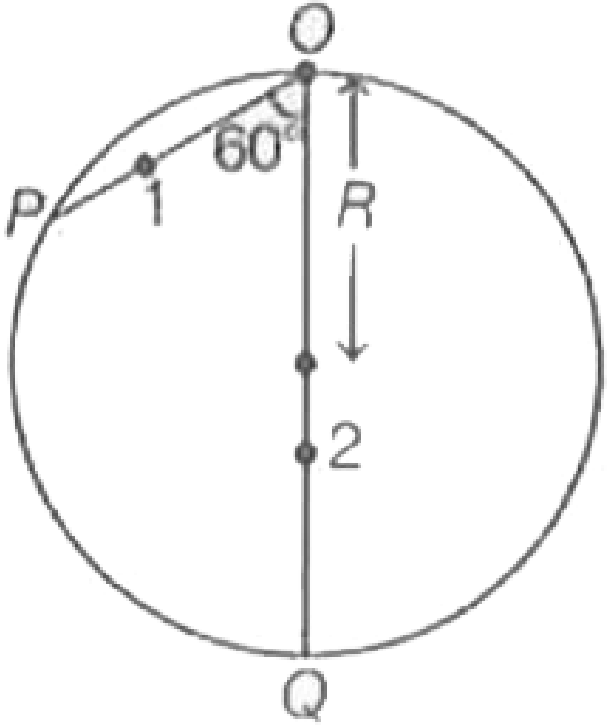
48. Two particles 1 and 2 are allowed to descend on two frictionless chords OP and OQ as shown in the figure. The ratio of the speeds of the particles 1 and 2, respectively when they reach the circumference is



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

B. 2

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

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

Answer: A

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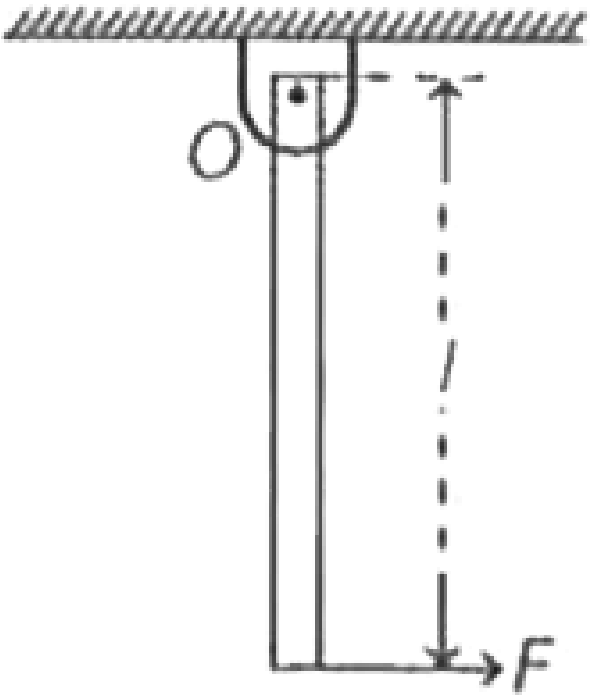
49. A uniform rod of mass m and length l is pivoted smoothly at point O as shown in figure. If a horizontal force F acts at the

bottom of the rod and ω is the angular velocity of the rod which is a function of angle of rotation θ, then the maximum angular displacement of the rod is

(Acceleration due to gravity, g)



A. $\theta = 2\sin^{-1}\left(\frac{2F}{mg}\right)$

B. $\theta = 2\cos^{-1}\left(\frac{2F}{mg}\right)$

C. $\theta = 2\tan^{-1}\left(\frac{2F}{mg}\right)$

D. $\theta = 2\cot^{-1}\left(\frac{2F}{mg}\right)$

Answer: C

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50. An electric motor of power 75 W rotates a flywheel of moment of inertia 0.36 kg - m^2 at a constant rate of 100 rad s^{-1}. If the power is

switched off, the time taken for the wheel to come to rest is

A. 12 s

B. 24 s

C. 36 s

D. 48 s

Answer: D

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51. A particle is executing simple harmonic motion along a straight line PQ. At three points A, B and C on the line PQ, lying on one side of the mean position, the velocities of the particles are $8ms^{-1}, 7ms^{-1}$ and $4ms^{-1}$, respectively. If AB = BC = 1m, the velocity of the particle at mean position is

A. $9ms^{-1}$

B. $\sqrt{47}ms^{-1}$

C. $\sqrt{65}ms^{-1}$

D. $10ms^{-1}$

Answer: C

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52. The gravitational potential difference between the surface of a planet and a point 20 m above it is 16 J kg^{-1}. The work done in moving a 4 kg body by 8 m on a slope of 60° from the horizontal is

A. 22.17 J

B. 2.217 J

C. 221.7 J

D. 0.2217 J

Answer: A

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53. The area of cross-section of steel wire is $0.1cm^2$ and Young's modulus of steel is $2 \times 10^{11} N \quad m^{-1}$. The force required to stretched by 0.1% of its length is

A. 1000 N

B. 2000 N

C. 5000 N

D. 4000 N

Answer: B

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54. A sphere of radius R has a concentric spherical cavity of radius r. The relative density of the material of the sphere is σ. It just floats

when placed in tank full of water. The value of $\frac{R}{r}$ is

A. $\left(\frac{\sigma}{\sigma-1}\right)^{\frac{1}{3}}$

B. $\left(\frac{\sigma-1}{\sigma}\right)^{\frac{1}{3}}$

C. $\left(\frac{\sigma}{\sigma-1}\right)^{\frac{1}{2}}$

D. $\left(\frac{\sigma-1}{\sigma}\right)^{\frac{1}{2}}$

Answer: A

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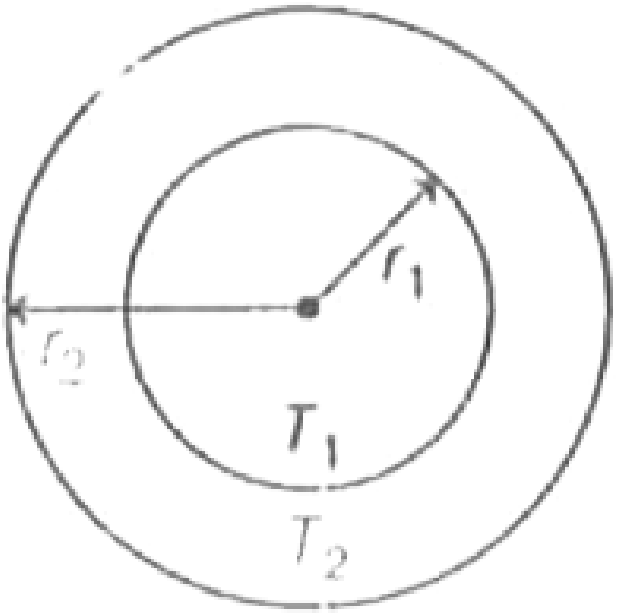
55. Figure shows a system of two concentric spheres of radii r_1 and r_2 at the temperatures T_1 and T_2, respectively. The radial rate of flow of heat in a substance filled between the two concentric spheres is proportional to



A. $r_2 - r_1$

B. $\ln\left(\frac{r_2}{r_1}\right)$

C. $\frac{r_2 - r_1}{r_1 r_2}$

D. $\frac{r_1 r_2}{r_2 - r_1}$

Answer: D

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56. A composite bar of uniform cross-section is made of 25 cm of copper, 10 cm of nickel and 15 cm of aluminium with perfect thermal

contacts. The free copper end of the rod is at $100^\circ C$ and the free aluminium ends is at $0^\circ C$. If $K_{Cu} = 2K_{Al}$ and $K_{Al} = 3K_{Ni}$, then the temperatures of Cu-Ni and Ni-Al junctions are respectively.

(Assume no loss of heat occurs from the sides of the rod, K-thermal conductivity).

A. $82.3 \quad ^\circ C, 31.3 \quad ^\circ C$

B. $78.3 \quad ^\circ C, 26.1 \quad ^\circ C$

C. $70 \quad ^\circ C, 23.3 \quad ^\circ C$

D. $90.3 \quad ^\circ C, 30.1 \quad ^\circ C$

Answer: B

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57. The specific heat capacities of three liquids A, B and C are in the ratio, 1 : 2 : 3 and the masses of the liquids are in the ratio 1 : 1 : 1. The temperatures of the liquids A, B and C are $15\ ^\circ C, 30\ ^\circ C$ and $45\ ^\circ C$, respectively. Then matched the resultant temperature of the mixture given in list-II with the

corresponding mixture given in list-I.

	List I		List II
A.	Mixture of liquids *A* and *B*	(i)	25 °C
B.	Mixture of liquids *B* and *C*	(ii)	35 °C
C.	Mixture of liquids *C* and *A*	(iii)	37.5 °C
D.	Mixture of liquids *A*, *B* and *C*	(iv)	39 °C

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

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

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

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

Answer: C

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58. A gas $(\gamma = 1.5)$ undergoes a cycle of adiabatic, isobaric and isochoric processes in an order. If the volume of the gas is doubled in the adiabatic process then the efficiency of the cycle is approximately,

A. $18\ \%$

B. $46.4\ \%$

C. $38.5\ \%$

D. $9.25\ \%$

Answer: A

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59. The y-components of velocities of the molecules of a gas are

-7, -6, -5, -4, -3, -2, -1, 0, +1, +2, +3, +4, +5, +6, +7

ms^{-1} then the rms velocity is

A. $\sqrt{\frac{56}{3}}ms^{-1}$

B. $\sqrt{\frac{28}{3}}ms^{-1}$

C. $\sqrt{\frac{112}{3}}ms^{-1}$

D. $\sqrt{\frac{84}{3}} ms^{-1}$

Answer: A

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60. A metal wire of length 80 cm, area of cross-section 3 mm^2 and material density 3000 kg m^{-3} is joined to another metal wire of length 60 cm, area of cross-sectional 1 mm^2 and material density 9000 $kg - m^3$.

The free ends of the two wires are stretched

between two rigid supports and a tension of 40 N is produced in the wires. The minimum frequency of the tuning fork which can produce stationary waves with the joint of the wires as a node is

A. $\frac{200}{3}$Hz

B. $\frac{400}{3}Hz$

C. $\frac{500}{3}Hz$

D. $\frac{70C}{3}Hz$

Answer: C

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61. A source producing sound of frequency 720 Hz is falling freely from the top of a tower of height 20 m. The frequency of sound heard by an observer on the top of the tower when the source just reaches the ground is (Acceleration due to gravity, $g = 10ms^{-2}$ and speed of sound in air $= 340ms^{-1}$)

A. 660 Hz

B. 680 Hz

C. 740 Hz

D. 760 Hz

Answer: B

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62. In a spherical glass marble of radius 6 cm, a small air bubble is formed at 1 cm from the centre of the marble. The apparent position of the air bubble from the nearest point on the

surface of the marble is about,

(refractive index of glass is 1.5.)

A. 3.3 cm

B. 4.6 cm

C. 5.4 cm

D. 7.0 cm

Answer: A

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63. In a Young's double slit experiment, the two slits are separated by 0.5 cm and the screen is at 0.5 m from the slits. If 20000 bright fringes are counted per meter on the screen, then the wavelength of light used is

A. $5000\overset{\circ}{A}$

B. $5890\overset{\circ}{A}$

C. $6000\overset{\circ}{A}$

D. $5460\overset{\circ}{A}$

Answer: A

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

A. $2.5\pi s$

B. $5\pi s$

C. $15\pi s$

D. πs

Answer: A

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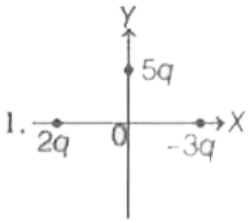
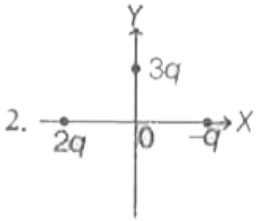
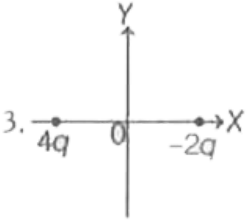
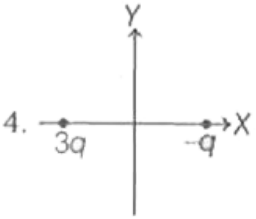
65. In the following four cases, charged particles are at equal distances from the origin. Arranged them in the descending order of magnitude of the net electric field at the

origin.









A. 1, 2, 3, 4

B. 2, 1, 3, 4

C. 1, 3, 2, 4

D. 4, 3, 2, 1

Answer: C

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66. An electrical technician requires a capacitance of $2\mu F$ in a circuit across a potential difference of $1kV$. A large number of $1\mu F$capacitors are available to him each of which can withstand a potential difference of not more than 400V. Suggest a possible arrangement that requires the minimum number of capacitors.

A. 24

B. 32

C. 8

D. 16

Answer: B

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67. A charge 5C is placed at the centre of shell of radius, r = 3 m and having charges 5 C. The

potential at a point $\frac{r}{2}$ distance from the centre of the shell will be

A. $-9 \times 10^9 V$

B. $30 \times 10^9 V$

C. $45 \times 10^9 V$

D. $-15 \times 10^9 V$

Answer: C

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68. Electrical energy costs 25 paisa per kilowatt hour. Assuming that no energy is wasted, the cost of heating 4.6 kg of water from $25^{\circ}C$ to the boiling point is

A. 25 paisa

B. 50 paisa

C. 20 paisa

D. 10 paisa

Answer: D

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69. A 500 W heater is designed to operate at 200 V potential difference. If it is connected across 160 V line, the heat it will produce in 20 minutes is

A. 384 kJ

B. 483 kJ

C. 843 kJ

D. 348 kJ

Answer: A

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70. A wire of length 44 cm carrying a current of 2 A is bent and the two ends are joined. This shape is placed in a uniform magnetic field of 50 mT. If the magnetic field in North-South direction, then the maximum torque acting on the shape is

A. $1.54 \times 10^{-3} Nm$

B. $0.77 \times 10^{-3} Nm$

C. $3.08 \times 10^{-3} Nm$

D. Zero

Answer: A

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71. A toroid has a non-ferromagnetic core of inner radius 20.5 cm and outer radius 21.5 cm, around which 4200 turns of a wire are wound. If the current in the wire is 10 A, the magnetic

field inside the core of the toroid is $(\mu_0 = 4\pi \times 10^{-7} Hm^{-1})$

A. 20 mT

B. 40 mT

C. 20 π mT

D. 40 π mT

Answer: B

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72. Two short bar magnets A and B are arranged co-axially. The distance between their centres is 30 cm. A compass needle placed on their axis at a distance of 6 cm from B shows no deflection. The ratio of the magnetic moments of A and B is

A. $16:1$

B. $1:16$

C. $64:1$

D. $1:64$

Answer: C

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73. A circular coil of area 0.1 m^2 having 200 turns is placed in a magnetic field of 40 T. The plane of the coil makes 30° with the field. If the field is removed for 0.1 s then the induced emf in the coil is

A. 4000 V

B. $4000\sqrt{3}V$

C. 2000 V

D. $2000\sqrt{3}V$

Answer: B

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74. A coil has an inductance 0.7 H and it is joined in series with a resistance of 220 Ω. When AC of 220 V, 50 Hz is applied to it, then wattles component in the circuit is

A. $5A$

B. $0.5A$

C. $0.7A$

D. $7A$

Answer: B

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75. A plane electromagnetic wave propagating in a non-magnetic dielectric medium is given by $E = E_0\left[4 \times 10^{-7}x - 50t\right]$, where x is in

metre and t is in second. If the relative permeability of the medium, $\mu_r = 1$ then the dielectric constant of the medium is

A. 2.42

B. 5.76

C. 8.26

D. 4.84

Answer: B

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76. All electrons ejected from a metal surface by the incident light of wavelength 200 nm can be stopped before travelling 1 m in the direction of uniform electric field of $4NC^{-1}$. The work function of the metal surface is

A. 2 eV

B. 2.2 eV

C. 4 eV

D. 6.2 eV

Answer: B

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77. A hydrogen atom emits a photon of wavelength $\frac{36}{35R}$ when it is jumped from its nth excited state to the ground state. Then the quantum number n is

(R is Rydberg constant.)

A. 8

B. 7

C. 5

D. 6

Answer: D

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78. Assertion (A) Fragments produced in the fission of $_{92}U^{235}$ are radioactive.

Reason (R) The fragments in the fission of ^{235}U have a proton to neutron ratio of 2.5.

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

B. Both (A) and (R) 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: C

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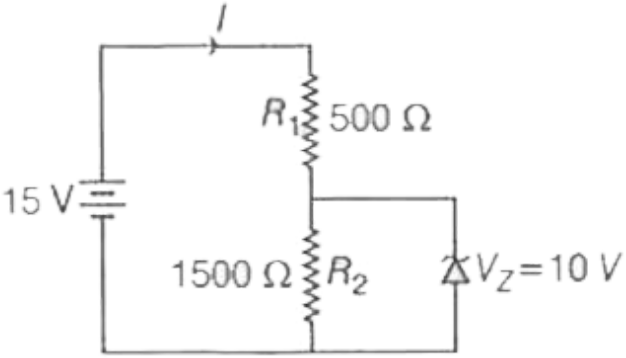
79. In the circuit given, the current through Zener diode is



A. 10 mA

B. 6.67 mA

C. 3.33 mA

D. 5 mA

Answer: C

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80. Co-axial cable, a widely used wire medium for transmission of signals offers a bandwith of approximately.

A. 600 kHz

B. 750 MHz

C. 850 GHz

D. 500 Hz

Answer:

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