PHYSICS

BOOKS - BITSAT GUIDE

QUESTION-PAPERS-2013

Physics

1. A square shaped current loop of side length L and carrying current I lies in a uniform magnetic field B acting perpendicular to the

plane of squre loop and directed inward. The net magnetic force acting on current loop is
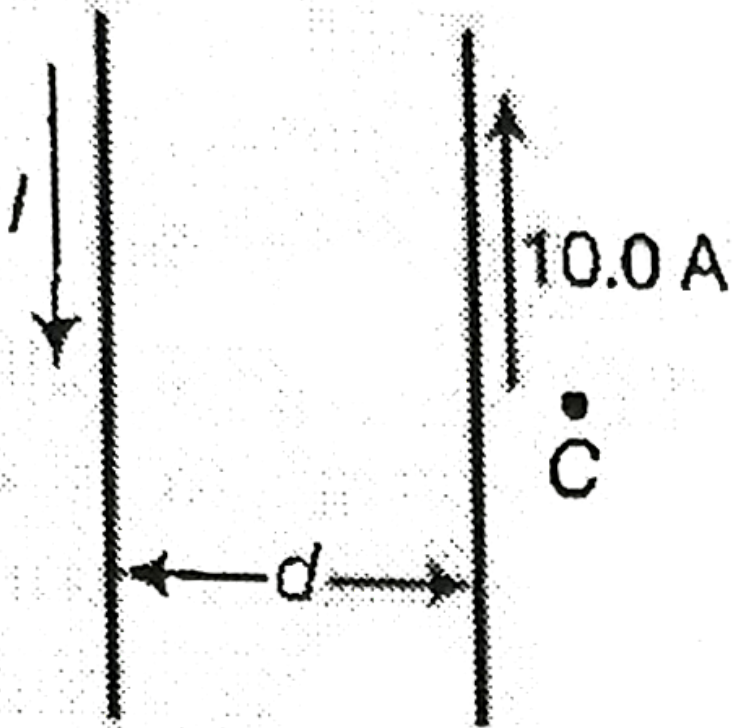
A. lBL

B. 4 lBL

C. zero

D. 2lBL

Answer: C

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2. Two parallel conductors carry current in opposite direction as shown in figure. One conductor carries a current of 10.0 A. point C is a distance $\dfrac{d}{2}$ to the right of the 10.0 A current. If the d=18 cm and I is adjusted so that the magnetic field at C is zero, the value of the

current I is

10.0 A

C

A. 10.0 A

B. 30.0A

C. 8.0 A

D. 18. 0 A

Answer: B

3. Two long, parallel conductors carry currents in the same direction, as shown in figure. Conductors A held firmly in position. Conductors B carries a current I_B and is allowed to slide freely up and down (parallel to A) between a se of non-conducting guides.

the mass per unit length of conductors B is 0.1

g/cm and the distance between the two

conductors is 5 cm. if system of conductors is

in equilibrium , the value of current I_B is
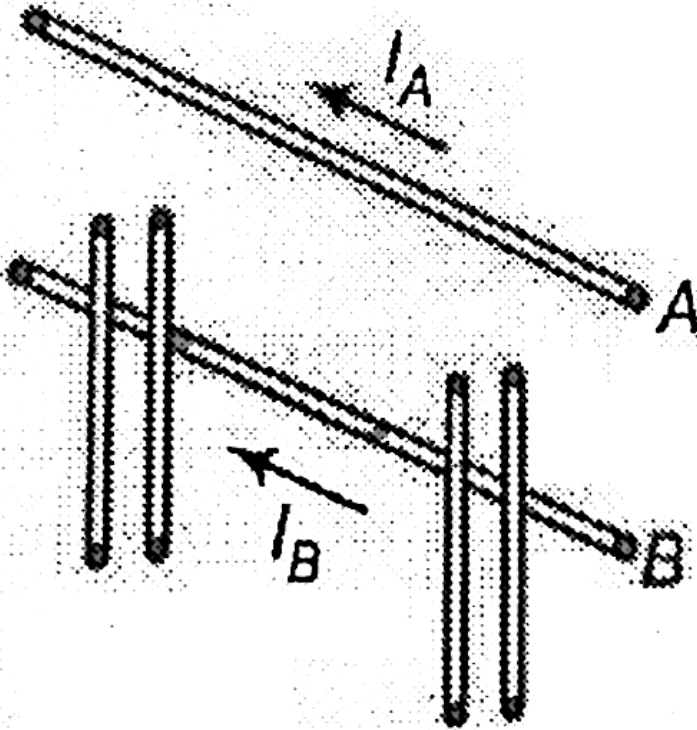
A. 250 A

B. 240 A

C. 220 A

D. 230 A

Answer: A

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4. The number of photoelectrons in a photoelectric effect experiment depends on the

A. Frequency of light

B. Intensity of light

C. Both (frequency of light) and (intensity

   of light) are correct

D. Both (frequency of light) and (intensity

   of light) are incorrect

Answer: B

5. In hydrogen atom, if $\lambda_1, \lambda_2, \lambda_3$ are shortest wavelengths in Lyman, Balmer and Paschen series respectively then $\lambda_1 : \lambda_2 : \lambda_3$ equals

    A. $1 : 4 : 9$

    B. $9 : 4 : 1$

    C. $1 : 2 : 3$

    D. $3 : 2 : 1$

Answer: A

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6. Half-lives of elements A and B are 1h and 2h respectively. Which of the following is correct?

A. Element A decays slower

B. Decay constant of A is smaller

C. If initial number of nuclei are same then activity of A is more

D. Mean life of A is more

Answer: C

7. A glass piece is dipped in a liquid of refractive index $\dfrac{4}{3}$ it gets disappeared in the liquid. The refractive index of the glass piece is?
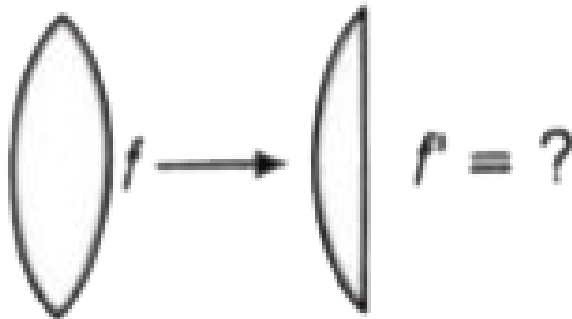
A. $\dfrac{3}{4}$

B. $\dfrac{5}{3}$

C. $\dfrac{4}{5}$

D. $\dfrac{4}{3}$

Answer: D

$f' = ?$

8.

If the bio-convex lens is cut as shown in the figure, the new focal length f' is

A. 2f

B. f

C. `(f)/(2)

D. Infinite

Answer: A

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9. Refractive index of a medium depends on

A. On the medium only

B. On the incident light only

C. On both the conditions given in options

(on the medium only) and (on the

incident light only)

D. None of the above

Answer: C

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10. A point object is placed at the focus of a convex mirror the image will be formed at
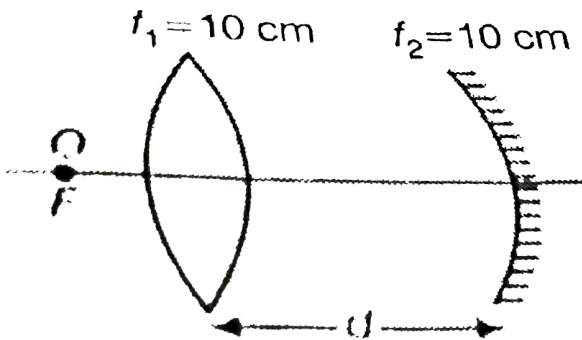
A. Infinity

B. Centre of curvature

C. At focus itself

D. None of these

Answer: D

$f_1 = 10$ cm $f_2 = 10$ cm

11.

A point object is placed at the focus of the bio-

conved lens. What should be the value of X, so the final image forms at infinity?

A. 10 cm

B. 20 cm

C. 15 cm

D. None of these

Answer: B

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12. The image formed by a concave spherical mirror,

    A. Is always virtual

    B. Is always real

    C. Is always inverted

    D. May be erect

Answer: D

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13. The total energy of a revolving satellite around the earth is $-KJ$. The minimum energy required to throw it out of earth's gravitational fields is
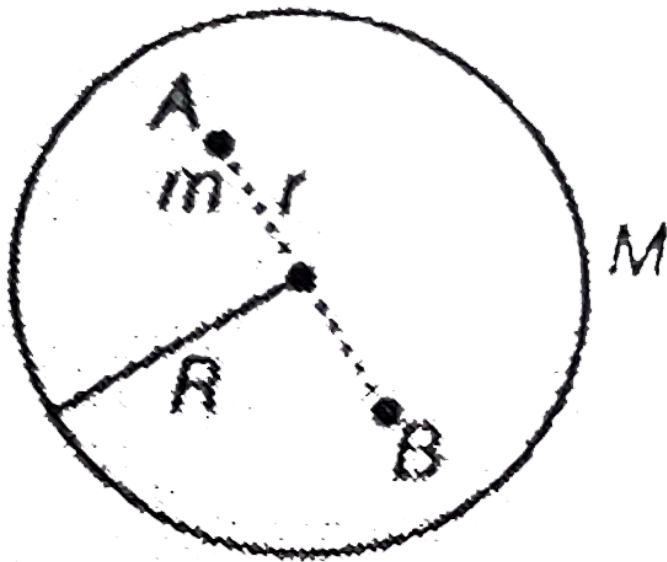
A. KJ

B. $\dfrac{K}{2}J$

C. 2KJ

D. None of these

Answer: A

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14. There is a shell of mass M and density of shell is uniform. The work done to take a point mass from point A to B is $(AB = r)$

A. $\dfrac{GmM}{r}$

B. $\dfrac{GmM}{R}$

C. $-\dfrac{GmM}{r}$

D. zero

Answer: D

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15. A body of mass m= 20 g is attached to an elastic spring of length L=50 cm and spring constant k=2 Nm^{-1}. The syste is revolved in a horizontal plan with a frequency v=30 rev/min.

Find the radius of the circular motion and the tension in the spring .

A. 0.25 m, 0.1 N

B. 0.5 m, 0.52 N

C. 0.55 m 0.1 N

D. 0.9 m, 0.2 N

Answer: C

16. A gramophone record of mass M and radius R is rotating at an angular velocity ω A coin of mass is gently placed on the record at a distance $r = \dfrac{R}{2}$ from its centre. The new angular velocity of the system is

A. $\dfrac{2\omega M}{(2M + m)}$

B. $\dfrac{2\omega M}{(M + 2m)}$
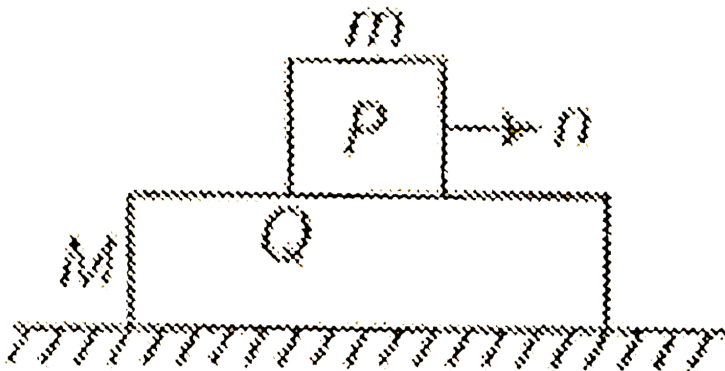
C. ω

D. $\dfrac{\omega M}{m}$

Answer: A

17. A block of mass m = 1 kg is placed over a plank Q of mass M = 6 kg, placed over a smooth horizontal surface as shown in figure. Block P is given a velocity $v = 2m/s^2$ to the right. If the coefficient of friction between P and Q is $\mu = 0.3$. Find the acceleration of Q

relative to P.

A. $4m/s^2$

B. $3.5m/s^2$

C. $2m/s^2$

D. $10.0m/s^2$

Answer: B

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18. A man runs at a speed of $4m/s$ to overtake a standing bus. When he is $6m$ beind the door at $t = 0$, the bus mover forward and continuous with a constant acceleration of $1.2m/s^2$. The man reaches the door in time t. Then

    A. $4t = 6 + 0.6t^2$

    B. $1.2t^2 = 4t$

    C. $4t^2 = 1.2t$

D. $6 + 4t = 0.2t^2$

Answer: A

19. In completely inelastic collision

    A. The complete KE of the medium must

       lost

    B. The linear momentum of the system

       must remain conserved during collision

C. Both (the complete KE of the medium must lost) and (the linear momentum of the system must remain conserved during collision) are correct

D. Both (the complete KE of the medium must lost) and (the linear momentum of the system must remain conserved during collision) are incorrect

Answer: B

20. Number of particles is given by $n = -D\dfrac{n_2 - n_1}{x_2 - x_1}$ crossing a unit area perpendicular to X-axis in unit time, where n_1 and n_2 are number of particles per unit volume for the value of x meant to x_2 and x_1. Find dimensions of D called as diffusion constant

A. $\left[M^0LT^0\right]$

B. $\left[M^0L^2T^{-4}\right]$
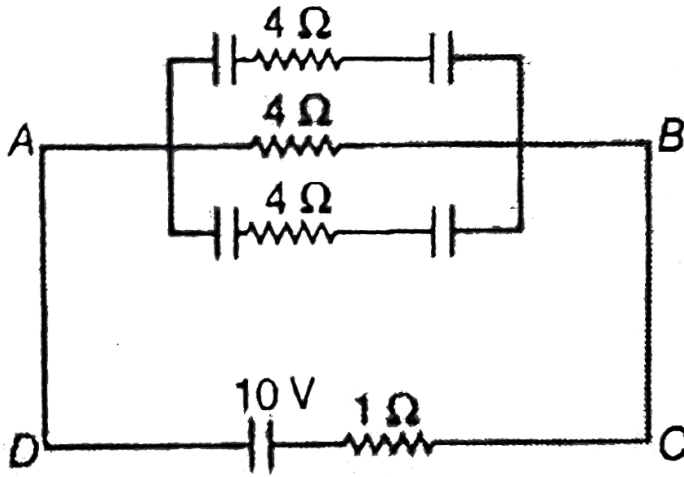
C. $\left[M^0LT^{-3}\right]$

D. $\left[M^0 L^2 T^{-1}\right]$

Answer: D

21. In the given circuit (as shown in figure), each capacitor has a capacity of $3\mu F$. What

will be the net charge on each capacitor ?

A. $48\mu C$
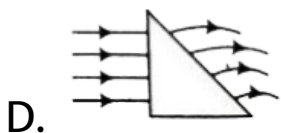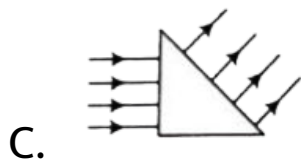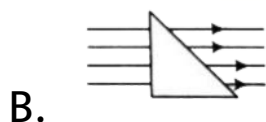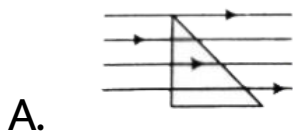
B. $24\mu C$

C. $12\mu C$

D. None of these

Answer: C

22. A solid conductor is placed in an uniform electric field as shown in figure. Which path will the lines of force follow?

A.

B.

C.

D.

Answer: C

23. A bomb at rest explodes into three parts of the same mass. The linear momentum of two parts are $-2p\hat{i}$ and $p\hat{j}$. The magnitude of momentum of third part is $p\sqrt{x}$. Find x.
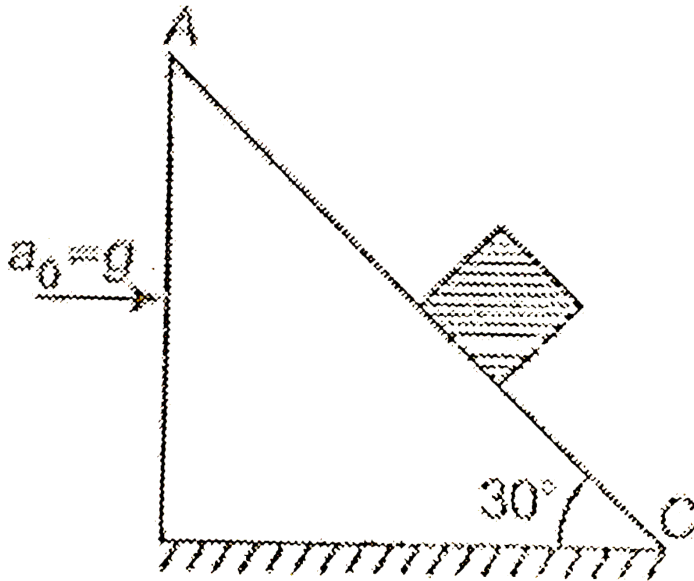
A. P

B. $\sqrt{5}P$

C. 2P

D. 10p

Answer: B

24. A block is placed on an inclined plane. The block is moving towards right horizontal with an acceleration $a_0 = g$. The length of the inclined plane (AC) is equal to 1 m. Whole the situation are shown in the figure. Assume that all the surfaces are frictionless. The time taken

by the block to reach from C to A is (Take, $g = 10m/s^2$)

A. 0.74 s

B. 0.9 s

C. 0.52 s

D. 1.24 s

Answer: A

25. Pseudo force is

    A. Electromagnetic in nature

    B. A nuclear force

    C. A gravitational force

    D. None of the above

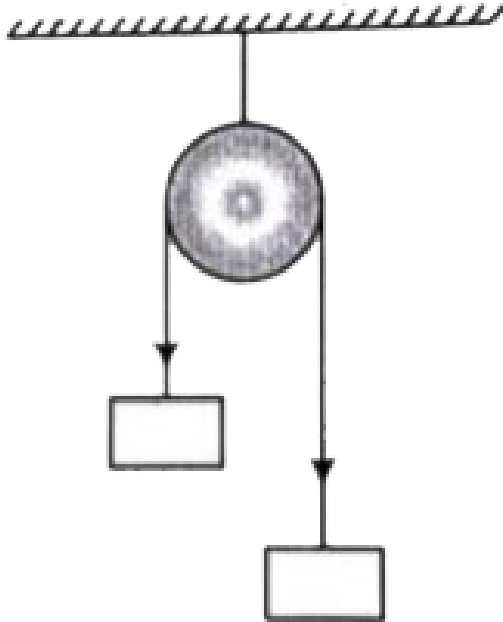**Answer: D**

26. A light in extensible string that goes over a smooth fixed pulley as shown in the figure connect two blocks of masses $0.36kg$ and $0.72kg$. Taking $g = 10m/s^2$. Find the work done by string on the block of mass $0.36kg$ during the first second after the

system is released from rest.

A. 4J

B. 2J

C. 8J

D. 10J

Answer: C

27. In the formula $X = 3YZ^2$, X and Z have dimensions of capacitance and magnetic induction respectively . When are the dimensions of Y in MLTQ system ?

A. $\left[M^{-3}L^{-2}T^{-2}Q^{-4}\right]$

B. $\left[ML^{-2}\right]$

C. $\left[M^{-3}L^{-2}Q^4T^8\right]$

D. $\left[M^{-3}L^{-2}Q^4T^4\right]$

Answer: D

28. Infinite number of masses, each of $1kg$, are placed along the x-axis at $x = \pm 1m, \ \pm 2m, \ \pm 4m, \ \pm 8m, \ \pm 16m..$

The gravitational of the resultant gravitational potential in term of gravitaitonal constant G at the origin $(x = 0)$ is

A. $\dfrac{G}{2}$

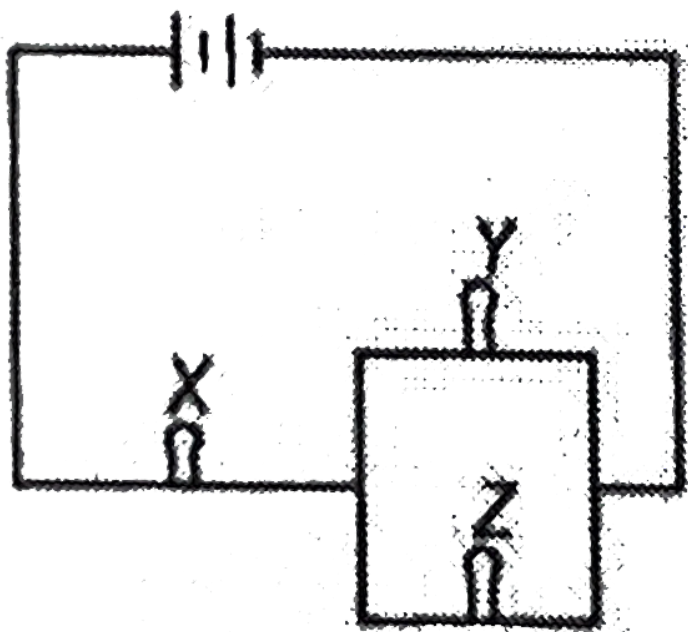B. G

C. 2G

D. 4G

Answer: C

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29. Three bulbs X, Y and Z are connected as shown in figure. The bulbs Y and Z are

identical. If bulb Z gets fused, then

A. Both X and Y will glow more brightly

B. Both X and Y will glow less brightly

C. X will glow less brightly and Y will glow

more brightly

D. X will glow more brightly and Y will glow

less brightly

Answer: C

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30. Active state of n-p-n transistor, in circuit is

achieved by

A. Low input voltage

B. High input voltage

C. Both (low input voltage) and (high input voltage)

D. Neither (low input voltage) nor (high input voltage)

Answer: D

31. A turntable of radius R=10 m is rotation making 98 rev in 10 s with a boy of mass m=60 kg standing at its centre. He starts running along a radius. Find the frequency of the turntable when the boy is 4m from the centre. The moment of inertia of the turntable about its axis $1000kg - m^2$.

    A. 10 Hz

    B. 2.5 Hz

    C. 5 Hz

D. 4Hz

Answer: C

32. To transmit a signal, if height of transmitting signal above surface of the earth is H, this signal can be received on surface of the earth upto distance from transmitter. Then
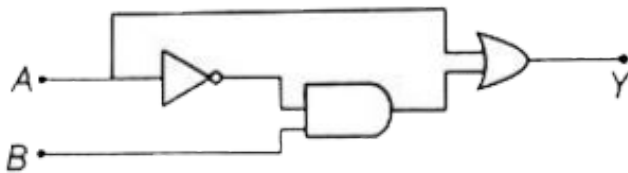
A. $d \propto H$

B. $d \propto H^2$

C. $d \propto H^{\frac{1}{2}}$

D. $d \propto H^{\frac{3}{2}}$

Answer: C

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33. The circuit is equivalent to

A. AND gate

B. OR gate

C. Not gate

D. None of these

Answer: B

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34. Length of 20 cm (exact) long pipe is measured by two instruments and reported as 19.65 cm and 20.1 cm

A. 19.65 cm is more accurate

B. Both measurements are equally precise

C. Both measurements are equally accurate

D. 20.1 cm is less precise

Answer: D

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35. An electric pump on the ground floor of a building takes 10 min to fill a tank of volume 2000 L with water. If the tank is 40 m above

the ground and the efficiency of the pump is 40%, how much electric power is consumed by the pump in filling the tank?

Take $g = 10m/s^2$

A. 2 kW

B. 3.33 kW

C. 4 kW

D. 6 kW

Answer: B

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36. A vessel containing 1 mole of O_2 gas (molar mass 32) at tempeature T. The pressure of the gas is P.An identical vessel containing onle mole of He gas (molar mass 4) at temperature 2 T has a pressure of [2013]

A. $\dfrac{p}{8}$

B. p

C. 2p

D. $8p$

Answer: C

37. The temperature of an ideal gas is increased from $27°C \rightarrow 127°C,$ the percentage increase in V_{rms} is [2013]

A. 37 %

B. 11 %

C. 33 %

D. 15.5 %

Answer: D

38. A particle of mass m=5g is executing simple harmonic motion with an amplitude 0.3 m and time period $\dfrac{\pi}{2}$ sec. The maximum value of force acting on the particle is

A. 5 N

B. 4 N

C. 0.5 N

D. 0.15 N

Answer: D

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39. A partition wall has two layers of different

materials A and B in contact with each other.

They have the same thickness but the thermal

conductivity of layer A is twice that of layer B.

At steady state the temperature difference

across the layer B is 50 K, then the corresponding difference across the layer A is

A. 50 k

B. 12.5 k

C. 25 k

D. 60 k

Answer: C

40. Pulse rate of a noumal person is 75 per minute. The time period of heart is

A. $0.8s$

B. 0.75 s

C. 1.25 s

D. 1.75 s

Answer: A