PHYSICS

RESONANCE ENGLISH

PART TEST 2

Exercise

1. The pressure P, volume V and temperature T of a gas in the jar A and the othere gas in the jar B at pressure 2P, volume V/4 and temperature 2T, then the ratio of the number of molecules in the jar A and B will be :

A. $4:1$

B. $2:1$

C. $1:4$

D. $1:1$

Answer: A

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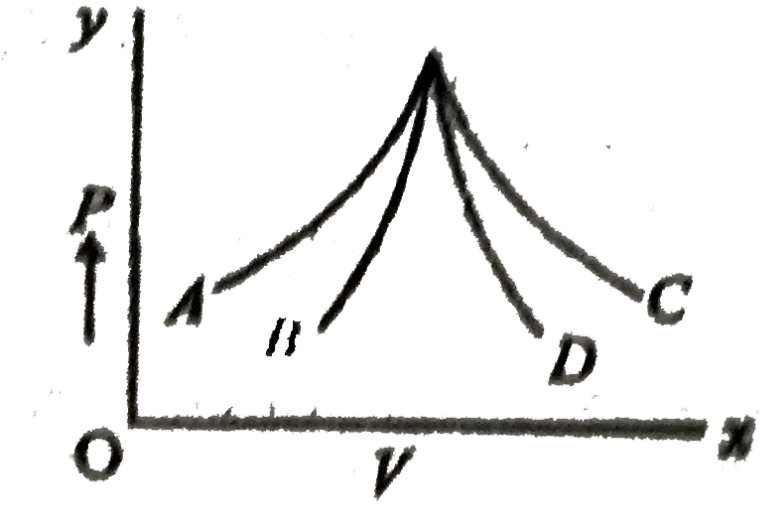
2. Figure shows four PV diagrams. Which of these curves represent isothermal and adiabatic processes?



A. C and D

B. A and C

C. A and B

D. B and D

Answer: A

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3. An ideal gas with adiabatic exponent $(\gamma = 1.5)$ undergoes a process in which work done by the gas is same as increase in internal energy of the gas. Here R is gas constant. The molar heat capacity C of gas for the process is:

A. C=4R

B. C=0

C. C=2R

D. C=R

Answer: A

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4. In internal combustion petrol/diesel engines, only cyclic processes are used, because:

A. Cyclic process have more efficiency as compared to non-cyclic process

B. Cyclic process can provide the work continuously

C. in the cyclic proces, heat loss is relatively less

D. in cyclic process process fuel consumption is less than that for non-cyclic process

Answer: B

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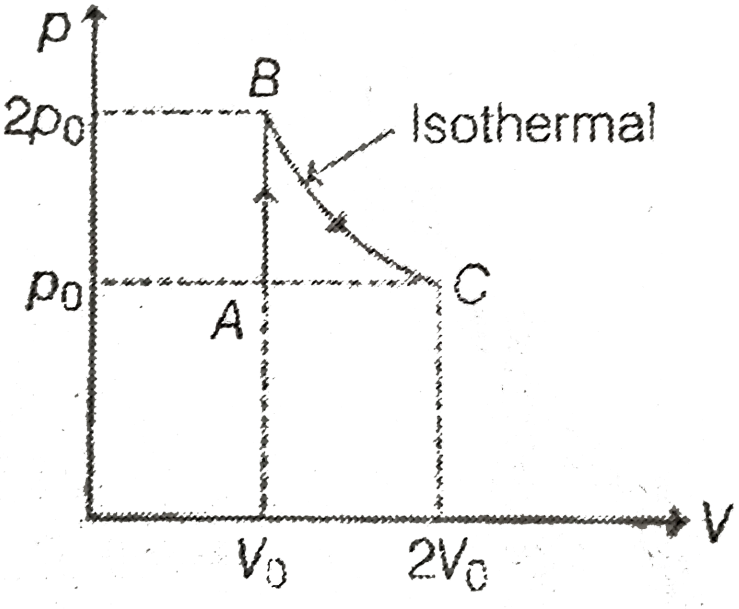
5. A diatomic ideal gas undergoes a thermodynamic change according to the P-V diagram shown in the figure. Tha total heat given to the gas is nearly (use ln 2 = 0.7)



A. $2.5P_0V_0$

B. $1.4P_0V_0$

C. $3.9P_0V_0$

D. $1.1P_0V_0$

Answer: C

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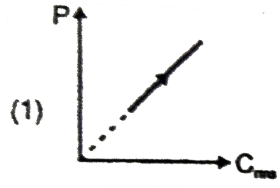
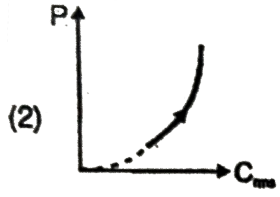
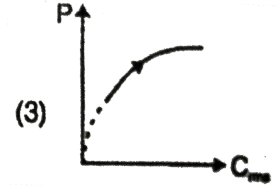
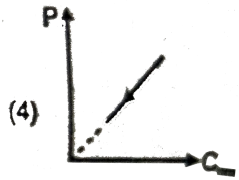
6. In a closed rigid container an ideal gas is filled. If the gas is heated, the graph of pressure (P) v/s root mean square speed (rms) will be :

A. 

B. 

C. 

D. 

Answer: B

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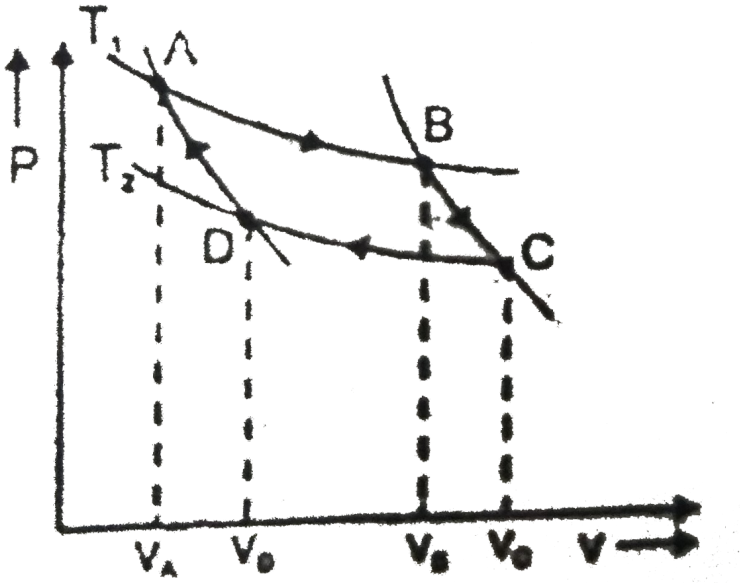
7. An ideal gas undergoes a process consisting of adiabatic and isothermal process only as shown in the figure. Then :



A. $T_1 < T_2$

B. $V_A V_C = V_B V_D$

C. work done by the gas in process will be negative

D. efficiency $= \dfrac{W_{AB} + W_{BC}}{Q_{AB}}$

Answer: B

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8. A vessel is partly filled with liquid. When the vessel is cooled to a lower temperature, the space in the vessel unoccupied by the liquid remains constant. Then the volume of the liquid (V_L), volume of the vessel (V_V) the coefficient of cubical expansion of the material of the vessel (γ_V) and of the liquid (γ_L) are related as :

A. $\gamma_L > \gamma_v$

B. $\gamma_L < \gamma_v$

C. $\frac{\gamma_v}{\gamma_L} = V_C / V_L$

D. $\frac{\gamma_v}{\gamma_L} = V_L / V_C$

Answer: A

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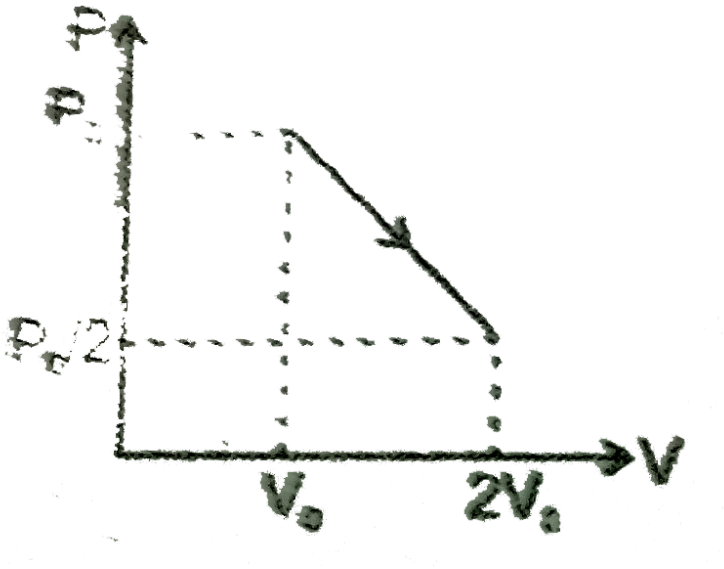
9. An ideal monatomic gas is at P_0, V_0. It is taken to final volume $2V_0$ when pressure is $P_0/2$ in a process which is straight line on $P-V$ diagram. Then



A. The final temperature is greater than initial temperature

B. internal energy increases

C. the work doen by the gas is $+\frac{P_0V_0}{4}$

D. The heat is absorbed in the process

Answer: D

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10. The value of $\gamma = \frac{C_p}{C_v}$ for a gaseous mixture consisting of 2.0 moles of oxygen and 3.0 moles of helium. The gases are assumed to be ideal.

A. $\frac{7}{5}$

B. $\frac{29}{19}$

C. $\frac{23}{19}$

D. $\frac{25}{19}$

Answer: B

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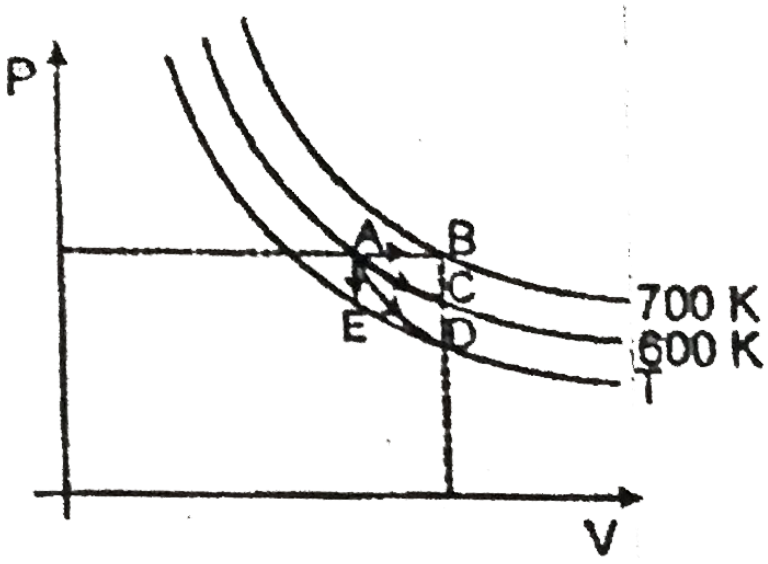
11. For an ideal gas four processes are marked as 1,2,3 and 4 on P-V diagram as shown in figure. The amount of heat supplied to the gas in the process 1,2,3 and 4 are Q_1, Q_2, Q_3 and Q_4 respectively, then correct order of heat supplied to the gas is : [AB is process-1, AC is process-2, AD

is adiabatic process-3 and AE is process-4]



A. $Q_1 > Q_2 > Q_3 > Q_4$

B. $Q_1 < Q_2 < Q_3 < Q_4$

C. $Q_1 > Q_2 > Q_4 > Q_3$

D. $Q_1 > Q_4 > Q_2 > Q_3$

Answer: A

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12. A circular hole is made in a plate. The plate is now heated. Which of the following statements is/are correct?

A. radius of the hole starts to decreases

B. no stress is developed in the material of plate

C. volume of the plate material will decreases

D. none of these

Answer: B

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13. At pressure P and absolute temperature T a mass M of an ideal gas fills a closed container of volume V. An additional mass 2M of the same gas is added into the container and the volume is then reduced to $\frac{V}{3}$ and the temperature to $\frac{T}{3}$. The pressure of the gas will now be:

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

B. P

C. 3P

D. 9P

Answer: C

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14. Two identical rooms in a perfectly insulated house are connected by an open doorway. The temperature in the two rooms are maintained at different values. The room which contains more air molecules is :

A. the one with higher temperature

B. the one with lower temperature

C. the one with higher pressure

D. neither since both have same volume

Answer: B

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15. The molar heat capacity of oxygen gas at STP is nearly 2.5R. As the temperature is increased, it gradually increases and approaches 3.5 R. The most appropriate reason for this behaviour is that at high temperature

A. oxygen does not behave as an ideal gas

B. oxygen molecules dissociate in atoms

C. the molecules collides more frequently

D. molecular vibration gradually becomes effective

Answer: D

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16. An ideal gas heat engine operates in a Carnot cycle between $227^\circ C$ and $127^\circ C$. It absorbs 6 kcal at the higher temperature. The amount of heat (in kcal)converted into work is eqal to

A. 1.6

B. 1.2

C. 4.8

D. 3.5

Answer: B

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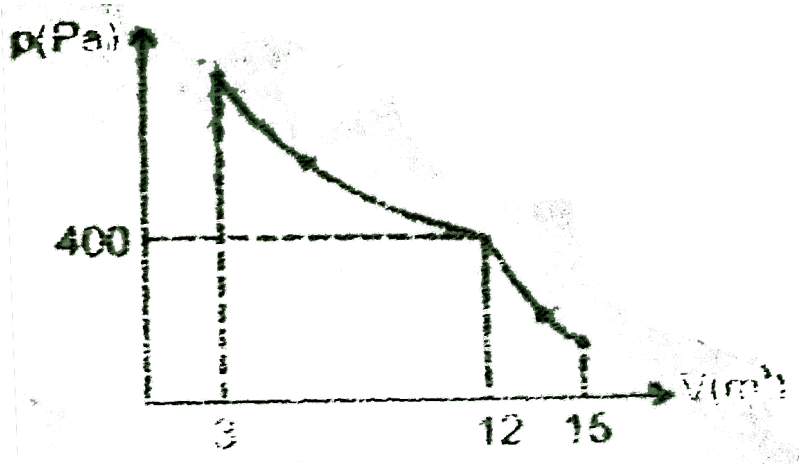
17. Curve in the figure shows an adiabatic compression of an ideal gas from $15m^3 \rightarrow$ 12 m^(3) , $followedbyanisothermlacompression \rightarrow af \in alvolumeof$ 3.0 m^(3). $Thereare$2.0 "moles" $ofthegas. Totalheat \supset plied \rightarrow thegasisequal \rightarrow$: (ln2 = 0.693)`



A. 4521 J

B. $-4521J$

C. $-6653J$

D. $-8476J$

Answer: C

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18. If there are no heat losses , the heat released by the condensation of x gram of steam at $100^\circ C$ into the water at $100^\circ C$ can be used to convert y gram of ice at $0^\circ C$ into the water at $100^\circ C$. Then the ratio of y : x is nearly

A. $1:1$

B. $2:1$

C. $3:1$

D. $2.5:1$

Answer: C

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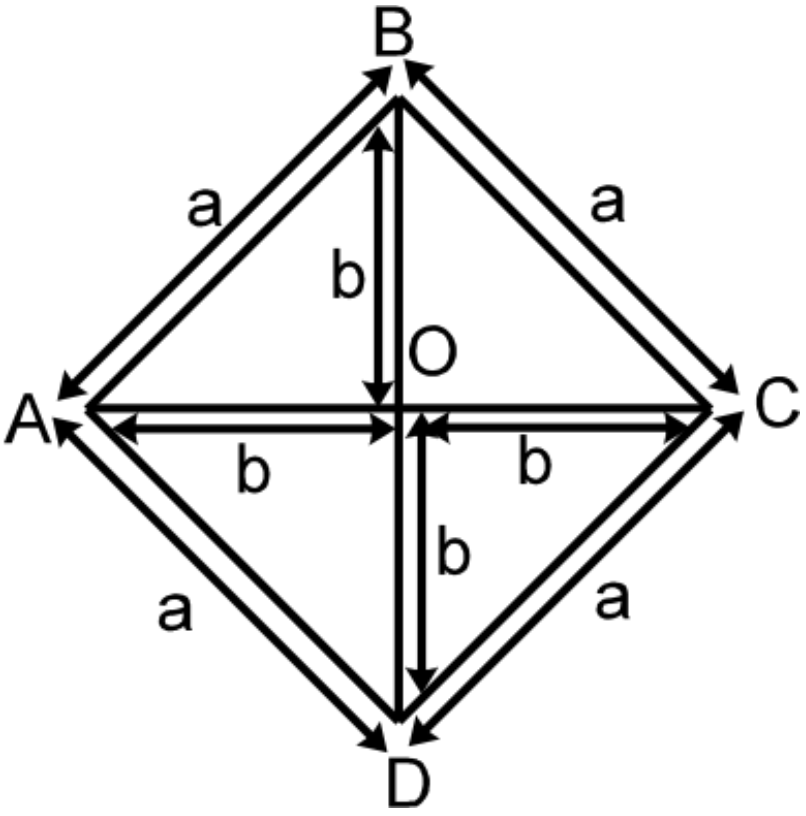

19.

All the rods have same conductance K and same area of cross section A. if ends A and C are maintained at temperature $2T_0$ and T_0 respectively then which of the following is/are correct

A. Rate of heat flow through ABC, AOC and ADC is same

B. Rate of heat flow through BO and OD is not same

C. Total Rate of flow from A to C $\frac{3KAT_0}{2a}$

D. Temperature at junction B,O and D are same

Answer: D

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20. A conducting container containing an ideal gas (He) is kept in ice-water mixture for long time. Now the piston is suddenly moved up so that its volume becomes eight times. Final temperature of gas will be:

A. 273 K

B. $\frac{273}{2}K$

C. $\frac{273}{4}K$

D. $\frac{273}{32}K$

Answer: C

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21. One litre of helium gas at a pressure $76cm.$ Of Hg and temperature $27^\circ C$ is heated till its pressure and volume are double. The final temperature attained by the gas is:

A. $327^\circ C$

B. $927^\circ C$

C. $1027^\circ C$

D. $827^\circ C$

Answer: B

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22. $4gm$ of steam at $100^\circ C$ is added to $20gm$ of water at $46^\circ C$ in a container of negligible mass. Assuming no heat is lost to surrounding, the mass of water in container at thermal equilibrium is. Latent heat of vaporisation $= 540cal/gm$. Specific heat of water $= 1cal/gm - ^\circ C$.

A. 18 gm

B. 20 gm

C. 22 gm

D. 24 gm

Answer: C

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23. Two elastic rods are joined between fixed supports as shown in figure. Condition for no change in the lengths of individual rods with the increase of temperature $(\alpha_1, \alpha_2$ linear expansion coefficient, A_1, A_2 =area of rods, Y_1, Y_2 =Young's modulus) is:

A. $\frac{A_1}{A_2} = \frac{\alpha_1 Y_1}{\alpha_2 Y_2}$

B. $\frac{A_1}{A_2} = \frac{L_1 \alpha_1 Y_1}{L_2 \alpha_2 Y_2}$

C. $\frac{A_1}{A_2} = \frac{L_2 \alpha_2 Y_2}{L_1 \alpha_1 Y_1}$

D. $\frac{A_1}{A_2} = \frac{\alpha_2 Y_2}{\alpha_1 Y_1}$

Answer: D

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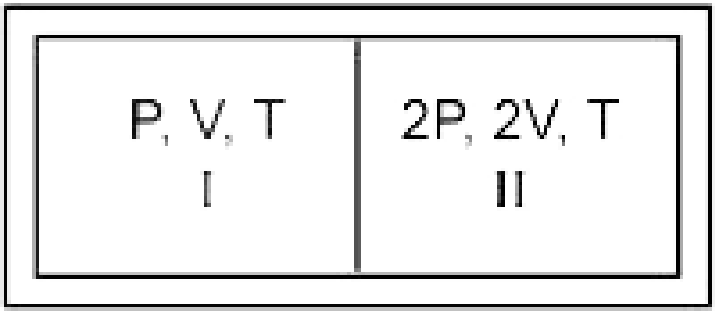
24. A partition divides a container having insulated walls into two compartments I and II. The same gas fills the two compartments whose initial parameters are given. The partition is a conducting wall which can move freely without friction. Which of the following statements is/are correct, with reference to the final equilibrium position?



A. The pressure in the two compartments are unequal.

B. Volume of compartment I is $\frac{2V}{5}$

C. Volume of compartment II is $\frac{12V}{5}$

D. Final pressure in compartment I is $\frac{4P}{4}$

Answer: C

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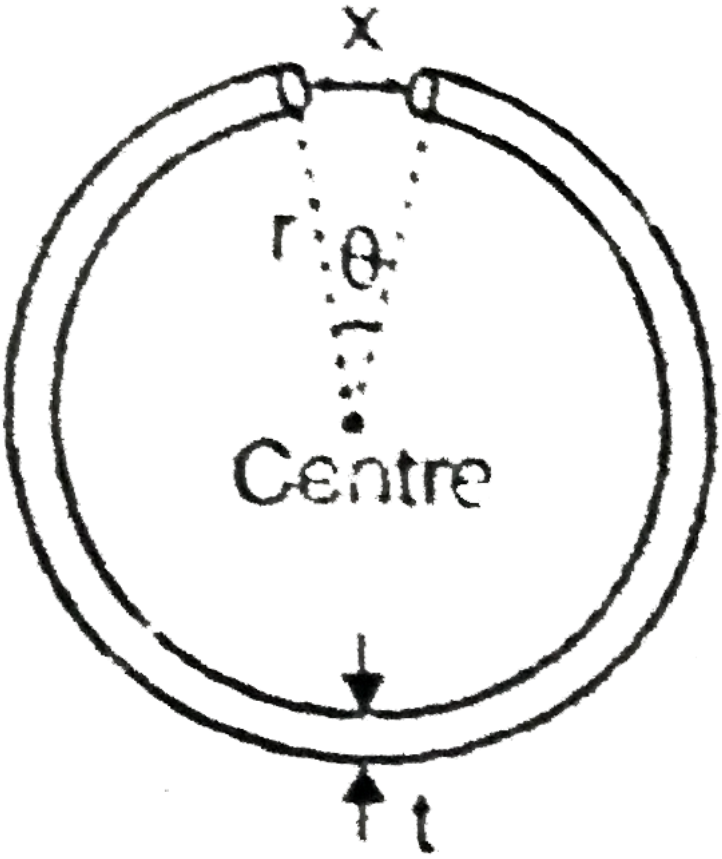
25. A uniform metallic object of circular shape which is free to expand in every direction is shown in figure. The

parameter which will not increase on hearing the object is:



A. x(gap)

B. r(radius of circle)

C. θ(angle formed at centre)

D. t(thickness)

Answer: C

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26. If the piston is moved so as to reduce the volume of gas by half keeping the temperature of gas constant, we know from the gas law that the pressure will be doubled. On microscopic level the increase in pressure on the piston is because

A. momentum change per collision is doubled while the frequency of collision remains constant

B. momentum change per collision remains constant while

the frequency of collision is doubled

C. momentum change per collision and the frquency of collision both are increased

D. none of these two physical quantities are changed. It is due to some other reason.

A. momentum change per collision is doubled while the frequency of collision remains constant

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D. none of these two physical quantities are changed. It is due to some other reason.

Answer: B

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27. Two rods of same length and areas of cross section A_1 and A_2 have their ends at same temperature. If K_1 and K_2 are their thermal conductivities, C_1 and C_2 their specific heats and ρ_1 and ρ_2 are their densities, then the condition that rate of flow of heat is same in both the rods is

A. $A_1 / A_2 = K_1 / K_2$

B. $A_1 / A_2 = K_1 C_1 \rho_1 / K_2 C_2 \rho_2$

C. $A_1 / A_2 = K_2 C_1 \rho_1 / K_1 C_2 \rho_2$

D. $A_1 / A_2 = K_2 / K_1$

Answer: D

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28. A rod of length l and cross-sectional area A has a variable conductivity given by $K = \alpha T$,where α is a positive constant and T is temperatures in Kelvin. Two ends of the rod are maintained at temperatures T_1 and $T_2(T_1 > T_2)$. Heat current flowing through the rod will be :

A. $\frac{A\alpha\left(T_1^2 - T_2^2\right)}{l}$

B. $\frac{A\alpha\left(T_1^2 - T_2^2\right)}{l}$

C. $\frac{A\alpha\left(T_1^2 + T_2^2\right)}{3l}$

D. $\frac{A\alpha\left(T_1^2 - T_2^2\right)}{2l}$

Answer: D

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29. A Carnot engine takes $3 \times 10^6 cal.$ of heat from a reservoir at $627^\circ C$, and gives it to a sink at $27^\circ C$. The work done by the engine is

A. $4.2 \times 10^6 J$

B. $8.4 \times 10^6 J$

C. $16.8 \times 10^6 J$

D. zero

Answer: D

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30. Statement 1: A gas has a unique value of specific heat.

Statement 2: Specific heat is defined as the amount of heat required to raise the temperature of unit mass of the substance through unit degree.

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