Physicsaholics

DPP – 3 (KTG)

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Q 1. A gas mixture consists of 2 moles of oxygen and 4 moles of argon at temperature T. Neglecting all vibrational modes, the total internal energy of the system is:
(a) 4 R T (b) 5 R T
(c) 15 R T (d) 11 R T

Q 2. The molecules of an ideal gas have 6 degrees of freedom. The temperature of the gas is T. The average translational kinetic energy of its molecules is:
(a) $\frac{3}{2}$k T (b) $\frac{6}{2}$ k T
(c) k T (d) $\frac{1}{2}$ k T

Q 3. The average translational kinetic energy of O_2 (molar mass 32) molecules at a particular temperature is 0.048 eV. The translational kinetic energy of N_2 (molar mass 28) molecules in eV at the same temperature is –
(a) 0.0015 (b) 0.003
(c) 0.048 (d) 0.768

Q 4. A gas sample is enclosed in a closed container, temperature of gas is continuously increasing. Match the correct options in column-ll corresponding to column-l

Column I		Column II
(a)Internal energy of gas	(P)	Increases
(b)Average momentum of gas molecules	(q)	Decreases
(c)Number of molecules moving with most probable speed	(r)	Zero
(d) $\frac{V_{avg}}{V_{rms}}$	(s)	Remains constant

Q 5. Temperature of an ideal gas is 300 K. The change in temperature of the gas when its volume changes from V to 2V in the process P = aV (Here, a is a positive constant) is:
(a) 900 K (b)1200 K
(c) 600 K (d) 300 K

Q 6. In the ρ-T graph shown in figure, match the following:

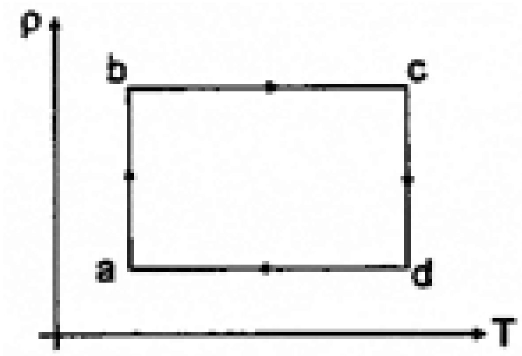

Table-1		Table-2	
(a)	Process a-b	(p)	Constant volume
(b)	Process b-c	(q)	$\Delta U = 0$
(c)	Process c-d	(r)	P increasing
(d)	Process d-a	(s)	P decreasing

Q 7. One mole of an ideal gas undergoes a process $P = \frac{P_0}{1+\left(\frac{V_0}{V}\right)^2}$. Here, P_0 and V_0 are constants. Change in temperature of the gas when volume is changed from $V = V_0$ to $V = 2V_0$ is:

(a) $-\frac{2P_0V_0}{5R}$ (b) $\frac{11P_0V_0}{10R}$ (c) $-\frac{5P_0V_0}{4R}$ (d) P_0V_0

Q 8. Two containers of equal volume contain the same gas at pressures p_1 and p_2 and absolute temperatures T_1 and T_2 respectively. On joining the vessels, the gas reaches a common pressure p and a common temperature T. The ratio P/T is equal to

(a) $\frac{p_1}{T_1}+\frac{p_2}{T_2}$ (b) $\frac{1}{2}\left[\frac{p_1}{T_1}+\frac{p_2}{T_2}\right]$

(c) $\frac{p_1T_2+p_2T_1}{T_1+T_2}$ (d) $\frac{p_1T_2-p_2T_1}{T_1-T_2}$

Q 9. What is the ratio of pressures on the left and right sides?

(a) p_2T_2/p_1T_1 (b) p_1T_2/p_2T_1

(c) $\frac{p_1+p_2}{T_1+T_2}$ (d) $\frac{p_1T_1}{p_2T_2}$

Q 10. What is the final equilibrium temperature?

(a) $\frac{T_1T_2(p_1+p_2)}{p_1T_2+p_2T_1}$ (b) $\frac{p_1p_2(T_1+T_2)}{p_1T_2+p_2T_1}$

(c) $\frac{T_1T_2(p_1+p_2)}{p_1T_1+p_2T_2}$ (d) $\frac{T_1^2p_2^2}{p_1T_2+p_2T_1}$

Answer Key

Q.1 d	Q.2 a	Q.3 c	Q.4 a(p) , b(r, s) , c(q) , d(s)	Q.5 a
Q.6 a(q, r) , b(p, r) , c(q, s) , d(p, s)	Q.7 b	Q.8 b	Q.9 b	Q.10 a