Gaseous State

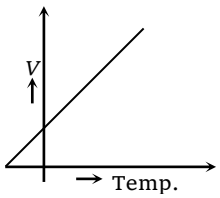
SET Self Evaluation Test - 6

1. Same mass of CH_4 and H_2 is taken in container. The partial pressure caused by H_2 is **[IIT 1989; CPMT 1996]**

(a) 8 / 9 (b) 1 / 9

(c) 1 / 2 (d) 1

2. The following graph illustrates **[JIPMER 2000]**



(a) Dalton's law (b) Charle's law

(c) Boyle's law (d) Gay-Lussac's law

3. If the pressure and absolute temperature of 2 *litres* of CO_2 are doubled, the volume of CO_2 would become **[CBSE PMT 1991]**

(a) 2 *litres* (b) 4 *litres*

(c) 5 *litres* (d) 7 *litres*

4. What is kinetic energy of $1g$ of O_2 at 47^oC **[Orissa JEE 2004]**

(a) $1.24 \times 10^2 J$ (b) $2.24 \times 10^2 J$

(c) $1.24 \times 10^3 J$ (d) $3.24 \times 10^2 J$

5. The root mean square speeds at STP for the gases H_2, N_2, O_2 and *HBr* are in the order **[Pb. CET 1994; CBSE PMT 1991]**

(a) $H_2 < N_2 < O_2 < HBr$

(b) $HBr < O_2 < N_2 < H_2$

(c) $H_2 < N_2 = O_2 < HBr$

(d) $HBr < O_2 < H_2 < N_2$

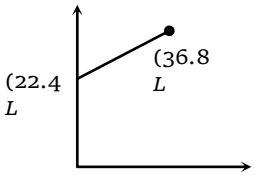
6. By what ratio the average velocity of the molecule in gas change when the temperature is raised from 50 to 200^oC **[DCE 2003]**

(a) 1.21 / 1 (b) 1.46 / 1

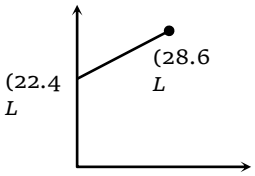
(c) 1.14 / 1 (d) 4 / 1

7. Which of the following volume (V) – temperature (T) plots represents the behaviour of one mole of an ideal gas at one atmospheric pressure **[IIT Screening 200**

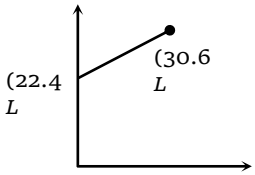
(a)



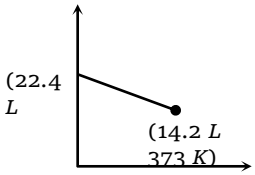
(b)



(c)



(d)



8. If the average velocity of N_2 molecule is $0.3 m/s$ at 27^oC, then the velocity will be $0.6 m/s$ at **[Pb. CET 2001]**

(a) $1200\ K$ (b) $600\ K$

(c) $400\ K$ (d) $1800\ K$

9. Equal volumes of two gases which do not react together are enclosed in separate vessels. Their pressures at 100 *mm* and 400 *mm* respectively. If the two vessels are joined together, then what will be the pressure of the resulting mixture (temperature remaining constant) **[CBSE PMT 1981]**

(a) 125 *mm* (b) 500 *mm*

(c) 1000 *mm* (d) 250 *mm*

10. A gas of volume 100 *cc* is kept in a vessel at pressure 10^4 *Pa* maintained at temperature 24^oC. If now the pressure is increased to 10^5 *Pa*, keeping the temperature constant, then the volume of the gas becomes **[AFMC 1992]**

(a) 10 *cc* (b) 100 *cc*

(c) 1 *cc* (d) 1000 *cc*

11. If a gas is expanded at constant temperature **[IIT 1986]**

(a) The pressure increases

(b) The kinetic energy of the molecules remains the same

(c) The kinetic energy of the molecules decreases

(d) The number of molecules of the gas increases

12. The rate of diffusion of SO_2 and O_2 are in the ratio

[Assam JET 1991; EAMCET 1980]

(a) $1:\sqrt{2}$ (b) 1 : 32

(c) 1 : 2 (d) 1 : 4

Answers and Solutions

(SET -6)

1. (a) N_{CH4} = number of moles of $CH_4 = \frac{m}{16}$

N_{H2} = number of moles of $H_2 = \frac{m}{2}$

fraction partial pressure of H_2 is

$$H_2 = \frac{n_{H_2}}{n_{H_2}+n_{CH_4}} = \frac{\frac{m}{2}}{\frac{m}{2}+\frac{m}{16}} = \frac{\frac{m}{2}}{\frac{9m}{16}} = \frac{8}{9}$$

2. (b) According to Charle's Law $V \propto T$

$V_t = V_o + V_o \alpha t$

compare it with $Y = C + mx$

3. (a) $V2 = \frac{P_1V_1}{T_1}.\frac{T_2}{P_2} = \frac{P}{2P} \times 2lt \times \frac{2T}{T} = 2lt$

4. (a) K.E. $= \frac{3}{2}nRT = \frac{3}{2} \times \frac{1}{32} \times 8.314 \times 320\, J$.

$= 1.24 \times 10^2\, J$

5. (b) $V_{rms} \propto \frac{1}{\sqrt{m}}$

$U_{H_2} : U_{N_2} : U_{O_2} : U_{HBr} = \frac{1}{\sqrt{2}} : \frac{1}{\sqrt{20}} : \frac{1}{\sqrt{32}} : \frac{1}{\sqrt{81}}$ is

$U_{HB_r} < U_{O_2} < U_{N_2} < U_{H_2}$

6. (c) $T_1 = 150 + 273 = 423\,K$; $T_2 = 50 + 273 = 323\,K$

Hence, $\frac{(V_{av})_1}{(V_{av})_2} = \sqrt{\frac{T_1}{T_2}} = \sqrt{\frac{423}{323}} = \frac{1.14}{1}$

7. (c) $\frac{V_1}{V_2} = \frac{T_1}{T_2} \therefore V_2 = V_1.\frac{T_2}{T_1} = \frac{22.4 \times 373}{273} = 30.6L$

8. (a) $V_{rms} = \sqrt{\frac{3RT}{M}}$; $V_{rms} = \sqrt{T}$

Given, $V_1 = V$, $T_1 = 300\,K$

$V_2 = 2V$, $T_2 = ?$

$= \frac{V_1}{V_2} = \sqrt{\frac{T_1}{T_2}} = \left(\frac{V}{2V}\right)^2 = \frac{300}{T_2}$

$T_2 = 300 \times 4 = 1200\,K$

9. (d) When two vessels are joined together, the volume will be doubled hence effective pressure will be halved

$P = \frac{P_1 + P_2}{2} = \frac{100 + 400}{2} = 250\,mm$

10. (a) $P_1V_1 = P_2V_2$ at constant T

$10^4.100 = 10^5 \times V_2$

$V_2 = 10\,cc$

11. (b) Kinetic energy will also remain constant if Temperature is constant.

12. (a) $\frac{r_{SO_2}}{r_{O_2}} = \sqrt{\frac{M_{O_2}}{M_{SO_2}}} = \sqrt{\frac{32}{64}} = \frac{1}{\sqrt{2}}$

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