1. The average, root mean square and most probable speeds of gas molecules at STP increase in the order
(A) Root mean square < average < most probable
(B) Most probable < root mean square < average velocity
(C) Average < most probable < root mean square
(D) Most probable < average < root mean square

2. Calculate the temperature at which the R.M.S. velocity of sulphur dioxide molecules is the same as that of oxygen at 300 K -
(A) 600°C (B) 600 K (C) 300 K (D) 300°C

3. Total kinetic energy of 14 grams of dinitrogen gas at 127°C is nearly :
(A) 4980 J (B) 25 J (C) 2490 J (D) 50 J

4. If the density of a gas sample is 4 g/L at pressure 1.2×10^5 Pa, the value of v_{rms} will be :
(A) 600 m/s (B) 300 m/s (C) 150 m/s (D) 450 m/s

5. The total KE of 1 mole a monoatomic ideal gas at 27°C is:
(A) 300 cal (B) 900 cal (C) 1800 cal (D) none of these

6. The average velocity of an ideal gas molecule at 27°C is 0.3 m/s. The average velocity at 927°C will be:
(A) 0.6 m/s (B) 0.8 m/s (C) 0.9 m/s (D) 3.0 m/s

7. Let the most probable velocity of hydrogen molecule at a temperature t°C is V_0. Suppose all the molecules dissociate into atoms when temp is raised to (2t + 273)ºC, then the new r.m.s velocity is -
(A) $\sqrt{2/3}\,V_0$ (B) $2V_0$ (C) $\sqrt{2/3}\,V_0$ (D) $\sqrt{6}\,V_0$

8. Collision diameter and collision cross section for molecules each having radius 'r' are respectively:
(A) πr^2, r (B) $4\pi r^2$, 2r (C) 2r, $4\pi r^2$ (D) r, πr^2

9. Correct expression for collision number and collison frequency would be given as
(A) $\sqrt{2}\pi\sigma^2 U_{avg} N^*, \frac{1}{\sqrt{2}}\pi\sigma^2 U_{avg} N^{*2}$ (B) $\pi\sigma^2 U_{avg} N^*, \frac{1}{\sqrt{2}}\pi\sigma^2 U_{avg} N^{*2}$
(C) $\sqrt{2}\pi\sigma^2 U_{avg} N^*, \frac{1}{\sqrt{2}}\pi\sigma^2 U_{avg} N^*$ (D) $\pi\sigma^2 U_{avg} N^*, \frac{1}{\sqrt{2}}\pi\sigma^2 U_{avg} N^*$

(σ ; collision diameter U_{avg} ; average speed of particles N^* ; number density)

10. Units of collision number & collision frequency respectively
(A) mol, mol sec^{-1} (B) sec^{-1}, sec^{-1} m^{-3}
(C) mol sec^{-1}, mol sec^{-1} m^3 (D) sec^{-1}, sec^{-1} m^3

Effusion and Diffusion

11. The rms velocity of hydrogen is $\sqrt{7}$ times the rms velocity of nitrogen. If T is the temperature of the gas, then :
(A) $T_{(H_2)} = T_{(N_2)}$ (B) $T_{(H_2)} > T_{(N_2)}$ (C) $T_{(H_2)} < T_{(N_2)}$ (D) $T_{(H_2)} = \sqrt{7}\,T_{(N_2)}$

12. The ratio of rates of diffusion of SO_2, O_2 and CH_4 under identical conditions is :
(A) 1 : $\sqrt{2}$: 2 (B) 1 : 2 : 4 (C) 2 : $\sqrt{2}$: 1 (D) 1 : 2 : $\sqrt{2}$

13. The molecular weight of a gas, which diffuse through a porous plug at 1/6th of the speed of hydrogen under identical conditions, is :

(A) 12 u (B) 72 u (C) 36 u (D) 24 u

14. The rate of diffusion of two gases A and B is in the ratio of 1 : 4 and that of B and C in the ratio of 1 : 3 the rate of diffusion of C with respect to A is -

(A) $\frac{1}{12}$ (B) 12 (C) 6 (D) 4

15. The rate of effusion of helium gas at a pressure of 1000 torr is 10 torr min-1. What will be the rate of effusion of hydrogen gas at a pressure of 2000 torr at the same temperature ?

(A) 20 torr min-1 (B) 40 torr min-1 (C) 20 $\sqrt{2}$ torr min-1 (D) 10 torr min-I

***16.** The time taken for effusion of 32 mL of oxygen gas will be the same as the time taken for effusion of which gas sample under identical conditions : (Take $\sqrt{2}$ = 1.4, $\sqrt{3}$ = 1.7)

(A) 64 mL H_2 (B) 50 mL N_2 (C) 44.8 mL CH_4 (D) 22.4 mL SO_2

17. A bottle of dry NH_3 & a bottle of dry HCl connected through a long tube are opened simultaneously under identical conditions at both ends. The white ammonium chloride ring first formed will be :

(A) at the centre of the tube (B) near the HCl bottle

(C) near the NH_3 bottle (D) throughout the length of tube

18. A straight glass tube has 2 inlets X & Y at the two ends of 200 cm long tube. HCl gas through inlet X and NH_3 gas through inlet Y are allowed to enter in the tube at the same time and white fumes form at a point P inside the tube. The distance of point P from X is :

(A) 118.9 cm (B) 81.1 cm (C) 91.1 cm (D) 108.9 cm

***19.** At room temperature, A_2 gas (vapour density = 40) and B_2 gas are allowed to diffuse through identical pinholes from opposite ends of a glass tube of 1m length and of uniform cross-section. The two gases first meet at a distance of 60 cm from the A_2 end. The molecular mass of B_2 gas is :

(A) 90 u (B) 180 u (C) 45 u (D) 35.5 u

20. A mixture containing 2 moles of He and 1 mole of CH_4 is taken in a closed container and made to effuse through a small orifice of container. Then, which is the correct effused volume percentage of He and CH_4 initially, respectively :

(A) 40%, 60% (B) 20%, 80% (C) 80%, 20% (D) 60%, 40%

21. A 4.0 dm^3 flask containing N_2 at 4.0 bar was connected to a 6.0 dm^3 flask containing helium at 6.0 bar, and the gases were allowed to mix isothermally. Then the total pressure of the resulting mixture will be

(A) 4.8 bar (B) 5.2 bar (C) 5.6 bar (D) 5.4 bar

ANSWER KEY

RACE # 33

1. (D) **2.** (B) **3.** (C) **4.** (B) **5.** (B) **6.** (A) **7.** (D) **8.** (C) **9.** (A) **10.** (B)
11. (C) **12.** (A) **13.** (B) **14.** (B) **15.** (C) ***16.** (C) **17.** (B) **18.** (B) ***19.** (B) **20.** (C)
21. (B)