NURTURE_(UNACADEMY) P-1_Akshay SIR (9-8-2020)

SCQ (1)

1. Calculate relative rate of effusion of O_2 to CH_4 through a container containing O_2 and CH_2 in 3 : 2 mass ratio. **[Ideal gas (E)]**
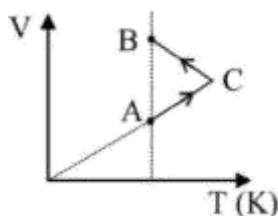
(A) $\dfrac{3\sqrt{2}}{4}$ (B) $\dfrac{3}{4\sqrt{2}}$ (C) $\dfrac{3}{2\sqrt{2}}$ (D) $\dfrac{2\sqrt{2}}{3}$

Ans. **(B)**

Sol. $\dfrac{r_{O_2}}{r_{CH_4}} = \dfrac{n_{O_2}}{n_{CH_4}} \times \sqrt{\dfrac{M_{CH_4}}{M_{O_2}}}$

$$= \dfrac{3}{2} \times \dfrac{16}{32} \times \sqrt{\dfrac{16}{32}} = \dfrac{3}{4\sqrt{2}}$$

MCQ (3Q)

2.

[Ideal gas (M)]

With reference to above graph, which of the following is/are incorrect.

(A) $P_A = P_B = P_C$ (B) Pressure first increases then decreases

(C) $P_C > P_A$ (D) $P_B < P_A$

Ans. **(A,B,C)**

Sol. $P_A = P_C$

$P_B < P_A$

3. A volume of 10 mL of a mixture of H_2 and O_2 is exploded. If the final volume becomes 1 mL, the composition of original mixture may be **[Concentration terms (M)]**

(A) 7mL H_2, 3 mL O_2 (B) 6mL H_2, 4mL O_2

(C) 5mL H_2, 5mL O_2 (D) 3mL H_2, 7mL O_2

Ans. **(A,B)**

**Sol.** $2H_2 + O_2 \longrightarrow 2H_2O$

Limiting reagent may be H_2 or O_2

4. A quantity of 12g of magnesium is burnt completely in air ($O_2 = 20\%$ and $N_2 = 80\%$, by volume). Which of the following is/are correct statement(s) regarding this combustion?
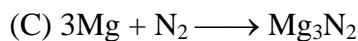
[MOLE CONCEPT (M)]

(A) A minimum of 36g air is needed if all Mg is converted into MgO only.

(B) A minimum of 40g air is needed if all Mg is converted into MgO only.

(C) A minimum of 4.67g air is needed if all Mg is converted into Mg_3N_2 only.

(D) A minimum of 6g air is needed if all Mg is converted into Mg_3N_2 only.

Ans. **(A,D)**

Sol. (A) $Mg + \dfrac{1}{2}O_2 \longrightarrow MgO$
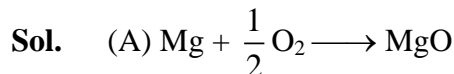
$\dfrac{1}{2}$ mole $\quad \dfrac{1}{4} \times 32 = 8g$

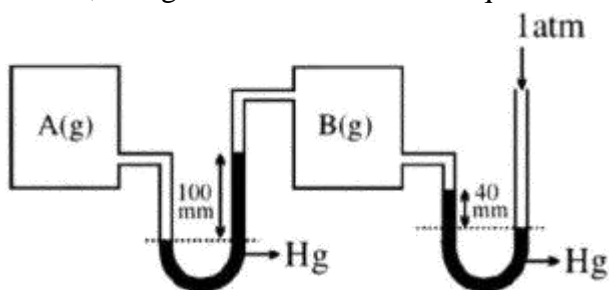$\therefore$ Mass of air needed = $8 + 1 \times 28 = 36$ g

(C) $3Mg + N_2 \longrightarrow Mg_3N_2$

$\dfrac{1}{2}$ mole $\quad \dfrac{1}{6}$ mole

$\therefore$ Mass of air needed = $\dfrac{1}{6} \times 28 + \dfrac{1}{24} \times 32 = 6g$

INTEGER (2Q)

5. At 300, two gasses are filled in two equal sized containers as given. **[Ideal gas (Tough)]**

What will be the pressure of A(g) (in mm of Hg).

Ans. **(820.00)**

Sol. $P_A + P_B + 100$

$P_B = P_{atm} - 40$

$P_B = 720$

6. A quantity of 50 g of water is saturated with HCl gas to get 75 mL of solution containing 40 % HCl by mass. What is the density of solution (in gm/mL) formed : **[Concentration terms (M)]**

Ans. **(1.11)**

Sol. $(75 \times d) \times \dfrac{60}{100} = 50 \Rightarrow d = 1.11$ g/mL