

**IB Chemistry HL Notes**

# **Stoichiometry**

Isaac D. Lim

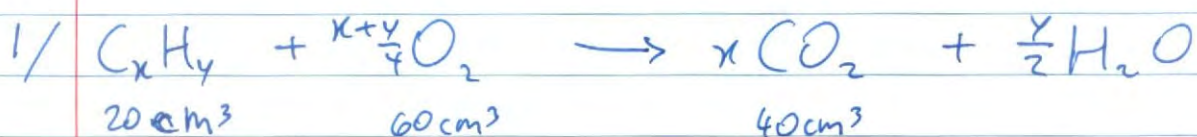
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For any queries, please contact the author at [isaacimdc@gmail.com](mailto:isaacimdc@gmail.com).

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## GAS VOLUME CALCULATIONS



$$\text{coeff. of } O_2 = 2x + \frac{y}{2} = \frac{4x+y}{2} = x + \frac{y}{4}$$

Because  $20\text{cm}^3 C_xH_y \rightarrow 40\text{cm}^3 CO_2$   
then coeff.  $x = 2$

Because  $20\text{cm}^3 C_xH_y$  reacts with  $60\text{cm}^3 O_2$   
then  $x + \frac{y}{4} = 3$   
 $2 + \frac{y}{4} = 3$   
 $\frac{y}{4} = 1$   
 $y = 4$

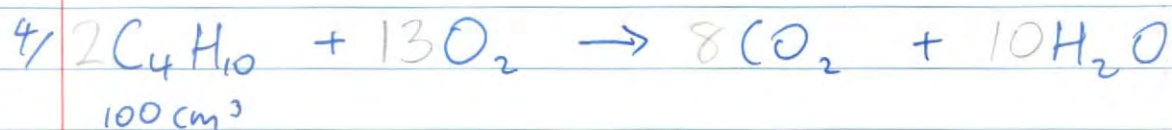
$\therefore$  hydrocarbon gas is  $C_2H_4$  (ethane).

2/ At s.t.p., 1 mole  $C_3H_8 = 22.4 \text{ dm}^3$  volume  
so  $\frac{1}{3}$  mole  $C_3H_8 = \frac{22.4}{3} = 7.47 \text{ dm}^3 = \text{L}$ .

3/  $M_r$  of  $C_2H_4 = 28 \text{ g mol}^{-1}$   
so no. of moles  $C_2H_4 = \frac{12}{28} = 0.43$  moles

By Avogadro's law, no. of moles  $C_3H_6 = C_2H_4 = 0.43$  moles

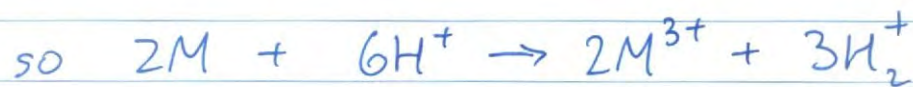
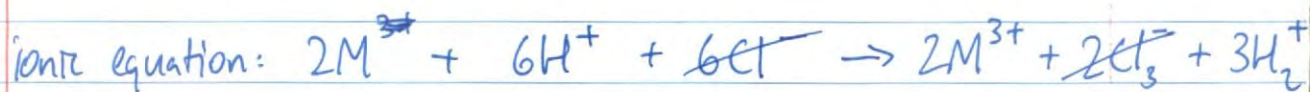
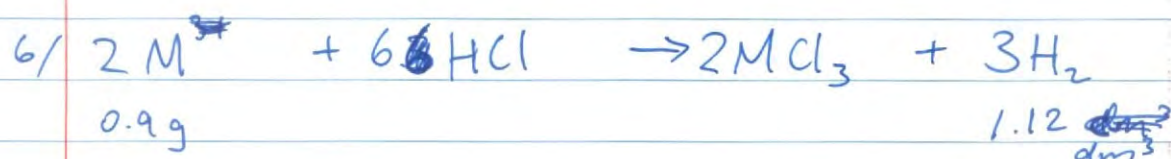
$\therefore$  mass of  $C_3H_6 = (0.43)(42) = 18.06 \text{ g}$



$$\begin{aligned} \text{volume of } \text{O}_2 \text{ required} &= \frac{100}{2} \times 13 \\ &= 650 \text{ cm}^3 \text{ O}_2 \parallel \end{aligned}$$

$$\begin{aligned} 5/ \quad \text{N} &= 7\text{g} & \text{O} &= 20\text{g} \\ \% \text{N} &= 25.9\% & \% \text{O} &= 74.1\% \\ \text{Mole fraction: } \text{N} &= 1.85 & \text{O} &= 4.63 \\ \text{Mole ratio} &= \text{N} = 1 & : & \text{O} = 2.5 \\ &= 2 & : & 5 \end{aligned}$$

$\therefore$  empirical formula is  $\text{N}_2\text{O}_5 \parallel$



$$\text{no. of moles H}_2 \text{ liberated} = \frac{1.12 \text{ dm}^3}{22.4} = 0.05 \text{ moles}$$

$$\text{so no. of moles M} = \frac{2}{3} \times 0.05 = 0.033 \text{ moles}$$

$$\therefore \text{Mr of M} = \frac{0.9}{0.033} = 27.3 \text{ g mol}^{-1}$$

$\therefore$  element M is Aluminium (Al)  $\parallel$