

Station # 1

$$\begin{aligned} \text{a) } M_{(\text{NH}_4)_2\text{SO}_4} &= 2(14.007) + 8(1.008) + 32.065 + 4(15.999) \\ &= 132.139 \frac{\text{g}}{\text{mol}} \end{aligned}$$

$$\begin{aligned} \text{b) } M_{\text{Ca}_3[\text{Co}(\text{CO}_3)_3]_2} &= 3(40.078) + 2(58.933) + 6(12.011) + 18(15.999) \\ &= 598.148 \frac{\text{g}}{\text{mol}} \end{aligned}$$

Station # 2

$$\begin{aligned} \text{a) } N_{\text{CH}_4} &= 8.50 \text{ mol} \times 6.022 \times 10^{23} \frac{\text{molecules}}{\text{mol}} \\ &= 5.12 \times 10^{24} \text{ molecules} \end{aligned}$$

$$\begin{aligned} \text{b) } m_{\text{C}_7\text{H}_6\text{O}_2} &= 1.50 \times 10^{24} \text{ molecules} \times \frac{1 \text{ mol}}{6.022 \times 10^{23} \text{ molecules}} \times \frac{122.123 \text{ g}}{\text{mol}} \\ &= 304 \text{ g} \end{aligned}$$

$$\begin{aligned} M_{\text{C}_7\text{H}_6\text{O}_2} &= 7(12.011) + 6(1.008) + 2(15.999) \\ &= 122.123 \frac{\text{g}}{\text{mol}} \end{aligned}$$

Station # 3



$$\text{a. } 1. \frac{\text{H}_2}{\text{H}_2\text{S}} \quad \frac{8 \text{ mol H}_2}{8 \text{ mol H}_2\text{S}} \quad 2. \frac{\text{H}_2}{\text{S}_8} \quad \frac{8 \text{ mol H}_2}{1 \text{ mol S}_8}$$

$$\begin{aligned} \text{b. } n_{\text{H}_2\text{S}} &= 20 \text{ mol H}_2 \times \frac{8 \text{ mol H}_2\text{S}}{8 \text{ mol H}_2} \\ &= 20 \text{ mol H}_2\text{S} \end{aligned}$$

$$\begin{aligned} \text{c. } n_{\text{H}_2\text{S}} &= 20 \text{ mol S}_8 \times \frac{8 \text{ mol H}_2\text{S}}{1 \text{ mol S}_8} \\ &= 160 \text{ mol} \end{aligned}$$

station # 7

$$\begin{aligned} \text{a) } M_{\text{Fe}(\text{C}_5\text{H}_5)_2} &= 55.845 + 10(12.011) + 10(1.008) \\ &= 186.035 \frac{\text{g}}{\text{mol}} \end{aligned}$$

$$\begin{aligned} \% \text{ Fe} &= \frac{55.845}{186.035} \times 100 \\ &= 30.0\% \end{aligned}$$

$$\begin{aligned} \% \text{ C} &= \frac{10(12.011)}{186.035} \times 100 \\ &= 64.6\% \end{aligned}$$

$$\begin{aligned} \% \text{ H} &= \frac{10(1.008)}{186.035} \times 100 \\ &= 5.42\% \end{aligned}$$

b) Assume 100g sample

$$m_{\text{C}} = 67.9 \text{ g}$$

$$m_{\text{H}} = 5.7 \text{ g}$$

$$m_{\text{N}} = 26.4 \text{ g}$$

$$n_{\text{C}} = 67.9 \text{ g} \times \frac{1 \text{ mol}}{12.011 \text{ g}}$$

$$n_{\text{H}} = 5.7 \text{ g} \times \frac{1 \text{ mol}}{1.008 \text{ g}}$$

$$n_{\text{N}} = 26.4 \text{ g} \times \frac{1 \text{ mol}}{14.007 \text{ g}}$$

$$= 5.653 \text{ mol}$$

$$= 5.655 \text{ mol}$$

$$= 1.885 \text{ mol}$$

C : H : N

$$\frac{5.653}{1.885} \quad \frac{5.655}{1.885} \quad \frac{1.885}{1.885}$$

3 3 1

∴ the empirical formula is $\text{C}_3\text{H}_3\text{N}$

Station # 8

Assume 100g sample

$$m_{\text{Li}} = 18.7 \text{ g}$$

$$m_{\text{C}} = 16.3 \text{ g}$$

$$m_{\text{O}} = 65.0 \text{ g}$$

$$n_{\text{Li}} = 18.7 \text{ g} \times \frac{1 \text{ mol}}{6.941 \text{ g}}$$

$$n_{\text{C}} = 16.3 \text{ g} \times \frac{1 \text{ mol}}{12.011 \text{ g}}$$

$$n_{\text{O}} = 65.0 \text{ g} \times \frac{1 \text{ mol}}{15.999 \text{ g}}$$

$$= 2.694 \text{ mol}$$

$$= 1.357 \text{ mol}$$

$$= 4.063 \text{ mol}$$

Li : C : O

$$\frac{2.694 \text{ mol}}{1.357} \quad : \quad \frac{1.357}{1.357} \quad : \quad \frac{4.063}{1.357}$$

2

1

3

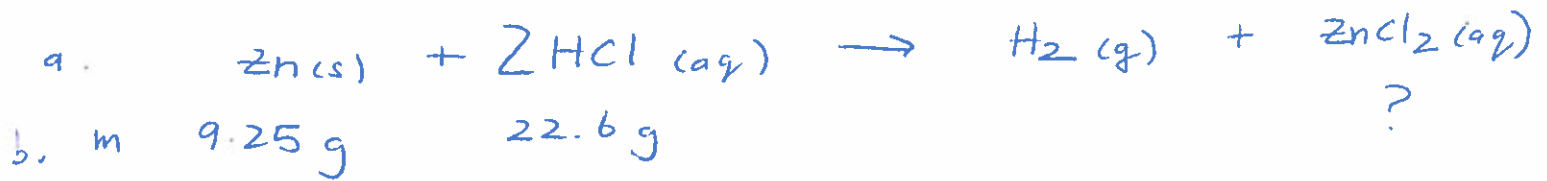
∴ the empirical formula is Li_2CO_3

$$M \text{Li}_2\text{CO}_3 = 2(6.941) + 12.011 + 3(15.999) \\ = 73.890 \frac{\text{g}}{\text{mol}}$$

$$\text{molecular multiplier} = \frac{73.8 \frac{\text{g}}{\text{mol}}}{73.890 \frac{\text{g}}{\text{mol}}} \\ = 1$$

∴ the molecular formula is Li_2CO_3 .

Station # 9:



$$M \quad 65.409 \frac{\text{g}}{\text{mol}} \quad 36.461 \frac{\text{g}}{\text{mol}} \quad 136.315 \frac{\text{g}}{\text{mol}}$$

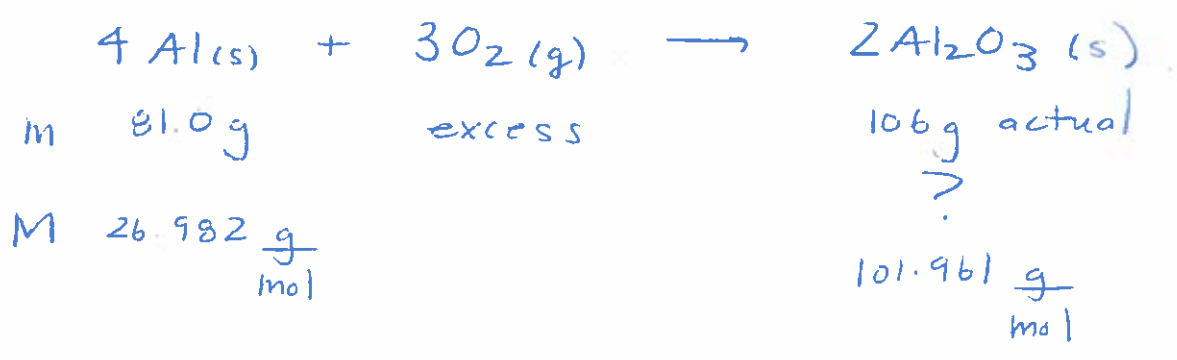
$$n \quad \boxed{0.1414 \text{ mol}} \quad \frac{0.6198 \text{ mol}}{2}$$

$$0.1414 \quad 0.3099$$

↑ LR
(smaller #)

$$\text{c. } m_{\text{ZnCl}_2} = 0.1414 \text{ mol Zn} \times \frac{1 \text{ mol ZnCl}_2}{1 \text{ mol Zn}} \times \frac{136.315 \text{ g ZnCl}_2}{1 \text{ mol ZnCl}_2} \\ = 19.3 \text{ g}$$

Station #10



$$m_{\text{Al}_2\text{O}_3} = 81.0 \cancel{\frac{\text{g Al}}{\text{mol}}} \times \frac{1 \cancel{\text{mol Al}}}{26.982 \cancel{\text{g Al}}} \times \frac{2 \cancel{\text{mol Al}_2\text{O}_3}}{4 \cancel{\text{mol Al}}} \times \frac{101.961 \text{ g Al}_2\text{O}_3}{1 \cancel{\text{mol Al}_2\text{O}_3}}$$

= 153 g