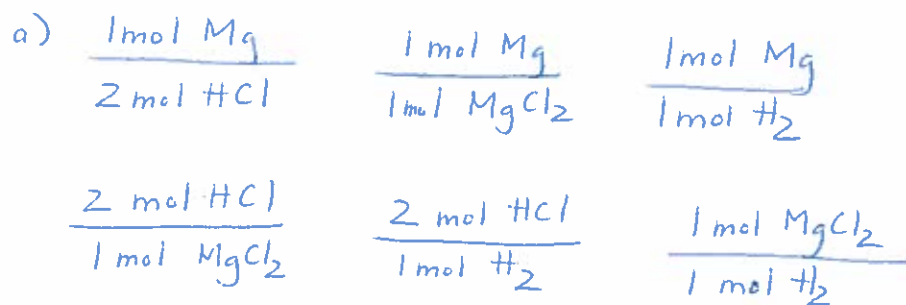
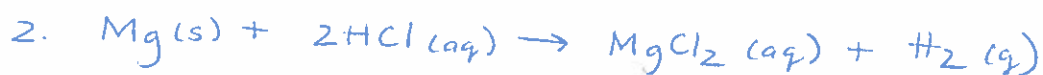
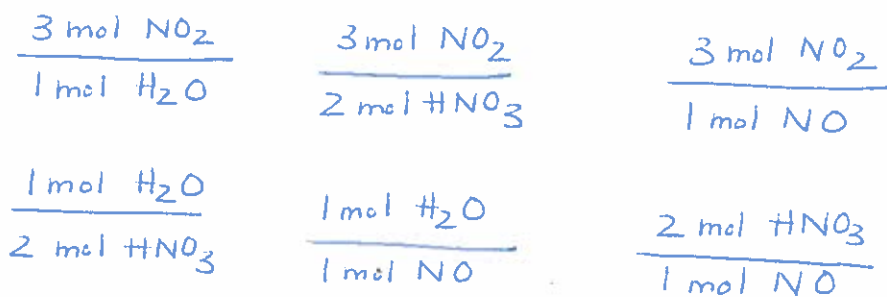
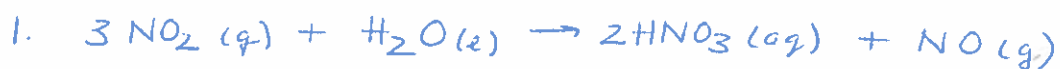


Stoichiometric Problems



b) $n_{\text{HCl}} = 2.0 \text{ mol Mg} \times \frac{2 \text{ mol HCl}}{1 \text{ mol Mg}} = \boxed{4.0 \text{ mol HCl}}$

c) $n_{\text{H}_2} = 3.5 \text{ mol Mg} \times \frac{1 \text{ mol H}_2}{1 \text{ mol Mg}} = \boxed{3.5 \text{ mol H}_2}$

d) $n_{\text{HCl}} = 8.6 \text{ mol Mg} \times \frac{2 \text{ mol HCl}}{1 \text{ mol Mg}} = 17.2 \text{ mol HCl} = \boxed{17 \text{ mol HCl}}$



m 12.0g

M 18.015g/mol

$n_{\text{H}_2\text{O}} = 12.0 \text{ g} \times \frac{1 \text{ mol}}{18.015 \text{ g}} = 0.6661 \text{ mol}$

$n_{\text{H}_2} = 0.6661 \text{ mol H}_2\text{O} \times \frac{2 \text{ mol H}_2}{2 \text{ mol H}_2\text{O}} = \boxed{0.666 \text{ mol}}$



$$m \quad 234g \quad ?$$

$$M \quad 159.687 \frac{g}{mol} \quad 36.461 \frac{g}{mol}$$

$$n_{\text{Fe}_2\text{O}_3} = \frac{234g}{159.687g/mol} = 1.465 \text{ mol}$$

$$n_{\text{HCl}} = 1.465 \text{ mol Fe}_2\text{O}_3 \times \frac{6 \text{ mol HCl}}{1 \text{ mol Fe}_2\text{O}_3} = 8.79 \text{ mol}$$

$$m_{\text{HCl}} = 8.79 \text{ mol} \times 36.461 \frac{g}{mol} = 320.49g = \boxed{3.20 \times 10^2 g}$$

OR

$$m_{\text{HCl}} = 234g \text{ Fe}_2\text{O}_3 \times \frac{1 \text{ mol Fe}_2\text{O}_3}{159.687g} \times \frac{6 \text{ mol HCl}}{1 \text{ mol Fe}_2\text{O}_3} \times \frac{36.461g}{1 \text{ mol HCl}} = 321g$$



$$m \quad \quad \quad 1.76g \quad ?$$

$$M \quad \quad \quad 46.005 \frac{g}{mol} \quad 31.998 \frac{g}{mol}$$

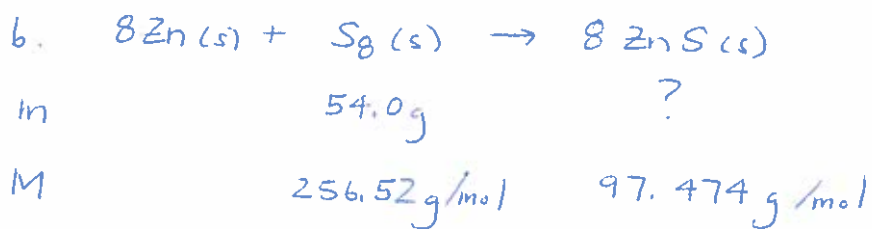
$$n_{\text{NO}_2} = \frac{1.76g}{46.005g/mol} = 0.03826 \text{ mol}$$

$$n_{\text{O}_2} = 0.03826 \text{ mol} \times \frac{1 \text{ mol O}_2}{4 \text{ mol NO}_2} = 0.009565 \text{ mol}$$

$$m_{\text{O}_2} = 0.009565 \text{ mol} \times 31.998 \frac{g}{mol} = \boxed{0.306g}$$

OR

$$m_{\text{O}_2} = 1.76g \text{ NO}_2 \times \frac{1 \text{ mol NO}_2}{46.005g \text{ NO}_2} \times \frac{1 \text{ mol O}_2}{4 \text{ mol NO}_2} \times \frac{31.998g \text{ O}_2}{1 \text{ mol O}_2} = 0.306g$$



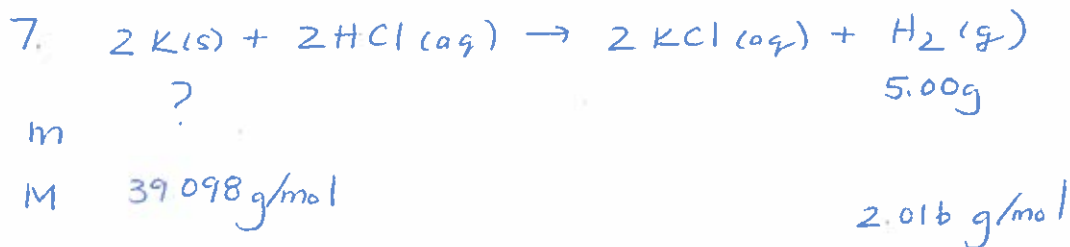
$$n_{\text{S}_8} = \frac{54.0\text{g}}{256.52\text{g/mol}} = 0.2105\text{mol}$$

$$n_{\text{ZnS}} = 0.2105\text{mol S}_8 \times \frac{8\text{mol ZnS}}{1\text{mol S}_8} = 1.684\text{mol}$$

$$m_{\text{ZnS}} = 1.684\text{mol} \times 97.474\frac{\text{g}}{\text{mol}} = \boxed{164\text{g}}$$

OR

$$\begin{aligned}
 m_{\text{ZnS}} &= 54.0\text{g S}_8 \times \frac{1\text{mol S}_8}{256.52\text{g S}_8} \times \frac{8\text{mol ZnS}}{1\text{mol S}_8} \times \frac{97.474\text{g ZnS}}{1\text{mol ZnS}} \\
 &= 164\text{g}
 \end{aligned}$$



$$n_{\text{H}_2} = \frac{5.00\text{g}}{2.016\text{g/mol}} = 2.480\text{mol}$$

$$n_{\text{K}} = 2.480\text{mol H}_2 \times \frac{2\text{mol K}}{1\text{mol H}_2} = 4.960\text{mol}$$

$$m_{\text{K}} = 4.960\text{mol} \times 39.098\frac{\text{g}}{\text{mol}} = \boxed{194\text{g}}$$

$$m_{\text{K}} = 5.00\text{g H}_2 \times \frac{1\text{mol H}_2}{2.016\text{g H}_2} \times \frac{2\text{mol K}}{1\text{mol H}_2} \times \frac{39.098\text{g K}}{1\text{mol K}} = 194\text{g}$$



$$m = ?$$

$$N = 1.72 \times 10^{24} \text{ molecules}$$

$$M = 65.01 \text{ g/mol}$$

$$n_{\text{N}_2} = \frac{1.72 \times 10^{24} \text{ molecules}}{6.022 \times 10^{23} \text{ molecules/mol}} = 2.856 \text{ mol}$$

$$n_{\text{NaN}_3} = 2.856 \text{ mol N}_2 \times \frac{2 \text{ mol NaN}_3}{3 \text{ mol N}_2}$$

$$= 1.904 \text{ mol}$$

$$m_{\text{NaN}_3} = 1.904 \text{ mol} \times 65.01 \frac{\text{g}}{\text{mol}}$$

$$= \boxed{124 \text{ g}}$$

$$m_{\text{NaN}_3} = 1.72 \times 10^{24} \text{ molecules N}_2 \times \frac{1 \text{ mol N}_2}{6.022 \times 10^{23} \text{ molecules N}_2} \times \frac{2 \text{ mol NaN}_3}{3 \text{ mol N}_2} \times \frac{65.01 \text{ g}}{1 \text{ mol NaN}_3}$$

$$= 124 \text{ g}$$