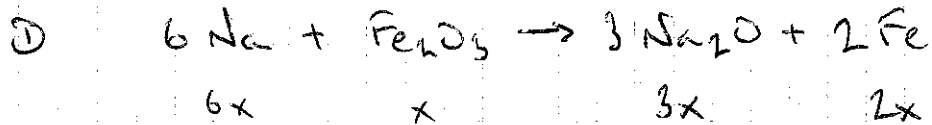


# Stoichiometry WS #5



a) Na:  $\frac{100\text{g}}{23\text{g/mol}} = 4.348 \text{ mol}$

$$6x = 4.348$$

$$x = 0.725 \text{ mol}$$

$$\text{Fe} = 2x = 2(0.725) = 1.449 \text{ mol}$$

Sodium

$\text{Fe}_2\text{O}_3$ :  $\frac{100\text{g}}{159.6\text{g/mol}} = 0.627 \text{ mol} = x$

$$\text{Fe} = 2x = 2(0.627) = 1.253 \text{ mol}$$

$\text{Fe}_2\text{O}_3$

Since  $\text{Fe}_2\text{O}_3$  results in less,  $\text{Fe}_2\text{O}_3$  is limiting

b) Na is excess

c)  $\text{Fe} = 1.253 \text{ mol}$  (from part a)

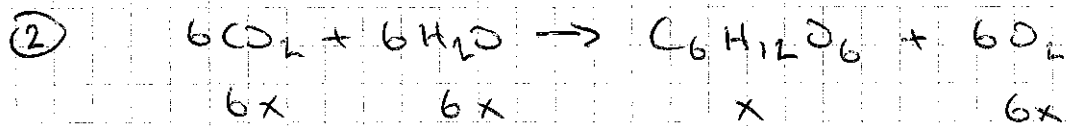
$$1.253 \text{ mol} \times 55.8 \text{ g/mol} = 69.9 \text{ g}$$

d)  $\text{Fe}_2\text{O}_3 = 0.627 \text{ mol} = x$  (from part a)

$$\text{Na} = 6x = 6(0.627) = 3.759 \text{ mol}$$

$$3.759 \text{ mol} \times 23 \text{ g/mol} = 86.5 \text{ g}$$

$$100\text{g} - 86.5\text{g} = 13.5\text{g Na left}$$



a)  $\text{CO}_2: \frac{88\text{g}}{44\text{g/mol}} = 2\text{ mol}$

$$6x = 2$$

$$x = 0.\bar{3}\text{ mol}$$

$$\text{C}_6\text{H}_{12}\text{O}_6 = x = 0.\bar{3}\text{ mol}$$

$$\text{H}_2\text{O}: \frac{64\text{g}}{18.02\text{g/mol}} = 3.552\text{ mol}$$

$$6x = 3.552$$

$$x = 0.592\text{ mol}$$

$$\text{C}_6\text{H}_{12}\text{O}_6 = x = 0.592\text{ mol}$$

∴  $\text{CO}_2$  is limiting

b)  $\text{H}_2\text{O}$  is excess

$$\text{C}_6\text{H}_{12}\text{O}_6 = x = 0.\bar{3}\text{ mol} \quad (\text{from a})$$

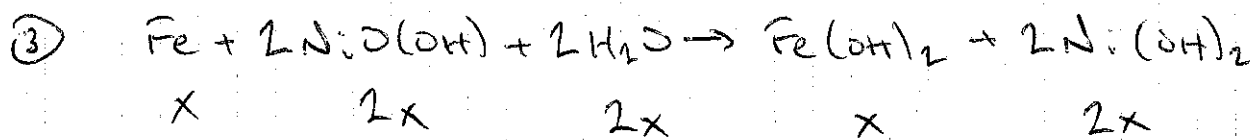
$$\text{H}_2\text{O} = 6x = 6(0.\bar{3}) = 2\text{ mol}$$

$$2\text{ mol} \times 18.02\text{g/mol} = 36.04\text{g}$$

$$64\text{g} - 36.04\text{g} = \boxed{27.96\text{g H}_2\text{O left}}$$

c)  $\text{C}_6\text{H}_{12}\text{O}_6 = 0.\bar{3}\text{ mol}$

$$0.\bar{3}\text{ mol} \times 180.12\text{g/mol} = \boxed{60\text{g}}$$



$$\text{Fe} = x = 5 \text{ mol}$$

$$\text{Fe(OH)}_2 = x = 5 \text{ mol}$$

$$\text{NiO(OH)} = 2x = 8 \text{ mol}$$

$$x = 4 \text{ mol}$$

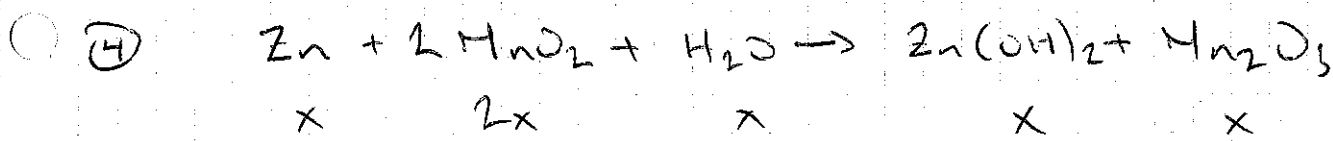
$$\text{Fe(OH)}_2 = x = 4 \text{ mol}$$

Fe

NiO(OH)

∴ NiO(OH) is limiting

4 mol Fe(OH)<sub>2</sub> are produced



$$\text{a) Zn} : \frac{25 \text{ g}}{65.4 \text{ g/mol}} = 0.382 \text{ mol} = x$$

$$\text{Zn(OH)}_2 = x = 0.382 \text{ mol}$$

$$\text{MnO}_2 : \frac{30 \text{ g}}{86.9 \text{ g/mol}} = 0.345 \text{ mol}$$

$$2x = 0.345$$

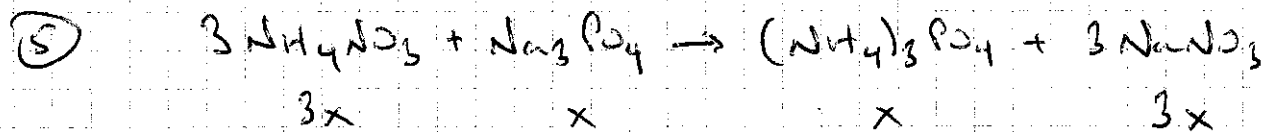
$$x = 0.173 \text{ mol}$$

$$\text{Zn(OH)}_2 = x = 0.173 \text{ mol}$$

∴ MnO<sub>2</sub> is limiting

$$\textcircled{4} \text{ b) } \text{Zn(OH)}_2 = 0.173 \text{ mol}$$

$$0.173 \text{ mol} \times 99.42 \text{ g/mol} = \boxed{17.2 \text{ g}}$$



$$\text{a) } \text{NH}_4\text{NO}_3 = \frac{30 \text{ g}}{80.04 \text{ g/mol}} = 0.375 \text{ mol}$$

$$3x = 0.375$$

$$x = 0.125 \text{ mol}$$

$$\underline{(\text{NH}_4)_3\text{PO}_4} = x = 0.125 \text{ mol}$$

$$\text{Na}_3\text{PO}_4 = \frac{50 \text{ g}}{164 \text{ g/mol}} = 0.305 \text{ mol} = x$$

$$(\text{NH}_4)_3\text{PO}_4 = x = 0.305 \text{ mol}$$

∴  $\text{NH}_4\text{NO}_3$  is limiting reactant

$$\text{b) } (\text{NH}_4)_3\text{PO}_4 = 0.125 \text{ mol}$$

$$0.125 \text{ mol} \times 149.12 \text{ g/mol} = \boxed{18.6 \text{ g}}$$

$$\text{c) } \text{NaN}_3 = 3x = 3(0.125) = 0.375 \text{ mol}$$

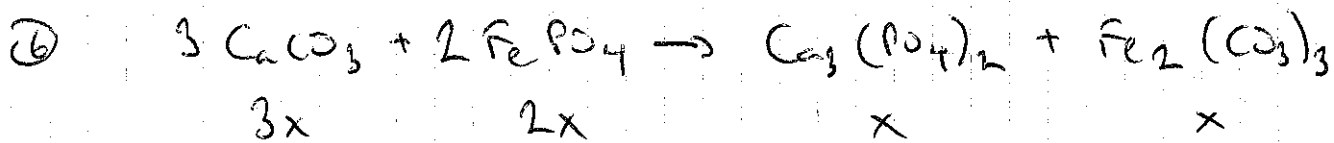
$$0.375 \text{ mol} \times 85 \text{ g/mol} = \boxed{31.9 \text{ g}}$$

5) d)  $\text{Na}_3\text{PO}_4$  is excess reactant

$$\text{Na}_3\text{PO}_4 = x = 0.125 \text{ mol}$$

$$0.125 \text{ mol} \times 164 \text{ g/mol} = 20.5 \text{ g}$$

$$50 \text{ g} - 20.5 \text{ g} = \boxed{29.5 \text{ g}}$$



$$\text{a) CaCO}_3: \frac{100 \text{ g}}{100.1 \text{ g/mol}} = 1 \text{ mol}$$

$$3x = 1 \text{ mol}$$

$$x = 0.333$$

$$\text{Ca}_3(\text{PO}_4)_2 = x = 0.333 \text{ mol}$$

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$$\text{FePO}_4: \frac{45 \text{ g}}{150.8 \text{ g/mol}} = 0.298 \text{ mol}$$

$$2x = 0.298 \text{ mol}$$

$$x = 0.149$$

$$\text{Ca}_3(\text{PO}_4)_2 = x = 0.149$$

So  $\text{FePO}_4$  is limiting reactant

$$\textcircled{b)} \quad \text{Ca}_3(\text{PO}_4)_2 = x = 0.149 \text{ mol.}$$

$$0.149 \text{ mol} \times 310.3 \text{ g/mol} = \boxed{46.2 \text{ g}}$$

$$\text{c)} \quad \text{Fe}_2(\text{CO}_3)_3 = x = 0.149 \text{ mol}$$

$$0.149 \text{ mol} \times 291.6 \text{ g/mol} = \boxed{43.4 \text{ g}}$$

d)  $\text{CaCO}_3$  is excess reactant

$$\text{CaCO}_3 = 3x = 3(0.149) = 0.448 \text{ mol}$$

$$0.448 \text{ mol} \times 100.1 \text{ g/mol} = 44.8 \text{ g}$$

$$100 \text{ g} - 44.8 \text{ g} = \boxed{55.2 \text{ g}}$$