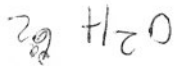


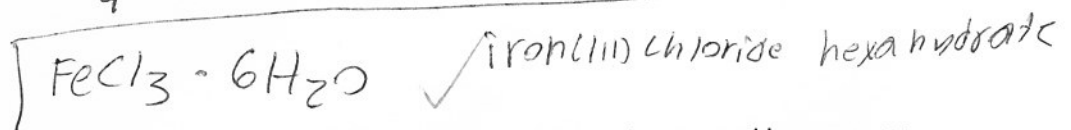
1. When 5.00 g of $\text{FeCl}_3 \cdot x \text{H}_2\text{O}$ are heated, 2.00 g of H_2O are driven off. Find the chemical formula and the name of the hydrate.
(4 marks = 3 marks T, 1 mark C)



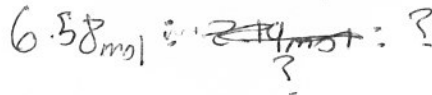
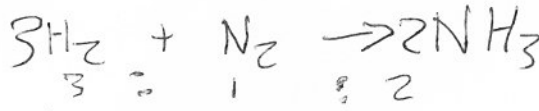
$$\frac{3.9}{162.2 \text{ g/mol}} = 0.0185 \text{ mol}$$

$$\frac{2.00}{18.02 \text{ g/mol}} = 0.111 \text{ mol } \text{H}_2\text{O}$$

$$\frac{0.111 \text{ mol}}{0.0185 \text{ mol}} = 6 \text{ H}_2\text{O} \quad \frac{0.0185 \text{ mol}}{0.0185 \text{ mol}} = 1 \text{ FeCl}_3$$



2. Suppose 6.58 mol of H_2 reacted with sufficient nitrogen. How many molecules of ammonia, NH_3 would be produced?
(4 marks = 3 marks T, 1 mark C)



$$\frac{6.58 \text{ mol}}{2} = 3.29 \text{ mol}$$

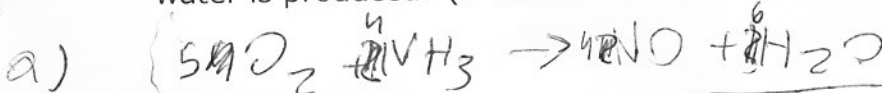
$$\frac{6.58 \text{ mol}}{3} = \frac{x}{2}$$

$$x = 4.39 \text{ mol}$$

$$4.39 \text{ mol} \times N_A = 2.64 \times 10^{24} \text{ particles of } \text{NH}_3$$

3. Consider the reaction:

If 323.2 grams of oxygen, O_2 , are reacted, how many grams of ammonia, NH_3 , are used? If nitric oxide (NO) and water are produced, what mass of water is produced? (6 marks = 5 marks T, 1 mark C)



$$\frac{323.2 \text{ g}}{32 \text{ g/mol}} = 10.1 \text{ mol } \text{O}_2$$

$$\frac{10.1 \text{ mol } \text{O}_2}{5} \cdot \frac{4 \text{ mol } \text{NH}_3}{4} = 8.08 \text{ mol}$$

$$8.08 \text{ mol}$$

$$8.08 \text{ mol} \cdot 17 \text{ g/mol} = 137.36 \text{ g}$$

b)

$$\frac{323.2 \text{ g}}{32 \text{ g/mol}} = 10.1 \text{ mol } \text{O}_2$$

$$\frac{10.1 \text{ mol } \text{O}_2}{5} \cdot \frac{6 \text{ mol } \text{H}_2\text{O}}{6} = 12.12 \text{ mol}$$

$$\text{H}_2\text{O} = 12.12 \text{ mol}$$

$$m_{\text{H}_2\text{O}} = 12.12 \text{ mol} \cdot 18.02 \text{ g/mol} = 218.4 \text{ g}$$

$$= 218.4 \text{ g}$$