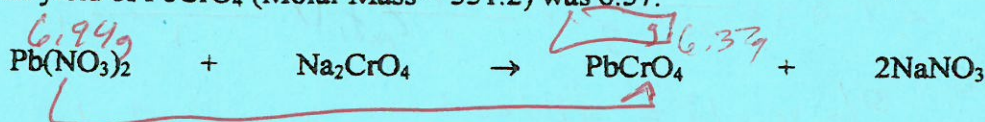


Percent Yield/Percent Error

Name _____
Period _____ Date _____

Calculate (a) the theoretical yield, (b) percentage yield and (c) experimental error.

1. In preparing a paint pigment of chrome yellow, PbCrO_4 , a student used 6.94 grams of $\text{Pb}(\text{NO}_3)_2$ (Molar Mass = 323.2). His actual yield of PbCrO_4 (Molar Mass = 331.2) was 6.37.

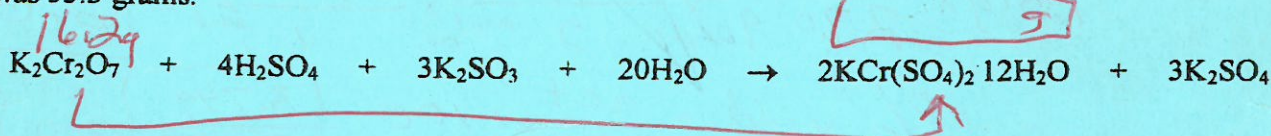


$$6.94\text{g} \times \frac{1 \text{ mol}}{323.2 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{331.2 \text{ g}}{1 \text{ mol}} = \boxed{7.11\text{g}}$$

$$\% \text{ yield} = \frac{\text{act}}{\text{theor}} \times 100 = \frac{6.37\text{g}}{7.11\text{g}} \times 100 = \boxed{89.6\%}$$

$$\% \text{ error} = 100\% - \% \text{ yield} = 100\% - 89.6\% = \boxed{10.4\%}$$

2. Crystals of chrome alum, $\text{KCr}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ (Molar Mass = 499.3), were prepared from 16.2 grams of potassium dichromate, $\text{K}_2\text{Cr}_2\text{O}_7$ (Molar Mass = 294.2), reacting according to the following equation. The actual yield was 53.3 grams.

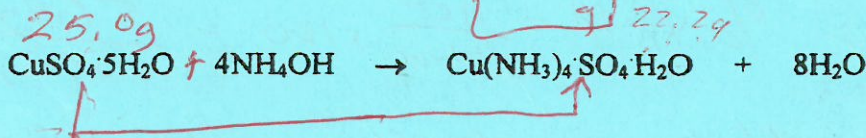


$$16.2\text{g} \times \frac{1 \text{ mol}}{294.2 \text{ g}} \times \frac{2 \text{ mol}}{1 \text{ mol}} \times \frac{499.3 \text{ g}}{1 \text{ mol}} = 55.0\text{g}$$

$$\% \text{ yield} = \frac{\text{act}}{\text{theor.}} \times 100 = \frac{53.3\text{g}}{55.0} \times 100 = 96.9\%$$

$$\% \text{ error} = \boxed{3.1\%} \quad 100\% - 96.9\% =$$

3. In preparing the ammonia complex of copper sulfate, $\text{Cu}(\text{NH}_3)_4 \cdot \text{SO}_4 \cdot \text{H}_2\text{O}$ (Molar Mass = 245.6), by reacting 25.0 grams of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (Molar Mass = 249.6) with NH_4OH , 22.2 grams of the product were formed.

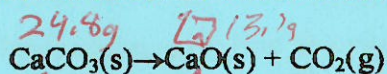


$$25.0\text{g} \times \frac{1 \text{ mol}}{249.6 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{245.6 \text{ g}}{1 \text{ mol}} = \boxed{24.6\text{g}}$$

$$\% \text{ yield} = \frac{22.2\text{g}}{24.6\text{g}} \times 100 = 90.2\%$$

$$\% \text{ error} \quad 100\% - 90.2\% = \boxed{9.8\%}$$

4. 24.8 g of calcium carbonate can be decomposed by heating to produce 13.1 g of CaO.

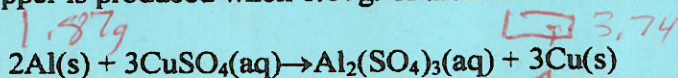


$$24.8g \times \frac{1 \text{ mol}}{100.1g} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{56.1g}{1 \text{ mol}} = 13.9g$$

$$\% \text{ yield} = \frac{\text{actual}}{\text{theoretical}} \times 100 = \frac{13.1g}{13.9g} \times 100 = \boxed{94.2\%}$$

$$\% \text{ error} = 100\% - \% \text{ yield} = 100\% - 94.2\% = \boxed{5.8\%}$$

5. 3.74g. of copper is produced when 1.87g. of aluminum is reacted with an excess of copper(II)sulfate

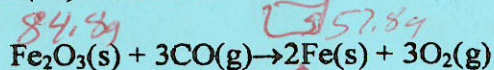


$$1.87g \times \frac{1 \text{ mol Al}}{27.0g \text{ Al}} \times \frac{3 \text{ mol Cu}}{2 \text{ mol Al}} \times \frac{63.5g}{1 \text{ mol}} = \boxed{6.6g}$$

$$\% \text{ yield} = \frac{\text{act}}{\text{theor}} \times 100 = \frac{3.74g}{6.6g} \times 100 = \boxed{56.7\%}$$

$$\% \text{ error} = 100\% - 56.7\% = \boxed{43.3\%}$$

6. 84.8g. of iron(III) oxide reacts with an excess of carbon monoxide and 57.8g. of iron is produced

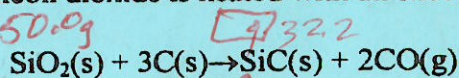


$$84.8g \times \frac{1 \text{ mol}}{159.6g} \times \frac{2 \text{ mol}}{1 \text{ mol}} \times \frac{55.8g}{1 \text{ mol}} = \boxed{59.3g}$$

$$\% \text{ yield} = \frac{\text{act}}{\text{theor}} \times 100 = \frac{57.8g}{59.3g} \times 100 = \boxed{97.5\%}$$

$$\% \text{ error} = 100\% - \% \text{ yield} = 100\% - 97.5\% = \boxed{2.5\%}$$

7. 50.0g. of silicon dioxide is heated with an excess of carbon to produce 32.2g. of silicon carbide.



$$50.0g \times \frac{1 \text{ mol}}{60.1g} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{40.1g}{1 \text{ mol}} = \boxed{33.4g}$$

$$\% \text{ yield} = \frac{\text{act}}{\text{theor}} \times 100 = \frac{32.2g}{33.4g} \times 100 = \boxed{96.4\%}$$

$$\% \text{ error} = 100\% - \% \text{ yield} = 100\% - 96.4\% = \boxed{3.6\%}$$