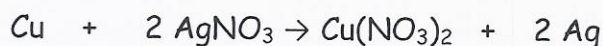


Stoichiometry Class Problems #1

1. According to the equation below, adding copper (Cu) to silver nitrate (AgNO_3) allows a chemical reaction to occur that produces silver (Ag) and copper nitrate ($\text{Cu}(\text{NO}_3)_2$).



a- Gram to gram question (steps 1-4)

You need 2.0 g of silver (Ag) for an experiment. What mass of the silver nitrate will you require to obtain the 2.0 g of silver that you need?

$$2.0 \text{ g Ag} \times \frac{1 \text{ mol Ag}}{107.87 \text{ g Ag}} \times \frac{2 \text{ mol AgNO}_3}{2 \text{ mol Ag}} \times \frac{169.88 \text{ g AgNO}_3}{1 \text{ mol AgNO}_3} = 3.1 \text{ g AgNO}_3$$

b- Gram to moles question (steps 1-3)

You need 2.0 g of silver (Ag) for an experiment. How many moles of the Cu will you require to obtain the 2.0 g of silver that you need?

$$2.0 \text{ g Ag} \times \frac{1 \text{ mol Ag}}{107.87 \text{ g Ag}} \times \frac{1 \text{ mol Cu}}{2 \text{ mol Ag}} = 0.0093 \text{ mol Cu}$$

c- Moles to gram question (steps 1, 3 and 4)

You have 1.5 moles of $\text{Cu}(\text{NO}_3)_2$, what mass of AgNO_3 was needed for the reaction to occur?

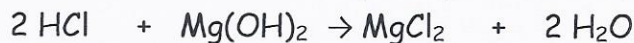
$$1.5 \text{ mol Cu}(\text{NO}_3)_2 \times \frac{2 \text{ mol AgNO}_3}{1 \text{ mol Cu}(\text{NO}_3)_2} \times \frac{169.88 \text{ g AgNO}_3}{1 \text{ mol AgNO}_3} = 510 \text{ g AgNO}_3$$

d- Moles to moles question (steps 1 and 3)

You have 3.0 moles of $\text{Cu}(\text{NO}_3)_2$, how many moles of AgNO_3 was needed for the reaction to occur?

$$3.0 \text{ mol Cu}(\text{NO}_3)_2 \times \frac{2 \text{ mol AgNO}_3}{1 \text{ mol Cu}(\text{NO}_3)_2} = 6 \text{ mol AgNO}_3$$

2. To neutralize hydrochloric acid (HCl), magnesium hydroxide (Mg(OH)₂), a base is added. The neutralization reaction is represented by the following equation:



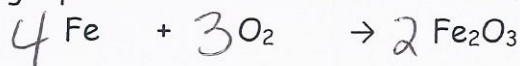
- A- You have 4.0 moles of HCl, what mass of Mg(OH)₂ is required to neutralize the 4.0 moles of HCl?

$$4.0 \text{ mol HCl} \times \frac{1 \text{ mol Mg(OH)}_2}{2 \text{ mol HCl}} \times \frac{58.33 \text{ g Mg(OH)}_2}{1 \text{ mol Mg(OH)}_2} = 120 \text{ g Mg(OH)}_2$$

- B- You have 4.0 moles of HCl, how many moles of H₂O is required to neutralize the 4 moles of HCl?

$$4.0 \text{ mol HCl} \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol HCl}} = 4.0 \text{ mol H}_2\text{O}$$

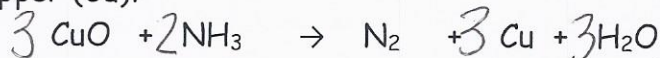
3. The following equation describes how iron oxide, Fe₂O₃, is produced.



How much Fe₂O₃ is formed by the complete oxidation of 448 g of iron?

$$448 \text{ g Fe} \times \frac{1 \text{ mol Fe}}{55.85 \text{ g Fe}} \times \frac{2 \text{ mol Fe}_2\text{O}_3}{4 \text{ mol Fe}} \times \frac{159.70 \text{ g Fe}_2\text{O}_3}{1 \text{ mol Fe}_2\text{O}_3} = 641 \text{ g Fe}_2\text{O}_3$$

4. A- Using the formula below, how many moles of ammonia (NH₃) are needed to obtain 7.00 g of copper (Cu)?



$$7.00 \text{ g Cu} \times \frac{1 \text{ mol Cu}}{63.55 \text{ g Cu}} \times \frac{2 \text{ mol NH}_3}{3 \text{ mol Cu}} = 0.0734 \text{ mol NH}_3$$

- B- If you needed 5.0 g of H₂O, how many grams of NH₃ were needed?

$$5.0 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \times \frac{2 \text{ mol NH}_3}{3 \text{ mol H}_2\text{O}} \times \frac{17.04 \text{ g NH}_3}{1 \text{ mol NH}_3} = 3.2 \text{ g NH}_3$$