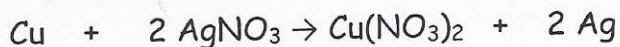


Stoichiometry Class Worksheet

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 ($\text{Cu(NO}_3)_2$).



A- 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?

Given

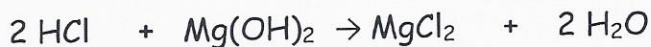
$$2.0 \text{ g Ag} \times \frac{1 \text{ mol}}{107.87 \text{ g Ag}} \times \frac{2 \text{ mol AgNO}_3}{2 \text{ mol Ag}} \times \frac{169.88 \text{ g AgNO}_3}{1 \text{ mol AgNO}_3} = 3.2 \text{ g AgNO}_3$$

B- 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?

Given

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

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?

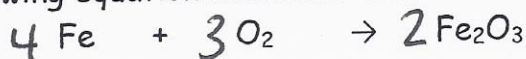
$$4.0 \text{ mol HCl} \times \frac{1 \text{ mol Mg(OH)}_2}{2 \text{ mol HCl}} \times \frac{58.33 \text{ g Mg(OH)}_2}{1 \text{ mol Mg(OH)}_2} = 120 \text{ g Mg(OH)}_2$$

B- You have 4.0 moles of HCl, how many moles of Mg(OH)_2 is required to neutralize the 4 moles of HCl?

Given

$$4.0 \text{ mol HCl} \times \frac{1 \text{ mol Mg(OH)}_2}{2 \text{ mol HCl}} = 2.0 \text{ mol Mg(OH)}_2$$

3. The following equation describes how iron oxide, Fe_2O_3 , is produced.



A- How much Fe_2O_3 is formed by the complete oxidation of 448 g of iron?

Given

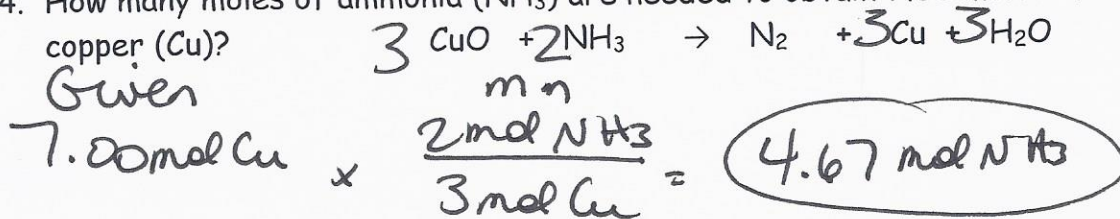
$$448 \text{g Fe} \times \frac{1 \text{ mol Fe}}{55.85 \text{g Fe}} \times \frac{2 \text{ mol Fe}_2\text{O}_3}{4 \text{ mol Fe}} \times \frac{159.7 \text{ Fe}_2\text{O}_3}{1 \text{ mol Fe}_2\text{O}_3} = 641 \text{g Fe}_2\text{O}_3$$

B- How many moles of Fe_2O_3 are produced when 7.5 moles of iron react completely?

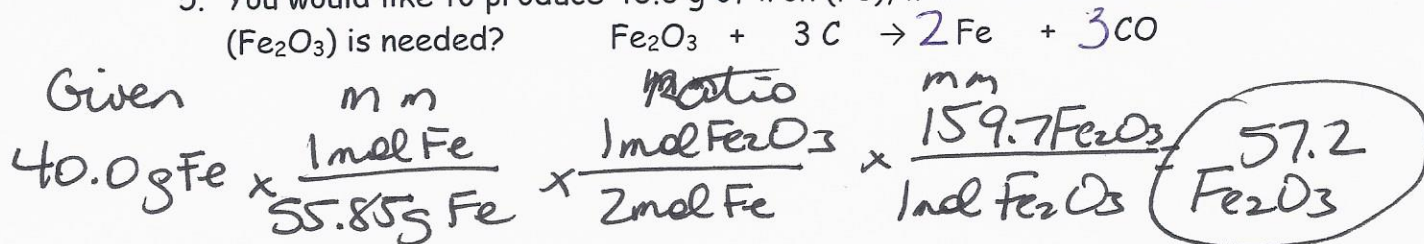
Given

$$7.5 \text{ mol Fe} \times \frac{2 \text{ mol Fe}_2\text{O}_3}{4 \text{ mol Fe}} = 3.8 \text{ mol Fe}_2\text{O}_3$$

4. How many moles of ammonia (NH_3) are needed to obtain 7.00 moles of copper (Cu)?

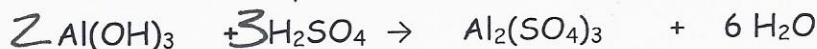


5. You would like to produce 40.0 g of iron (Fe), what mass of iron oxide (Fe_2O_3) is needed?



6. When a solution of aluminum hydroxide, $\text{Al}(\text{OH})_3$, reacts with a solution of sulfuric acid, H_2SO_4 , the result is a salt, aluminum sulphate, $\text{Al}_2(\text{SO}_4)_3$ and water, H_2O .

The reaction is seen by the following unbalanced equation:

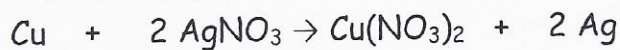


What mass of sulfuric acid is required to produce 10.0 g of water?

Given

$$10.0 \text{g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{g H}_2\text{O}} \times \frac{3 \text{ mol H}_2\text{SO}_4}{6 \text{ mol H}_2\text{O}} \times \frac{98.0 \text{g H}_2\text{SO}_4}{1 \text{ mol H}_2\text{SO}_4} = 27.2 \text{g H}_2\text{SO}_4$$

7. According to the equation below, adding copper (Cu) to silver nitrate (AgNO₃) allows a chemical reaction to occur that produces silver (Ag) and copper nitrate (Cu(NO₃)₂).



- A- If 3.33×10^7 molecules of Cu are available, how many moles of silver nitrate AgNO₃ would react with it?

Given 3.33×10^7 molecules Cu

$$3.33 \times 10^7 \text{ molecules Cu} \times \frac{1 \text{ mol Cu}}{6.02 \times 10^{23} \text{ molecules of Cu}} \times \frac{2 \text{ mol AgNO}_3}{1 \text{ mol Cu}} = 1.11 \times 10^{-16} \text{ moles of AgNO}_3$$

- B- If 400.0 g of copper nitrate Cu(NO₃)₂ was produced, how many Cu atoms must have reacted with the copper nitrate?

G

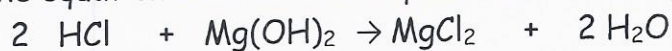
$$400.0 \text{ g Cu(NO}_3)_2 \times \frac{1 \text{ mol Cu(NO}_3)_2}{187.5 \text{ g Cu(NO}_3)_2} \times \frac{1 \text{ mol Cu}}{1 \text{ mol Cu(NO}_3)_2} \times (6.02 \times 10^{23}) \text{ molecules} = 1.284 \times 10^{24} \text{ Cu atoms}$$

- C- If 7.5×10^4 molecules of Ag are available, how many moles of silver nitrate AgNO₃ would react with it?

G

$$7.5 \times 10^4 \text{ mol Ag} \times \frac{1 \text{ mol Ag}}{6.02 \times 10^{23} \text{ molecules Ag}} \times \frac{2 \text{ mol Ag(NO}_3)_2}{2 \text{ mol Ag}} = 1.2 \times 10^{-19} \text{ moles AgNO}_3$$

8. Use the equation below to solve questions A, B and C.



- A- If 700.0 g of water was produced, how many molecules of magnesium chloride (MgCl₂) must have reacted with the oxygen?

Given

$$700.0 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \times \frac{1 \text{ mol MgCl}_2}{2 \text{ mol H}_2\text{O}} \times (6.02 \times 10^{23}) \text{ mol MgCl}_2 = 1.169 \times 10^{25} \text{ molecules}$$

- B- If 3.3×10^9 molecules of HCl are available, how many moles of water react with it?

Given

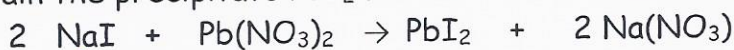
$$3.3 \times 10^9 \text{ molecules HCl} \times \frac{1 \text{ mol HCl}}{6.02 \times 10^{23} \text{ molecules HCl}} \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol HCl}} = 5.5 \times 10^{-15} \text{ mol H}_2\text{O}$$

C- If 100.0 g of water was produced, how many molecules of hydrochloric acid (HCl) was needed?

Given
 $100.0 \text{ g H}_2\text{O}$

$$\times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \times \frac{2 \text{ mol HCl}}{2 \text{ mol H}_2\text{O}} \times \frac{6.04 \times 10^{23} \text{ molec HCl}}{1 \text{ mol HCl}} = 3.341 \times 10^{24} \text{ molec HCl}$$

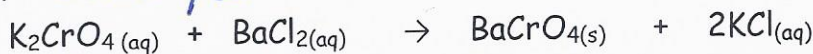
9. 200.0 mL of NaI whose concentration is 2.0 M are reacted with $\text{Pb}(\text{NO}_3)_2$ in order to obtain the precipitate PbI_2 . Calculate the mass of PbI_2 obtained.



$\frac{2.0 \text{ mol}}{\text{L}} \times \frac{x}{.2 \text{ L}} = .4 \text{ mol}$

$$.4 \text{ mol NaI} \times \frac{1 \text{ mol PbI}_2}{2 \text{ mol NaI}} \times \frac{461 \text{ g PbI}_2}{1 \text{ mol PbI}_2} = 92 \text{ g PbI}_2$$

10. 75 mL of BaCl_2 is used to produce BaCrO_4 . If 4.81 g of BaCrO_4 is made, what is the concentration of the BaCl_2 used? The following equation represents the reaction:



Given
 4.81 g BaCrO_4

$$\times \frac{1 \text{ mol BaCrO}_4}{253.33 \text{ g BaCrO}_4} \times \frac{1 \text{ mol BaCl}_2}{1 \text{ mol BaCrO}_4} = \frac{0.018987092 \text{ mol}}{.075 \text{ L}} = .25 \text{ mol/L}$$

11. How many mL of a 6.0M solution of HCl are needed to react with 4.85g of NaHCO_3 ? The equation that represents the reaction follows.

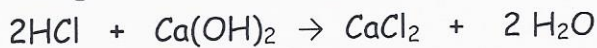


Given
 4.85 g NaHCO_3

$$\times \frac{1 \text{ mol NaHCO}_3}{84.01 \text{ g NaHCO}_3} \times \frac{1 \text{ mol HCl}}{1 \text{ mol NaHCO}_3} = \frac{5.77122 \text{ mol}}{6.0 \text{ mol/L}} = .96 \text{ L} = 960 \text{ mL}$$

12. Sandy neutralizes 200mL of HCL at a concentration of 1.5mol/L using

$\text{Ca}(\text{OH})_2$ according to the following equation:



$$\frac{1.5 \text{ mol}}{\text{L}} \times \frac{x}{.2 \text{ L}} = .3 \text{ mol}$$

After the neutralization, she allows the water from the beaker to evaporate. What is the mass of the CaCl_2 that will be left in the beaker?

Given
 3 mol HCl

$$\times \frac{1 \text{ mol CaCl}_2}{2 \text{ mol HCl}} \times \frac{110.97 \text{ g CaCl}_2}{1 \text{ mol CaCl}_2} = 20 \text{ g CaCl}_2$$