Atomic Mass and Molar Mass Conversions and Stoichiometry

1. Calculate the molecular mass of ibuprofen **$C_{13}H_{18}O_2$**

   Number of atoms C____ H ____ O ____
   Atomic mass of C _____ amu H _____ amu O _____amu

2. Calculate the formula weight of $Al_2(SO_4)_3$.

   Number of atoms Al ____ S ____ O ____
   Atomic mass of Al_____ amu S _____ amu O _____ amu

3. How many molecules of oxygen (O_2) are present in a 0.250 mol sample of the gas?
   Given: Desired

   Equivalences:

   Conversion factors

   Setup:

4. I have 2.61 x 10^{23} C atoms. How many moles is this? How many grams?

   Given units desired units

   Equivalences

   Roadmap

   Conversion factors

   Setup:

5. Calculate the molar mass of NH_3.

What is the mass in grams of 0.25 mol NH_3?

Given: Desired: Equivalence:

Conversion Factors

Setup:

How many moles NH_3 are in 25.0 g?

Given: Desired: Equivalence:

Setup:

6. How many moles of aspirin ($C_9H_8O_4$) are in a 350 mg tablet?

7. How many moles of sodium hydrogen phosphate are in 2.8 g? How many moles of Na^+ ions? How many moles of HPO_4^{2-} ions?

8. Consider the following reaction:

$$Ni\ (s) + 2\ HCl\ (aq) \longrightarrow NiCl_2\ (aq) + H_2(g)$$

ALWAYS make sure equation is balanced!!!!!!!!!!

a) How many moles of nickel will react with 2.40 moles HCl?

Mole ratios: $\frac{1\ mol\ Ni}{2\ mol\ HCl}$ and $\frac{2\ mol\ HCl}{1\ mol\ Ni}$

Setup: 2.40 mol HCl x _____ = [ ]

b) How many moles of $NiCl_2$ are formed if 3.2 moles of HCl are reacted?

Mole ratios: _____ and _____

Setup: 3.2 mol HCl x _____ = ☐

c) How many grams of $NiCl_2$ are produced for every 2.60 mol of Ni reacted?

Mole ratios: _____ and _____

Equivalence: 1 mol $NiCl_2$ = 126.9 g

Additional Conversion factors _____ and _____

Setup: 2.60 mol Ni x _____ x _____ ☐

d) How many grams of HCl is needed to produce 0.6678 g H_2 gas?

Mole ratios: _____ and _____

Equivalences: 1 mol HCl = 36.460 g and 1 mole H_2 = 2.016 g

Additional Conversion Factors:

Setup: 0.6778 g H_2 x _____ x _____ x _____ = ☐

e) Using the information obtained from part c, what is the percent yield if in an experiment 322 g of $NiCl_2$ was recovered?

$$\% \text{ yield} = \frac{\text{actual yield, g}}{\text{theoretical yield , g}} \times 100\ \%$$

theoretical yield _____ actual yield _____

calculation: