**Mass**

**Calculation of the mass of a substance**

**1 Gram = 1 AMU**

**Formula Mass – used to express the mass of any element or compound in AMU or grams**

**Molecular Mass – used to express the mass of molecular substances (none metals only covalent)**

**Gram Formula Mass – used to express the mass of a substance in GRAMS ONLY! (The gram formula mass of H2O is 18g)**

**Ex- H2O NH3 K2SO4**

**H 2x1 = 2 N 1x14 = 14 K 2x39 = 78**

**O 1x16 = 16 H 3x1 = 3 S 1x32 = 32**

**16 + 2 = 18g 14 + 3 = 17 amu O 4x16 = 64**

**64+78+32= 174g**

**Hydrate**

**Hydrate - A substance that has water molecules within its crystalline structure**

**Anhydrous – a hydrate in which the water has been removed from the crystalline structure**

**Copper Sulfate - CuSO4 x 5H2O**

**H2O**

**H2O H2O**

**H2O**

**H2O**

**Gram Formula Mass of a Hydrate**

**CuSO4 x 5H2O**

**Cu 1x64 = 64**

**S 1x32 = 32**

**O 4x16 = 64**

CuSO4

Crystal

**64+64+32= 160**

**5(18) = 90**

**90 + 160 = 250g**

**Percent Composition**

**Mass of Part  
Mass of Whole   
(GFM)**

**X 100**

**What is the percent by mass of Hydrogen in H2O?**

**H 2x1 = 2  
O 1x16 = 16  
2+16= 18**

**X 100 = 11.1%**

**\_\_\_2\_\_   
18**

**The Mole  
The Mole is a unit used measure  
Mole = mol**

**Formula =   
Number of Moles = Given Mass  
 GFM**

**How many moles are present in 50.0g of H2O?**

**\_\_\_50\_\_\_= 2.8  
18**

**Mole Map**

Volume  
1L = 1000 mL

Mass

Molecules, Atoms, Particles

MOLE

**\**

÷ 22.4

× Gram Formula Mass

÷ Gram Formula Mass

× 22.4

× 6.02 × 1023

÷ 6.02 x 1023

**Ex- 36.0g of water  
\_\_2\_\_ Moles**

**\_44.8\_ L**

**1.204 x 1024 Particles**

**Determining the molecular formula when given the empirical formula and the molecular mass**

1. **Determine the Gram Formula Mass**
2. **Molecular Mass  
   Empirical Mass**
3. **Increase the ratio of atoms**
4. **Check**

**Ex- CH2**

**C = 12x1 = 12 \_\_70g\_\_ = 5 moles   
H = 2x1 = 2 14 amu  
12 + 2 = 14 amu**

**Mole Problems using Balanced Equations**

**How many moles of water will be produced when 3 moles of C2H6 under goes combustion?**

**2C2H6 + 7O2 🡪 4CO2 + 6H2O  
 3 X**

**2 = 6  
3 X**

**2X = 18**

**X = 9mol**