Objectives for Chapter 3: Stoichiometry: Calculations with Chemical formulas and Equations.

1. Write word equations and symbolic equations for chemical reactions.
2. Balance chemical equations by inspection.
3. Derive from balanced chemical equation conversion factors for use in stoichiometry calculations.
4. Identify combustion, combination, and decomposition reactions
5. Calculate the formula or molecular weight (mass) of a compound
6. A compound's formula to determine its percent composition.
7. Obtain and use relationships between the mole, the Avogadro's constant (Avogadro's number), and the molar mass of an element.
8. Distinguish between a mole of atoms or particles and a mole of molecules.
9. Describe the atomic mass unit scale and the carbon-12 atom standard of the scale
10. Calculate the number of atoms, ions, formula units, or molecules in a substance from a given mass or vice versa.
11. Predict the combustion products particularly of carbon and hydrogen and carbon-hydrogen-oxygen compounds—and write a balanced equation.
12. Use the percent composition of a compound to determine its empirical formula.
13. Use the masses of the products of the complete combustion of a compound to determine its percent composition or empirical formula
14. Be able to use the formulas for hydrates and other complex compounds in the same ways as those of simpler compounds.
15. Distinguish between formula unit and molecule, empirical formula and molecular formula, and formula mass and molecular mass.
16. Determine the reactant(s) in excess, the limiting reagent, and the amounts of products obtained in a chemical reaction.
17. Define the terms actual yield, theoretical yield, and percent yield and compute these quantities for a given reaction.
18. Calculate the amount of water in a hydrated compound.

Abbreviation for mol	Mol Œ stands for atom, molecule, ion, compound, particle
General mole definition	1 mol Œ = atomic, formula, or molecular mass of Œ in g 1 mol Œ = 6.02×10^{23} atoms, ions, formula units, or molecules of Œ
Mole definitions for substances that exists as atoms, ions, etc.	1 mol Œ = atomic mass Œ in g 1 mol Œ = 6.02×10^{23} Œ formula units
Mole definitions for substances that exist as molecules	1 mol Œ = molecular mass of Œ in g (molar mass) 1 mol Œ = 6.02×10^{23} Œ molecules
Rule for deciding meaning of ambiguous expressions such as "one mole of oxygen"	"One mole of oxygen" might refer either to oxygen molecules or oxygen atoms. When in doubt, assume that the expression refers to that form in which the substance occurs in nature, in this case, oxygen molecule
Name for 6.02×10^{23}	Avogadro's number (N_A)
Percentage composition	Statement of the percentage, by mass of each element in the compound

for a compound	
Simplest formula	Formula that show only the smallest whole-number relationships of atoms in the compound. For the molecular formula $C_6H_{12}O_6$, the simplest formula is CH_2O.
Method for finding the simplest formula from molecular formula	Divide subscripts in molecular formula by largest integer to give a whole number to each subscript. For example, $C_6H_{12}O_6$, 6 is the largest integer that can be divided into each subscript giving an empirical formula of CH_2O
Steps for finding simplest formula from percentage composition and molecular mass	1)Calculate the number of moles of each element in 100g of the compound. 2) Convert these numbers of moles to whole numbers. 3) Divide the smallest number of these moles into the others. You should get whole number ratios. 4) If given the molar mass, divide the formula mass into the molar mass and multiply the simplest formula's subscript by this number to determine the molecular formula.

Of Interest:

- Mass ‰ A in compound = $\frac{\text{mass of A}}{\text{mass compound}}$ X 100
- Empirical formula: mass % each element → moles each element → mole ratio (smallest into largest) or "percent to mass, mass to moles, divide by small, multiply till whole.
- Molecular formula: find empirical formula and empirical formula mass. $\frac{\text{molecular formula mass}}{\text{emperical formula mass}}$ = Ratio of the number of empirical formulas that fit in the molecular formula. Multiply each subscript in the empirical formula by this number combustion data
- If no oxygen present in problem: mass of CO_2 → moles CO_2 → moles of C; mass of H_2O → moles of H_2O→ moles of H; find mole ratio
- Oxygen in formula: mass of CO_2 → moles CO_2 → moles of C → mass of C; mass of H_2O → moles of H_2O→ moles of H → mass of H; mass of sample (C, H, O) - mass C - mass H = mass O→ moles O. find mole ratio