

Unit 1 Study Guide

- Balance the following equations by providing the missing coefficients and identify the type of reaction.
 - $\text{Fe(s)} + \text{O}_2\text{(g)} \rightarrow \text{Fe}_2\text{O}_3\text{(s)}$
 - $\text{C}_2\text{H}_4\text{(g)} + \text{O}_2\text{(g)} \rightarrow \text{CO}_2\text{(g)} + \text{H}_2\text{O(g)}$
 - $\text{Al(s)} + \text{HCl(aq)} \rightarrow \text{AlCl}_3\text{(aq)} + \text{H}_2\text{(g)}$
- Calculate the percentage of nitrogen, by mass, in $\text{Ca(NO}_3)_2$.
- How many oxygen atoms are in 0.25 mol $\text{Ca(NO}_3)_2$?
- How many oxygen atoms are in 1.50 grams of sodium carbonate?
- How many moles of sodium bicarbonate (NaHCO_3) are in 508 g of NaHCO_3 ?
- How many nitric acid molecules are in 4.20 g of HNO_3 ?
- A compound contains 37.51% C, 3.15% H, and 59.34% F by mass. The compound has a molar mass of 96.052 g/mol.
 - Determine the empirical formula of the compound.
 - Determine the molecular formula of the compound.
- Caproic acid, which is responsible for the foul odor of dirty socks, is composed of C, H, and O atoms. Combustion of a 0.225 g sample of this compound produces 0.512 g CO_2 and 0.209 g H_2O .
 - What is the empirical formula of caproic acid?
 - Caproic acid has a molar mass of 116 g/mol. What is its molecular formula?
- Zinc metal reacts with hydrochloric acid to produce hydrogen gas and zinc chloride.
 - Write the balanced equation for this reaction.
 - Identify the type of reaction.
 - If 5.00 g of zinc and 5.00 g of hydrochloric acid are mixed and allowed to react, which is the limiting reactant?
 - What is the theoretical yield in grams of hydrogen gas?
 - How much grams of excess reactant remain?
- Imagine that you are working on ways to improve the process by which iron ore containing Fe_2O_3 is converted into iron. In your tests you carry out the following reaction on a small scale:
$$\text{Fe}_2\text{O}_3\text{(s)} + 3\text{CO(g)} \rightarrow 2\text{Fe(s)} + 3\text{CO}_2\text{(g)}$$
 - If you start with 150 g of Fe_2O_3 as the limiting reagent, what is the theoretical yield of Fe?
 - If the actual yield of Fe in your test was 87.9 g, what was the percent yield?
 - What was the percent error?
- A student is to determine the formula of a hydrate of ZnSO_4 . He heats the hydrate in a crucible driving off all the water in the hydrate. His results are recorded in the data table below.

Mass of Empty Crucible	15.013 g
Mass of Hydrate and Crucible	17.580 g
Mass of Anhydrous Salt and Crucible	16.454 g

- Determine the mass of the hydrate before heating.
 - Determine the mass of water in the hydrate.
 - Determine the percent composition of water in the hydrate.
 - Determine the formula and name of the hydrate.
- Review sig figs, naming, and writing formulas.