Chemistry 20 Final
Review

Stoichiometry Checklist

Have you mastered the concepts, applications, and skills associated with the following items? Check them off when you are confident in your understanding.

Knowledge

- identify limitations and assumptions about chemical reactions
- write balanced ionic and net ionic equations, including identification of spectator ions, for reactions taking place in aqueous solutions
- recognize limiting and excess reagents in chemical reactions
- calculate quantities of reactants and/or products involved in chemical reactions using gravimetric, solution, or gas stoichiometry
- define predicted (theoretical) and experimental (actual) yields, and explain the discrepancy between the
- identify sources of experimental uncertainty in experiments

Key Terms

quantitative reaction	stoichiometric reaction
net ionic equation	spectator ion
limiting reagent	excess reagent
stoichiometry	theoretical
yield gravimetric stoichiometry yield	percent
gas stoichiometry	solution stoichiometry

Stoichiometry Questions for Review
Mole to Mole Problems

1. How many moles of hydrogen gas are produced if 0.500 mol of water are decomposed? (0.500 mol)

2. Sulfur reacts with barium oxide to produce barium sulfide and oxygen gas.
   a. How many moles of elemental sulfur are needed if 2.00 mol of barium oxide are used? (0.250 mol)

   b. How many moles of barium sulfide are produced from 0.100 mol of sulfur? (0.800 mol)

3. The combustion of methane gas takes place in the presence of oxygen gas to produce carbon dioxide and water vapor (the compounds produced when you burn a hydrocarbon)
   a. How many moles of oxygen gas are needed to completely burn 3.00 mol of methane gas? (6.00 mol)

   b. How many moles of water vapor are produced from 0.0400 mole of methane gas? (0.0800 mol)

4. Iron (II) phosphate reacts with tin (IV) nitride to produce iron (II) nitride and tin (IV) phosphate.
   a. How many moles of tin (IV) nitride are needed to produce 0.500 mol of iron (II) nitride? (0.250 mol)

   b. How many moles of iron (II) phosphate are used when 0.045 mol of tin (IV) nitride also react? (0.090 mol)

1. When 6.5 mol of potassium chlorate solid breaks down to the simpler compound of potassium chloride and oxygen gas, what mass of KCl (s) would be produced? (4.8×10^2 g)

2. When an excess of silver reacts with 3.45 moles of zinc phosphate, what mass of silver phosphate would be produced? (2.87×10^3 g)

3. In neutralization of sulfuric acid solution, 4.56 mol of sodium hydroxide was used. What mass of water would be produced in this reaction? (82.2 g)

4. When iron (II) hydroxide reacts with cobalt (II) phosphate, iron (II) phosphate and cobalt (II) hydroxide are formed. If 3.00 mol of iron (II) hydroxide react, what mass of cobalt (II) phosphate is needed?
   (367 g)

5. For each of the following questions indicate which reactant is the limiting reagent, and which is the reagent in excess. You may need to complete a balanced chemical equation before answering the question.
   a. 25 grams of zinc reacts with 75 g of nitric acid. What mass of zinc nitrate is produced? (72.4 g)

   b. 15 g of sodium hydroxide reacts with 26 g of hydrochloric acid. What mass of sodium chloride is produced? (22 g)

   c. 2.0 g of methane reacts with 7.0 g of oxygen. How many grams of carbon dioxide is produced? (4.8 g)

6. When 84.8 g of iron(III) oxide react with an excess of carbon monoxide, then 57.8 g of iron are produced. $Fe_2O_{3(s)} + 3CO_{(g)} \rightleftharpoons 2Fe_{(s)} + 3CO_{2(g)}$
   What is the percent yield of this reaction?
   (97.5%)

7. When 50.0 g of silicon dioxide are heated with an excess of carbon, 32.2 g of silicon carbide are produced.
   $$SiO_{2(g)} + 3C_{(s)} \rightleftharpoons SiC_{(s)} + 2CO_{(g)}$$

What is the percent yield of this reaction?
(96.5%)

8. What is the percent yield if 3.74 g of copper are produced when 1.87 g of aluminum are reacted with 14.5 g of copper (II) sulfate? (64.8%)