**GENERAL & ANALYTICAL CHEMISTRY I**

**CHMG-141**

With Dr. Bailey Name\_\_\_\_\_\_\_\_\_\_\_\_

Recitation

Week 8

**Part 1: Molecular geometry**

Complete the following table:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Central atom | Total Number of “charged clouds” (electron groups) in central atom | Number of bonding “charge clouds” in central atom | Number of nonbonding electron pairs on central atom | Lowes Dot Structure around central atom | Electron pair geometry of central atom | Bond angles | Molecular geometry of central atom |
| P | 4 | 3 | 1 |  | Tetrahedral |  | Trigonal pyramidal |
| P | 4 | 4 | 0 |  |  |  |  |
| P | 5 | 5 | 0 |  |  |  |  |
| S | 6 | 6 | 0 |  |  |  |  |
| S | 6 | 4 | 2 |  |  |  |  |
| S | 5 | 4 | 1 |  |  |  |  |
| S | 5 | 3 | 2 |  |  |  |  |
| S | 4 | 2 | 2 |  |  |  |  |
| S | 3 | 2 | 1 |  |  |  |  |
| O | 4 | 2 | 2 |  |  |  |  |
| C | 2 | 2 | 0 |  |  |  |  |
| Xe | 5 | 2 | 3 |  |  |  |  |

**Part 2: Stoichiometry**

**Concepts you should know:**

1. Mole conversions: moles ↔ grams
2. Determine molar mass
3. Balancing chemical equations
4. Mass Relationships in Chemical Reactions: Stoichiometry
5. Limiting Reactant Problems
6. **Mole conversions. Answer the questions, show solutions including units and conversion factors:**
   * 1. How many moles of hydrogen peroxide [H2O2] are in 7.35 grams?
     2. 9.80 moles of CuSO4 are how many grams?
     3. How many moles of NH3 are in 5.00X1022 molecules?
     4. What is the mass of 37.5X1027 CO molecules?
     5. There are how many atoms of hydrogen are in 4.20 moles of water?
     6. How many atoms (total) are in 62.0 g SO2?

1. **Balance the equations:**
2. S + O2→ SO3
3. CaC2 + H2O → Ca(OH)2 + C2H2
4. VCl3 + Na + CO → V(CO)6 + NaCl
5. Rul3 + CO + Ag → Ru(CO)5 + Agl
6. CoS + CO + Cu → Co2(CO)8 + Cu2S
7. Pb(NO3)2 (aq) + K3PO4 (aq) 🡪 Pb3(PO4)2 (s) + KNO3 (aq)
8. **Mass Relationships in Chemical Reactions: Stoichiometry;**

**Limiting Reactant Problems**

1. Consider the reaction

**N2 (g) + O2 (g) → NO (g)**

1. Balance the equation.
2. How many g NO can be produced when 25.0 g of nitrogen reacts?
3. How many g NO can be produced when 25.0 g of oxygen reacts?
4. **Based on your answers in a and b, predict the amount of NO that can be produced when 25.0 g nitrogen is reacted with 25.0 g of oxygen (both reactants are mixed).**
5. Based on your answer in d, determine the number of grams of the reactant that is not the limiting reagent are left over.

**2).** When aluminum reacts with oxygen, aluminum oxide is formed. Aluminum is a very reactive metal, yet we use aluminum foil to protect food from spoiling. According to the simple principles of Chemistry the aluminum should be reacting with the food! The reason this does not occur is that the wrap we use naturally becomes coated with an amount of aluminum oxide, which is essentially very stable, and thus non-reactive.

**In the reaction between equal amounts of aluminum and oxygen gas how much aluminum oxide is formed?** 12.50 grams of aluminum and 12.50 grams oxygen gas are reacted.

**Your strategy:**

1. Determine the formula for aluminum oxide.
2. Determine the balanced equation for the reaction between aluminum and oxygen gas.
3. Calculate the number of moles of aluminum given.
4. Calculate the number of moles of oxygen given.
5. If aluminum were the limiting reagent, how many moles of aluminum oxide would be formed?
6. If oxygen were the limiting reagent, how many moles of aluminum oxide would be formed?
7. **Which reactant is the limiting reagent?**
8. How many moles of product are formed?
9. **How many grams of product are formed?**
10. What information identifies a problem as a limiting reagent problem