

Review sheet for chapters 1-3

Chapter 1:

1. Describe each step of the scientific method
2. Define independent variable and dependent variable
3. Explain the terms theory and scientific law

Chapter 2

1. Define a base unit and derived unit
2. What are the SI units for time, length, mass, volume, density and temperature?
3. Write the rules for significant figures?
4. Determine how many sig figs **and** place the following numbers in scientific notation:
 - a. 0.0009
 - b. 120000
 - c. 102.23
 - d. 103
5. Write the rules for multiplying and dividing sig figs
6. Multiply and Divide the following numbers using sig figs
 - a. $123 / 13$
 - b. 1563×4.5
 - c. $13.25 / 5$
 - d. $100 / 5.2$
7. Define accuracy and precision
8. Find the percent error in the following:
 - a. Susan got 11 grams out of her experiment but she expected to get 25 grams
 - b. Miriam expected to get 2.3 grams of a substance but only got 1.2 grams

Chapter 3

1. Define the three main states of matter
2. Draw a picture of what each state of matter looks like on a molecular level
3. What are the differences between physical and chemical properties? What are the differences between extensive and intensive properties?
4. Determine whether the following are Physical (P) or Chemical © properties. If they are physical determine if they are Extensive (PE) or Intensive (PI)?
 - a. Iron rusting
 - b. Copper having a reddish color
 - c. A sample of water having a mass of 18 grams
 - d. Copper turning green when outside for a long time
5. What is the difference between a chemical and physical change
6. Determine if the following are chemical or physical changes
 - a. Crushing an aluminum can
 - b. Melting ice
 - c. Burning paper
 - d. Burning magnesium to become magnesium oxide
7. State the law of conservation of matter
8. Define mixture

9. Define heterogeneous mixture and homogeneous mixture
10. Determine if the following are mixtures or pure substance. If they are mixtures, state whether they are homogeneous or heterogeneous mixtures
 - a. Water
 - b. A salad
 - c. Carbon dioxide
 - d. Chocolate chip cookies
 - e. Sweet tea
 - f. oxygen
11. Define the following separation techniques:
 - a. filtration
 - b. distillation
 - c. crystallization
 - d. chromatography
12. What are the differences between an element and a compound?
13. Determine if the following are elements or compounds
 - a. Hydrogen
 - b. Water
 - c. Carbon monoxide
 - d. Oxygen

Chapter 4

1. What is Dalton's Atomic Theory
2. What is an atom
3. What are the differences between protons, neutrons, and electrons? Where are they located in the atom?
4. Describe the plum pudding model, who came up with it?
5. Explain Rutherford's gold foil experiment. What did he discover from this?
6. What is an isotope?
7. Fill in the following table:

Element name	Element symbol	Atomic mass	Protons	Neutrons	electrons
	Na			12	
Calcium		41			
		14	7		
Bromine				45	

8. Describe what radioactivity is and what its purpose is?
9. Describe and draw the symbol for the following radiation:
 - a. Alpha
 - b. Beta
 - c. Gamma
10. Write out the following equations:
 - a. The alpha decay of ^{145}Ce
 - b. The beta decay of ^{247}Cm
 - c. The alpha decay of ^{240}U

Chapter 5

1. Define the following terms and label each on a drawing of a wave
 - a. Wavelength
 - b. Frequency
 - c. Amplitude
 - d. Crest
 - e. Trough
2. Describe the electromagnetic spectrum
3. Define a quantum and what it means in an atom
4. What does it mean for an electron to be in ground state?
5. What was important about Heisenberg uncertainty principle with the development of the atom
6. What is a principal quantum number? How can you find it on the periodic table?
7. What is a sublevel? What are the four sublevels and where are they located on the periodic table
8. How many orbitals do each sublevel have?
9. What are shapes of the S and P sublevels' orbitals?
10. Describe aufbau principle, pauli exclusion principle and hund's rule
11. What are valance electrons and how can you find them on the periodic table?
12. For the following atoms, draw the electron configuration, orbital diagram, noble gas configuration and Lewis dot structure:
 - a. Nitrogen
 - b. Aluminum
 - c. Potassium
 - d. Selenium
 - e. Magnesium

Chapter 6

1. Who developed our modern periodic table?
2. What are groups and periods on the periodic table?
3. Where can you find the representative and transition elements on the periodic table?
4. What are the properties of Metals, Nonmetals, and Metalloids
5. Where can alkali metal be found and why are they so reactive
6. Where can the alkaline earth metals be found
7. Where are the transition metals
8. Where are the lanthanide series and the actinide series?
9. Where are the halogens and why are they so reactive
10. Where are the noble gases and why are they nonreactive
11. State what the trends are on the periodic table:
 - a. Atomic radius
 - b. Electronegativity
 - c. Ionization energy
12. For the following set of atoms state which one has the largest atomic radius
 - a. Carbon or fluorine
 - b. Magnesium or calcium
 - c. Boron or gallium
 - d. Sodium or silicon

13. For the following set of atoms state which one has the largest electronegativity

- Carbon or fluorine
- Magnesium or calcium
- Born or gallium
- Sodium or silicon

14. For the following set of atoms state which one has the largest ionization energy

- Lithium or sodium
- Beryllium or carbon
- Aluminum or sulfur
- Oxygen or selenium

Chapter 7 and Chapter 8:

- Define a chemical bond
- State what a cation and anion is, give an example for each, and explain how it became this way?
- State the octet rule.
- State two differences between an ionic and covalent compound
- Explain in steps how to name an ionic compounds
- Explain in steps how to name a covalent compound.
- Explain in steps how to name acids
- Name or write the chemical formula for the following compounds

<u>Formula</u>	<u>Name</u>	<u>Formula</u>	<u>Name</u>
NaCl			Iron (II) Oxide
NO ₂			Phosphic acid
Al ₂ O ₃			Disilicon tetrachloride
Mn ₃ N			Lithium Fluoride
H ₂ CO ₃			Nitrogen trihydride
CF ₄			Copper (II) Chloride
CaS			Hydrosulfic acid
CrO			Potassium Sulfate
ClF ₅			Hydrofluoric acid
HNO ₂			Mg ₃ (PO ₄) ₂
Fe ₂ S ₃			Hydronitric acid

Chapter 9: Understand how to write and balance reactions. Understand types of reactions. Be able to predict products of reactions

- State the definition of a chemical reaction
- Define a reactant and a product
- State the five signs of a chemical change and give an example for each.

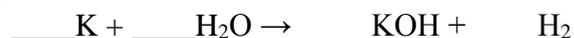
4. Write the skeleton equation for the following word equations and balance each equation.
 - A. Solid sodium reacts with chlorine gas to form solid sodium chloride
 - B. Aqueous sodium bromide reacts with aqueous sulfuric acid to form aqueous sodium sulfate and aqueous hydrobromic acid
 - C. Aqueous calcium oxide reacts with solid lithium to form aqueous lithium oxide and solid calcium
 - D. Liquid water breaks down into hydrogen gas and oxygen gas
5. State the five types of chemical reactions and give an example of each type.
6. Balance the following reactions and state what type of reaction it is:
 - A. $\underline{\quad}\text{Cr} + \underline{\quad}\text{O}_2 \rightarrow \underline{\quad}\text{Cr}_2\text{O}_3$
 - B. $\underline{\quad}\text{AgNO}_3 + \underline{\quad}\text{K}_3\text{PO}_4 \rightarrow \underline{\quad}\text{Ag}_3\text{PO}_4 + \underline{\quad}\text{KNO}_3$
 - C. $\underline{\quad}\text{C}_6\text{H}_{16} + \underline{\quad}\text{O}_2 \rightarrow \underline{\quad}\text{CO}_2 + \underline{\quad}\text{H}_2\text{O}$
 - D. $\underline{\quad}\text{Ca} + \underline{\quad}\text{HCl} \rightarrow \underline{\quad}\text{CaCl}_2 + \underline{\quad}\text{H}_2$
 - E. $\underline{\quad}\text{P}_4 + \underline{\quad}\text{O}_2 \rightarrow \underline{\quad}\text{P}_2\text{O}_5$
 - F. $\underline{\quad}\text{NaClO}_3 \rightarrow \underline{\quad}\text{NaCl} + \underline{\quad}\text{O}_2$
 - G. $\underline{\quad}\text{C}_3\text{H}_8 + \underline{\quad}\text{O}_2 \rightarrow \underline{\quad}\text{CO}_2 + \underline{\quad}\text{H}_2\text{O}$

Chapter 10: Know how to convert from particles to moles to grams, using molar mass and Avogadro's number.

1. State the definition of a mole.
2. Calculate the following:
 - a. How many grams are in 3.5 moles of Gallium Oxide
 - b. How many moles are in 4.5×10^{24} formula units of calcium chloride
 - c. How many formula units are in 0.25 moles of lithium sulfate
 - d. How many grams are in 1.7×10^{23} molecules of carbon tetrachloride
 - e. How many grams are in 7.9 moles of Nitrogen
 - f. How many grams are in $.78 \times 10^{25}$ formula units of iron (III) oxide

Chapter 11: Be able to use stoichiometry to calculate grams. Understand and be able to calculate limiting reactants and percent yield.

1. State the definition of Stoichiometry
2. Determine the molar ratios for the following reactions:
 - A. $\underline{\quad}\text{Al} + \underline{\quad}\text{H}_2\text{SO}_4 \rightarrow \underline{\quad}\text{H}_2 + \underline{\quad}\text{Al}_2(\text{SO}_4)_3$
 - B. $\underline{\quad}\text{H}_2\text{O} \rightarrow \underline{\quad}\text{H}_2 + \underline{\quad}\text{O}_2$
3. Using Stoichiometry and the equations above (Question 2), calculate the following:
 - A. If 5 grams of Aluminum reacts with sulfuric acid, how many grams of hydrogen will be formed?
 - B. If 25 grams of oxygen were produced how many grams of water did the reaction start with?
 - C. If 15 grams of aluminum sulfate are formed how many grams of sulfuric acid did the reaction start with?
4. Explain limiting reactants and excess reactants.
5. If 15.6 grams of potassium reacts with 25.6 grams of water according to the reaction below, how many grams of hydrogen gas will be produced? Determine the limiting reactant.



6. If 125 grams of phosphorus reacts with 345 grams of oxygen according to the reaction below, how many grams of diphosphorus pentaoxide are formed? Determine the limiting reactant.



7. For the number 6 above, what is the percent yield if 235 grams of diphosphorus pentaoxide are actually formed?

Chapter 13: Be able to use the ideal gas law and gas stoichiometry

- Complete the following problems using the ideal gas law: $PV = nRT$ ($R = 0.0821$)
 - What is the pressure of a 5.00L container at 25.0C that contains 23.4 grams of chlorine gas (remember diatomics)?
 - What is the temperature of a 7.89L container that has 1.25 moles of gas held at 1.50 atm?
 - How many moles can be found in a 2.00L container at 45.0C and 1.00atm?
 - What is the volume of a container that has 4.56 moles of gas held at 15.0C and 3.45 atm?
- Complete the following problems using gas stoichiometry (remember 22.4L = 1 mole)
 - Using the following reaction, if 54.6 L of hydrogen gas are produced, how many grams of sodium did the reaction start with?

$$\underline{\hspace{1cm}} \text{H}_2\text{CO}_3 + \underline{\hspace{1cm}} \text{Na} \rightarrow \underline{\hspace{1cm}} \text{Na}_2\text{CO}_3 + \underline{\hspace{1cm}} \text{H}_2$$
 - If 345 grams of ammonium carbonate decomposes, how many liters of carbon dioxide would be produced?

$$\underline{\hspace{1cm}} (\text{NH}_4)_2\text{CO}_3 \rightarrow \underline{\hspace{1cm}} \text{NH}_3 + \underline{\hspace{1cm}} \text{CO}_2 + \underline{\hspace{1cm}} \text{H}_2\text{O}$$
 - If 45.6 L of carbon dioxide are collected from the following reaction, how many grams of sodium carbonate did the reaction start with?

$$\underline{\hspace{1cm}} \text{Na}_2\text{CO}_3 + \underline{\hspace{1cm}} \text{HCl} \rightarrow \underline{\hspace{1cm}} \text{H}_2\text{O} + \text{CO}_2 + \underline{\hspace{1cm}} \text{NaCl}$$

Chapter 14: Be able to calculate molarity and use the dilution formula

- State the definition of concentration.
- What is a solution? Explain the difference between solute and solvent
- Using the formula for Molarity and Dilutions, calculate the following:
 - What is the molarity for a solution containing 5.76 moles of a substance dissolved in 1.54L
 - What is the molarity of a solution containing 467.5 grams of Potassium sulfate dissolved in 56.7L
 - What is the new molarity of a 578.9mL solution when the original solution was 56.7mL with a molarity of 5.6M.
 - If 345mL of 1.50M solution is diluted to make a solution with a molarity of 0.50M, what is the volume of the new solution?
- Define the following terms:
 - Soluble
 - Insoluble
 - Unsaturated
 - Saturated
 - Super saturated