

**AP Chemistry Summer Assignment**

The goal of this assignment is to make sure that everyone has the fundamentals that they will need to be successful in Honors Chemistry II & AP Chemistry. You should have had all of this material in your general chemistry course. It is important to refresh your memory before we delve into the higher level chemistry topics. I have included most of the rules and equations, etc. for solving these problems. The assignment will be graded for completion and will be due on the first day of class. We will also have a quiz covering some of these topics during the first week of class, so it is important to review before school starts. Have a great summer! I look forward to doing some exciting chemistry next year!!!

**Show all work on Math Problems!!!****Unit Conversions**

Memorize these!	1 L = 1000 mL (milli)	1 L = $1 \times 10^6$ $\mu$ L (micro)
	1 kg = 1000 g (kilo)	1 m = $1 \times 10^9$ nm (nano)
	1 m = 100 cm (centi)	K = $^{\circ}$ C + 273

- 1) 60 kg = \_\_\_\_\_ g
- 2) 62 cm = \_\_\_\_\_ m
- 3) 1.5 mL = \_\_\_\_\_ L
- 4) 5.3 L = \_\_\_\_\_  $\mu$ L
- 5)  $6.2 \times 10^4$  nm = \_\_\_\_\_ m
- 6)  $30^{\circ}$ C = \_\_\_\_\_ K
- 7) 500 K = \_\_\_\_\_  $^{\circ}$ C

**Density = mass / volume**

- 1) What is the density of an object that has a mass of 5 g and occupies 5 cm<sup>3</sup>? \_\_\_\_\_
- 2) What is the mass of a 5 L gas that has a density of 2.3 g/L? \_\_\_\_\_
- 3) What is the volume of a 0.03 g object that has a density of 4.8 g/mL? \_\_\_\_\_

**Atomic Number, Mass Number, Isotopes**

Atomic number = # of protons; Mass Number = # of protons and neutrons;

Isotopes of an element have a different number of neutrons which gives them different masses.

- 1) How many protons, neutrons, and electrons are in  $^{50}\text{Cr}^{3+}$ ? \_\_\_ p+, \_\_\_ n, \_\_\_ e-
- 2) How many protons, neutrons, and electrons are in  $^{80}\text{Br}^{1-}$ ? \_\_\_ p+, \_\_\_ n, \_\_\_ e-
- 3) How many protons, neutrons, and electrons are in Te-127? \_\_\_ p+, \_\_\_ n, \_\_\_ e-
- 4) Circle the two that are isotopes:  $^{59}_{42}\text{Z}$ ,  $^{59}_{23}\text{Z}$ ,  $^{61}_{42}\text{Z}$

**Electron Configuration - Energy levels and sublevels**

Hint:  $1s^2 2s^2 \dots$  etc.

- 1) What is the electron configuration for a Nitrogen atom? \_\_\_\_\_
- 2) What is the electron configuration for a Magnesium ion? \_\_\_\_\_
- 3) How many valence electrons does this atom have:  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$ ? \_\_\_\_\_

**Periodic Trends - radius, ionization energy, electron affinity (electronegativity), oxidation states**

- Atomic Radius (size): Top to Bottom -increases because you are adding energy levels;  
Left to Right - decreases because you add protons which pulls in the electrons closer.
- Ionization Energy (energy needed to remove an e-): Highest = He, Lowest = Fr
- Electron Affinity (Electronegativity; pull for e-): Highest = F, Lowest = Fr
- Oxidation States = Charges

- 1) Use the following elements: K, Ca, Sn, I
  - a. Which has the smallest radius? \_\_\_\_
  - b. Which has the largest radius? \_\_\_\_
  - c. Which has the greatest electron affinity? \_\_\_\_
  - d. Which has the smallest electron affinity? \_\_\_\_
  - e. Which has the greatest ionization energy? \_\_\_\_
  - f. Which has the lowest ionization energy? \_\_\_\_
- 2) Give the oxidation number of each of the elements below:
  - a. Strontium: \_\_\_\_
  - b. Nitrogen: \_\_\_\_
  - c. Gallium: \_\_\_\_
  - d. Argon: \_\_\_\_

### Naming Ionic and Covalent Compounds

Ionic (Metal + Nonmetal, or polyatomic ion)– change the ending to -ide (except for polyatomic ions), include Roman Numerals if the first element is a transition metal (not Ag, Cd, or Zn) or if it is Sn or Pb.

Covalent (Nonmetal + Nonmetal): use prefixes; change ending to -ide.

- 1)  $Mg(NO_3)_2$  = \_\_\_\_\_
- 2)  $(NH_4)_2SO_4$  = \_\_\_\_\_
- 3)  $S_2O_4$  = \_\_\_\_\_
- 4)  $NO_3$  = \_\_\_\_\_
- 5)  $CuNO_3$  = \_\_\_\_\_
- 6)  $PbSO_4$  = \_\_\_\_\_
- 7)  $CrO_2$  = \_\_\_\_\_

### Naming Acids

Polyatomic ion ends in -ate → -ic acid

Polatomic ion ends in -ite → -ous acid

Ends in just an element (-ide) → hydro- -ic acid

- 1) HCl: \_\_\_\_\_
- 2)  $H_2SO_4$ : \_\_\_\_\_
- 3)  $HNO_2$ : \_\_\_\_\_
- 4) HBr: \_\_\_\_\_
- 5)  $HNO_3$ : \_\_\_\_\_
- 6)  $H_3PO_4$ : \_\_\_\_\_

### Write Formulas from Names

Ionic: criss-cross charges to find subscripts; reduce to simplest ratio

Covalent: the prefixes give you the subscripts

Acids: Start with an "H", choose appropriate anion, criss-cross

- 1) Dinitrogen tetroxide: \_\_\_\_\_
- 2) Chromium (VI) sulfide: \_\_\_\_\_
- 3) Magnesium oxide: \_\_\_\_\_
- 4) Calcium cyanide: \_\_\_\_\_
- 5) Lead (II) sulfate: \_\_\_\_\_
- 6) Ammonium carbonate: \_\_\_\_\_
- 7) Phosphorus tribromide: \_\_\_\_\_
- 8) Hydrofluoric acid: \_\_\_\_\_
- 9) Acetic acid: \_\_\_\_\_

10) Sulfurous acid: \_\_\_\_\_

**Mass Percent (Percent Composition)**

Put the mass of the element (multiplied by the number of atoms) over the mass of the total compound and multiply by 100.

1) What is the mass percent of oxygen in  $\text{Sr}(\text{NO}_3)_2$ ? **Show your work here:**2) What is the mass percent of Cu in copper (II) nitrate? **Show your work here:****Empirical & Molecular Formulas**

Empirical Formula (simplest ratio): Change the percent to grams. Convert grams to moles. Divide by the smallest number of moles. The numbers are the subscripts.

Molecular Formula (a multiple of the empirical formula): You will be given the molecular mass. Divide the molecular mass by the mass of the empirical formula. Multiply the subscripts by the number you get.

1) What is the empirical formula if the mass percents are 75% Carbon and 25% Hydrogen?

2) What is the molecular formula of the above compound if the molecular weight is 64 g/mol?

**Balancing Chemical Equations & Types of Chemical Reactions**

Complete the following reactions, balance, and label the type.

**Stoichiometry**1. How many liters of  $\text{H}_2\text{O}$  are produced from 8.3 g of  $\text{O}_2$  and excess hydrogen at STP according to the following reaction:  $\text{O}_2 + 2\text{H}_2 \rightarrow 2\text{H}_2\text{O}$ 2. What mass of sodium chloride is produced when chlorine reacts with 0.29g of sodium iodide according to the following reaction:  $\text{Cl}_2 + 2\text{NaI} \rightarrow 2\text{NaCl} + \text{I}_2$

**Molarity**

1. What is the molarity of a solution of HCl with 20 moles in 500 mL?
2. How much volume would be needed to make a 3.0 Molar solution of NaOH if you dissolve 50 grams into water?
3. How many grams of iron (II) oxide would be needed to make a 1.5 M solution with 800 mL of water?
4. How much volume would be needed to dilute 2 liters of a 6.0 M solution of HCl to 3.0 M?

**Gas Laws – Combined, Ideal**

1. A gas has a pressure of 120 kPa and a volume of 45 L. If the temperature remains constant, but the volume is reduced to 20 L, what is the final pressure?
2. If 1.5 moles of a gas are put into a container that holds 20 L at a temperature of 25°C, what pressure (in atm) would it be?
3. A gas has a temperature of 30°C and it occupies a space of 600 mL at 580 torr. If its conditions change so that it is at STP, what is the final volume?
4. A sample of oxygen has a pressure of 1.3atm, a sample of hydrogen has a pressure of 0.8atm, and a sample of nitrogen has a pressure of 1.5atm. If all three gases are combined into a single container, what would the total pressure of the gas mixture be?
5. A gas at constant volume experiences a pressure change from 2.1 atm to 780 torr. If the final temperature was 20°C, what was the initial temperature?