



HOLMDEL TOWNSHIP SCHOOL DISTRICT

"A COMMITMENT TO EXCELLENCE"

Office of Science and Mathematics

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To My Future AP Chemists:

Welcome to AP Chemistry!

I hope you are all ready for a fun, yet challenging year. Students who finish AP Chemistry come out with a much better understanding of the world around them. They also come out with a sense of great accomplishment. AP Chemistry is a difficult class, but with determination and perseverance, you will surely succeed! Like almost all AP classes, AP Chem comes with a summer assignment. Previous AP students have designed this assignment-it is what they think is important to review and know before starting class in the fall. This assignment will be graded in the first few days of class. There will be a test on the material the first week of class. Don't procrastinate!

Enjoy your summer; take July off, but realize that come August, you must put in the time for get these set in your minds. Why the rush? The AP Chemistry test is the very first AP test, on Monday, May 7th, 2018. We have to finish everything by the end of March so that we can review for the month of April. HHS students have ALWAYS performed incredibly well in the past years, with a great majority (> 80%) getting 5's. Magic? Nope, but plain and unadulterated hard work. You are all capable of earning 5's, but you must work for it!

Please check your email frequently towards the end of August for emails from me. You may always email me at: jblaha@holmdelschools.org.

AP CHEMISTRY FIRST WEEK TEST

AP Chemistry is a difficult course. It is not all about memorization; however, having these items memorized is essential for success in learning the concepts covered in the course. Make flashcards, have your friends and family quiz you, take the lists with you on vacation, or do whatever it takes to get this information firmly planted in your head. Do not wait until the night before school begins. The first day test will cover six areas of memorization:

1. Polyatomic Ions (including name, symbol and charge)
2. Variable Valences for Transition Metals
3. Rules for Naming Acids
4. Rules for Naming Ionic Compounds
5. The Solubility Rules
6. Determining Oxidation Numbers

See you soon!

Dr. Blaha

Rules for Determining Oxidation Number

Oxidation Number: A number assigned to an atom in a molecular compound or molecular ion that indicates the general distribution of electrons among the bonded atoms.

1. The oxidation number of any uncombined element is 0.
2. The oxidation number of a monatomic ion equals the charge on the ion.
3. The more electronegative element in a binary compound is assigned the number equal to the charge it would have if it were an ion.
4. The oxidation number of fluorine in a compound is always -1 .
5. Oxygen has an oxidation number of -2 unless it is combined with F, when it is $+2$, or it is in a peroxide, when it is -1 .
6. The oxidation state of hydrogen in most of its compounds is $+1$ unless it is combined with a metal, in which case it is -1 .
7. In compounds, the elements of groups 1 and 2 as well as aluminum have oxidation numbers of $+1$, $+2$, and $+3$, respectively.
8. The sum of the oxidation numbers of all atoms in a neutral compound is 0.
9. The sum of the oxidation numbers of all atoms in a polyatomic ion equals the charge of the ion.

Solubility Rules

1. All compounds containing alkali metal cations and the ammonium ion are soluble.
2. All compounds containing NO_3^- , ClO_4^- , ClO_3^- , and $\text{C}_2\text{H}_3\text{O}_2^-$ anions are soluble.
3. All chlorides, bromides, and iodides are soluble except those containing Ag^+ , Pb^{2+} , or Hg^{2+} .
4. All sulfates are soluble except those containing Hg^{2+} , Pb^{2+} , Sr^{2+} , Ca^{2+} , or Ba^{2+} .
5. All hydroxides are insoluble except compounds of the alkali metals, Ca^{2+} , Sr^{2+} , and Ba^{2+} .
6. All compounds containing PO_4^{3-} , S^{2-} , CO_3^{2-} , and SO_3^{2-} ions are insoluble except those that also contain alkali metals or NH_4^+ .

Variable Valences for Transition Metals: Pay attention to mercury(I)!

Zinc (I)	Zn^{1+}
Zinc (II)	Zn^{2+}
Antimony (III)	Sb^{3+}
Antimony (V)	Sb^{5+}
Bismuth (III)	Bi^{3+}
Bismuth (V)	Bi^{5+}
Silver(I)	Ag^{1+}
Gold (I)	Au^{1+}
Gold (III)	Au^{3+}
Tin (II)	Sn^{2+}
Tin (IV)	Sn^{4+}
Mercury(I)	Hg^{1+}
Mercury(II)	Hg^{2+}
Nickel (II)	Ni^{2+}
Nickel(III)	Ni^{3+}
Lead(II)	Pb^{2+}
Lead (VI)	Pb^{4+}
Copper(I)	Cu^{1+}
Copper(II)	Cu^{2+}
Cobalt(II)	Co^{2+}
Cobalt(III)	Co^{3+}
Iron (II)	Fe^{2+}
Iron (III)	Fe^{3+}
Manganese (II)	Mn^{2+}
Manganese (III)	Mn^{3+}
Chromium (II)	Cr^{2+}
Chromium (III)	Cr^{3+}

**Naming and writing chemical formulas is an essential skill to know before starting AP
Chemistry.**

Rules for Naming an Acid

1. When the name of the anion ends in -ide, the acid name is 'hydro _____ ic acid'
Example: Cl⁻ is the Chloride ion so HCl = hydrochloric acid
2. When the anion name ends in -ite, the acid name is the stem of the anion with the suffix -ous, followed by the word acid. -ite becomes _____ ous Acid
Example: ClO₂⁻ is the Chlorite ion so HClO₂ = Chlorous acid.
3. When the anion name ends in -ate, the acid name is the stem of the anion with the suffix -ic, followed by the word acid. -ate becomes _____ ic Acid
Example: ClO₃⁻ is the Chlorate ion so HClO₃ = Chloric acid.

Common Acid Names

HC₂H₃O₂ acetic acid
HNO₃ nitric acid
CH₃COOH acetic acid
H₃PO₄ phosphoric acid
H₂CO₃ carbonic acid
H₂SO₄ sulfuric acid
HCl hydrochloric acid

Rules for Naming Binary Ionic Compounds

1. Balance Charges (charges should equal zero)
2. Cation is always written first (in name and in formula)
3. Change the ending of the anion to -ide

Rules for Naming Tertiary Compounds

1. Balance Charges (charges should equal zero)
 2. Cation is always written first (in name and in formula)
 - Remember transition metal ions need to have their charge specified, except for Zn (always +2), Ag (always +1) and Cd (always +2).
 3. Name of the polyatomic ion.
- Examples: Na₂SO₄ sodium sulfate
CuSO₃ copper (II) sulfite

Rules for naming molecular compounds (nonmetal-nonmetal)

1. Use prefixes: mono, di, tri, tetra, penta, hexa, hepta, octa, nona, and deca.
2. Drop the prefix 'mono' if it is at the beginning of the name.
3. There are some exceptions in which the 'mono' prefix is dropped: HCl – hydrogen chloride; HBr – hydrogen bromide
4. If there are two vowels in a row and the first vowel is an 'a' or an 'o' (do NOT drop any 'i's, drop the first vowel. P₂O₅- diphosphorus pentoxide; but PI₃ is phosphorus triiodide.

TO BE TURNED IN the first week of school, by September 8, 2017.

Name _____ 2017-2018 AP Chemistry Summer Assignment Date _____

I. Chemical Formula

1. Write formulas for the following substances:

- a. Barium sulfate _____
- b. Ammonium chloride _____
- c. Chlorine monoxide _____
- d. Silicone tetrachloride _____
- e. Magnesium fluoride _____
- f. Sodium oxide _____
- g. Sodium peroxide _____
- h. Copper (I) iodide _____
- i. Zinc sulfide _____
- j. Potassium carbonate _____
- k. Hydrobromic acid _____
- l. Perchloric acid _____
- m. Lead (II) acetate _____

- n. Sodium permanganate _____
- o. Lithium oxalate _____
- p. Potassium cyanide _____
- q. Iron (III) hydroxide _____
- r. Silicone dioxide _____
- s. Nitrogen trifluoride _____
- t. Chromium (III) oxide _____
- u. Calcium chlorate _____
- v. Sodium thiocyanate _____
- w. Cobalt (III) nitrate _____
- x. Nitrous acid _____
- y. Ammonium phosphate _____
- z. Potassium chromate _____

2. Name each of the following compounds (Give acid names where appropriate)

- a. CuSO_4 _____
- b. PCl_3 _____
- c. Li_3N _____
- d. BaSO_3 _____
- e. N_2F_4 _____
- f. KClO_4 _____
- g. NaH _____
- h. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ _____
- i. HNO_2 _____
- j. Sr_3P_2 _____
- k. $\text{Mg}(\text{OH})_2$ _____
- l. Al_2S_3 _____
- m. AgBr _____
- n. P_4O_{10} _____
- o. $\text{HC}_2\text{H}_3\text{O}_2$ _____
- p. CaI_2 _____

- q. MnO_2 _____
- r. Li_2O _____
- s. FeI_3 _____
- t. Cu_3PO_4 _____
- u. PCl_3 _____
- v. NaCN _____
- w. Cs_3N _____
- x. $\text{Zn}(\text{NO}_3)_2$ _____
- y. N_2O _____
- z. HF _____

III. Stoichiometry

1) Find the mass percent of nitrogen in each of the following compounds:

a. NO

b. NO₂

2) Benzene contains only carbon and hydrogen and has a molar mass of 78.1 g/mol. Analysis shows the compound to be 7.74% H by mass. Find the empirical and molecular formulas of benzene.

3) Calcium carbonate decomposes upon heating, producing calcium oxide and carbon dioxide gas.

a. Write a balanced chemical equation for this reaction.

b. How many grams of calcium oxide will be produced after 12.25 g of calcium carbonate is completely decomposed?

c. What volume of carbon dioxide gas is produced from this amount of calcium carbonate, at STP?

6) When solutions of potassium iodide and lead (II) nitrate are combined, the products are potassium nitrate and lead (II) iodide.

a. Write a balanced equation for this reaction, including (aq) and (s).

b. Calculate the mass of precipitate produced when 50.0 mL of 0.45M potassium iodide solution and 75mL of 0.55M lead (II) nitrate solution are mixed.

c. Calculate the volume of 0.50M potassium iodide required to react completely with 50.0 mL of 0.50M lead (II)nitrate.