CHEMISTRY II SUMMER ASSIGNMENT
and First Day Test Material
CHEMISTRY II FIRST DAY TEST

Chemistry II 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 (and permanently) planted in your head. **Do not** wait until the night before school begins.

The first day test will cover these areas of memorization:

1. Polyatomic Ions (including name, symbol and charge)
2. Rules for Naming Acids
3. Rules for Naming Ionic Compounds
4. The Solubility Rules
5. Determining Oxidation Numbers
6. The Five Types of Chemical Reactions (predicting the products of a reaction)

Chemistry II is a college level course. You will need to be dedicated and work very hard if you are to be successful.

Note:

One of the BIG projects in chemistry II every year involves starting and maintaining a thriving aquatic ecosystem. We will discuss this after the 1st day test, but be thinking about whether or not you want to do this project. It encompasses the entire year - 1st semester is the research phase and 2nd semester is the "do-it" phase. Part of the project involves purchasing the animals that you chose for your tank. This expense is on you. We will vote in class as to whether or not do this project or if another year-long research project will take its place. I will decide based on the majority of students. Think about it and let me know.

Mrs. Platt

Polyatomic Ions

Name	Formula	Charge
ammonium	NH_4	+1
acetate	$C_2H_3O_2$	-1
bromate	BrO_3	-1
chlorate	ClO_3	-1
chlorite	ClO_2	-1
cyanide	CN	-1
dihydrogen phosphate	H_2PO_4	-1
hypochlorite	ClO	-1
hydrogen carbonate (bicarbonate)	HCO_3	-1
hydrogen sulfate (bisulfate)	HSO_4	-1
hydrogen sulfite (bisulfite)	HSO_3	-1
hydroxide	OH	-1
iodate	IO_3	-1
nitrate	NO_3	-1
nitrite	NO_2	-1
perchlorate	ClO_4	-1
permanganate	MnO_4	-1
thiocyanate	SCN	-1
carbonate	CO_3	-2
chromate	CrO_4	-2
dichromate	Cr_2O_7	-2
oxalate	C_2O_4	-2
selenate	SeO_4	-2
sulfate	SO_4	-2
sulfite	SO_3	-2
thiosulfate	S_2O_3	-2
metasilicate	SiO_3	-2
phosphate	PO_4	-3
phosphite	PO_3	-3
orthosilicate	SiO_4	-4

Rules for Naming an Acid

1. When the name of the anion ends in *–ide* and the acid name begins with the prefix "hydro-", the stem of the anion has the suffix –ic and it is followed by the word acid.

-ide becomes hydro _____ic acid

Cl^- is the chlor**ide** ion so HCl = **hydro**chlor**ic 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

ClO_2^- is the chlorite ion, so $HClO_2$ = 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

ClO_3^- is the Chlor**ate** ion, so $HClO_3$ = Chlor**ic** acid.

Rules for Naming Ionic Compounds

1. Balance charges (sum of charges should equal zero)
2. The name of the cation is always written first (also written first in formula)
3. Change the ending of the anion (if the compound is binary) to -ide

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 $C_2H_3O_2^-$ 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^+.

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 (zero).
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 number of hydrogen in most of its compounds is +1 unless it 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 number 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 number of all atoms in a polyatomic ion equals the charge of the ion.

Examples:

the oxidation number of oxygen in O_2: 0

the oxidation number for each element in the compound NaCl: Na +1: Cl -1

the oxidation number of iron in Fe_2O_3: +3

the oxidation number of oxygen in OF_2: +2

the oxidation number of oxygen in hydrogen peroxide (H_2O_2) : -1

the oxidation number of hydrogen in lithium hydride (LiH) : -1

the oxidation number of each element in the polyatomic ion nitrate (NO_3^{1-}) : N +5, O -2

Join Chemistry II's Remind: text @96d593e to 81010. Send me a Remind text if you have questions.

Five Types of Chemical Reactions

1. **Synthesis** - two smaller substances reacting to form a single larger one.
   General form: $A + B \rightarrow AB$
   Example: $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

2. **Decomposition** - One large substance breaking apart into two or more smaller substances.
   General form: $AB \rightarrow A + B$
   Example: $Mg(ClO_3)_2(s) \rightarrow MgCl_2(s) + 3O_2(g)$

3. **Single Replacement** - A metal replacing the cation in an ionic compound -OR- An anion replacing another. (Depends on activity level of the ions)
   General Form: (cation replacement) $A + BC \rightarrow B + AC$
   (anion replacement) $Y + BX \rightarrow X + BY$
   Example: (cation replacement) $Cu(s) + AgNO_3(aq) \rightarrow Ag(s) + CuNO_3(aq)$
   (anion replacement) $F_2(g) + 2NaCl(s) \rightarrow Cl_2(g) + 2NaF(s)$

4. **Double Replacement** - The cations in two compounds replace one another. This reaction only occurs if a liquid (water), a gas (like CO_2), or an insoluble solid forms.
   General form: $AB + CD \rightarrow AD + CB$
   Example: $NaCl(aq) + AgNO_3(aq) \rightarrow NaNO_3(aq) + AgCl(s)$

5. **Combustion** - Generally, combustion is the addition of oxygen. The product of a reaction of oxygen and a single element produces an oxide.
   Example: $S_8(s) + 8O_2(g) \rightarrow 8SO_2(g)$

   Hydrocarbons: This is a "burning" reaction. A hydrocarbon combines with oxygen and forms carbon dioxide gas and water vapor.
   Example: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$