Honors Chemistry Summer Assignment

Honors Chemistry can be a difficult course, but it is not an impossible course. It is not all about memorization; however, having the summer assignment items memorized is essential for success in learning the concepts covered in the course. Make flash cards, 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 the following areas of memorization.

1. **Symbols and Names of the Elements** - Two periodic tables attached: one with names/symbols and one with only symbols. The one with symbols only is the type you are allowed to use on all Chemistry exams, so you will need to know the symbols and the correct spelling of the element's names.
2. **Metric Prefixes/Values and Base Units** - charts attached
3. **Polyatomic Ions (including name, symbol, and charge)** - chart attached
4. **Variable valences of Transition Metals** - chart attached
5. **The Diatomics** - (Goggle this and make a list. Hint: There are 7 of them.)
6. Get a **scientific calculator** and learn how to use the EXP or the EE button for scientific notation. A TI-84 or 86 is recommended due to your needs in future math classes, but for this class all you need is a calculator will an EE button or an EXP button for scientific notation. (I've seen these for about $11.) Calculators are require in class every day.

Metric Base Units

Base Unit	Symbol	Measures	Tool	Information
Meter	m	distance	ruler, meter stick	1 meter is about the length of 1 yard (3 feet)
Liter	L	volume	graduated cylinder	defined by building a box that was 10 cm X 10 cm X 10 cm
Gram	g	mass - the amount of matter in an object	balance	does not change with location
Newton	N ($Kg/m*s^2$)	weight - the pull of gravity on an object	scale	changes with location
Kelvin	K (no degrees sign)	Temperature	thermometer	Absolute Zero - coldest possible temperature Kelvin has no negative numbers

1 Liter = 1000 cm^3 = 1000 mL

1 mL = 1 cm^3

Metric Prefixes

Prefix	Abbreviation	Value
Giga	G	10^9 base units
Mega	M (capital M)	10^6 base units
Kilo	K	1000 base units
Hecta	H	100 base units
Deka	Dk	10 base units
base unit	m, L or g	1
deci	d	10 in 1 base unit
centi	c	100 in 1 base unit
milli	m	1000 in 1 base unit
micro	μ (pronounced "mu")	10^6 in 1 base unit
nano	n	10^9 in 1 base unit
pico	P	10^{12} in 1 base unit

Prefixes symbols are combined with the base unit symbols.
Example: millimeters = mm or Megameters = Mm

Polyatomic Ions

- "Poly" means "many" or "group" "atomic" means "atom." "Ion" means "charged atom." So, all together: "Polyatomic Ion" means a "charged group of atoms."
- Polyatomic ions are written in parenthesis with their charges written up high as superscripts. Example: $(SO_4)^{-2}$ is the sulfate ion.
- Suffixes on ployatomics containing oxygen:
  - "-ate" ending - Do not memorize the -ate ending as being a certain number of oxygen atoms -- this amount changes from polyatomic to polyatomic. Example: phosphate $(PO_4)^{-3}$ and sulfate $(SO_3)^{-2}$
  - "-ite" ending means one less oxygen than the -ate ion
- Prefixes on polyatomics:
  - "Per" is short for "hyper" and means one more oxygen atom on the -ate ion.
  - "Hypo" means one less oxygen on the -ite ion.
- Examples of prefixes and suffixes: <u>Notice that the charges do not change</u>.
  - <u>Per</u>chlor<u>ate</u> = $(ClO_4)^{-1}$
  - Chlo<u>rate</u> = $(ClO_3)^{-1}$
  - Chor<u>ite</u> = $(ClO_2)^{-1}$
  - <u>Hypo</u>chlor<u>ite</u> = $(ClO)^{-1}$
- Why go in this much detail? If you memorize the -ate ending's formula/charges and you memorize the meanings of the prefixes/suffixes it will cut down on the number of individual polyatomics you have to memorize --- making it easier for you.

Polyatomic Ions

Name	Symbol	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	$CrO4$	-2
dichromate	Cr_2O_7	-2
oxalate	C_2O_4	-2
peroxide	O_2	-2
selenate	SeO_4	-2
silicate	SiO_3	-2
sulfate	SO_4	-2
sulfite	SO_3	-2
phosphate	PO_4	-3
phosphite	PO_3	-3

Variable Valences of Transition Metals

- "Variable Valences" means the different charges on the ion
- "Transition metals" means the elements in groups 3 - 12 on the periodic table.
    - These elements have more than one charge available to them, so we have to memorize which charges can go with which element.
- Groups go up and down. Periods go across.
- Ions are atoms that have gained or lost electrons, so they are no longer neutral. They have a positive or negative charge.
- Charges are written two ways:
    - to the right of the symbol and up high on the line as a superscript.
        - Examples: Cr^{+2} This is read out loud as "chromium two."
    - in parenthesis after the name of the element.
        - Example: Iron(III) This is read out loud as "iron three."

Name	Symbol	Charge	Stock Name
Chromium	Cr	+2 +3	Chromium(II) Chromium(III)
Manganese	Mn	+2 +3	Manganese(II) Manganese(III)
Iron	Fe	+2 +3	Iron(II) Iron(III)
Cobalt	Co	+2 +3	Cobalt(II) Cobalt(III)
Copper	Cu	+1 +2	Copper(I) Copper(II)
Lead	Pb	+2 +4	Lead(II) Lead(IV)
Mercury	Hg	+1 +2	Mercury(I) Mercury(II)
Tin	Sn	+2 +4	Tin(II) Tin(IV)
Gold	Au	+1 +3	Gold(I) Gold(III)
Silver	Ag	+1 +2 (rarely)	Silver Silver(II)
Bismuth	Bi	+3 +5	Bismuth(III) Bismuth(V)
Antimony	Sb	+3 +5	Antimony(III) Antimony(V)
Cadmium	Cd	+2	Cadmium
Zinc	Zn	+2	Zinc