Honors Chemistry Summer Work Packet

Due Date: 1st Day of Class

Purpose: To cover some of the basic concepts used consistently throughout the school year.
This should be review and some new content (it's OK if some of this is hard for you – we'll go over it!).
Keep this packet of information. We will use it throughout the school year. Please use a Periodic Table.

1. Be able to make metric conversions:

M	/	/	k	h	da	/	d	c	m	/	/	μ	/	/	n	/	/	p
mega			kilo	hecta	deca	BU	deci	centi	milli			micro			nano			pico

   - BU = Base Unit
   - Base Units are:
     - Meters (m), Liters (L), Grams (g)
   - Each "jump" represents a "jump" of "10"
     - 1dm = 10cm
     - 1L = 10^6μL
     - Remember: **1L = 1 dm^3 = 1000 mL = 1000 cm^3**
2. Be able to convert between units of length, mass and volume using the metric system.
   - The metric system can convert between units because it was designed by "creating" a cubic box that measures 1dm on each side ($1dm^3$). The volume of water that completely fills that box is defined as 1L. The mass of the water (at 4°C) that fills that box is defined as 1kg.
   - **For water at 4°C: 1000 g = 1 kg**
   - **For 1 gram of water at 4°C: 1 mL = $1cm^3$ = 1g**
   - When converting from volume to mass or mass to volume of any substance other than water, you must know & use the density of that substance to make the comparison.
3. Know the 7 Diatomic Elements. These exist as molecules which contain 2 atoms. All other elements exist as single atoms. Both of these types of elements are known as FREE elements.
   - Use this to remember them: BrINClHOF: Br_2, I_2, N_2, Cl_2, H_2, O_2, F_2
4. Know & be able to use the definition of a mole.
   - A mole (mol) is a unit of quantity that is used in many chemical problems. Since every mole contains the same number of particles (like a dozen always contains 12 "things"), moles of different substances can be compared to each other by using the coefficients of the substances in a balanced chemical equation.
   - 1 mole contains 6.02×10^{23} particles of matter (that could be: atoms, ions, molecules, ionic units, atomic units, particles
   - **1 mol of any substance = formula weight (g) = 6.02×10^{23} particles**
   - Remember: Formula Weight (aka Formula Mass) = ∑(# of atoms x mass number)
   - All formula weights/mass numbers will be rounded to 3 significant figures (just my rule to make it easier when calculating).
   - Example. The FW of sucrose $C_{12}H_{22}O_{11}$

     C 12 x 12.0 = 144
     H 22 x 1.01 = 22.2
     O 11 x 16.0 = 176
     342.2 = 342 g
   - This means that 1 mole of $C_{12}H_{22}O_{11}$ has a mass of 342 grams & that 342 g $C_{12}H_{22}O_{11}$ has 6.02×10^{23} particles
5. Know the Common Monatomic & Polyatomic Ions listed on another page. You need to know their name, formula & charge.
6. Know that a Period on the periodic table is a horizontal row (aka a Series)
7. Know the Groups/Families (vertical columns) of the periodic table
   - Group 1 – Alkali Metals, **always** have 1+ charge as an ion
   - Group 2 – Alkaline Earth Metals, **always** have a 2+ charge as an ion
   - Groups 3-12 – Transition Metals, no set ionic charge-have to memorize some, if have to guess: 2+
   - Group 17 – Halogens, usually have a 1- charge as an ion
   - Group 18 – Noble Gases, do not make ions so charge is 0
   - Bottom two-rows (57-71 & 89-103) – Inner Transition Metals (aka rare earth metals), if have to guess 3+
     - Top Row (Lanthanide Series), Bottom Row (Actinide Series)
8. Know how to write the names and formulas of ionic & covalent compounds.
   - Write the **name** of Ionic Compounds (metals bonded with nonmetals)
     - name the 1st element in the compound as it is written on the periodic table
     - the 2nd element in compound gets its ending changed to –ide

- Ex. NaCl is named sodium chloride
- if the 2nd element is a polyatomic ion then don't change the ending, just name it as it is written on ions chart
  - Ex. Na_3PO_4 is named sodium phosphate
- if the 1st element is a transition metal (or an element with more than one possible ionic charge) you have to write the oxidation number as a roman numeral in parentheses after the transition metal
  - Ex. PbF_2 is named lead **(II)** fluoride

- Write the **formula** of Ionic Compounds
  - write the element symbol of the 1st element including its oxidation number as a superscript
  - write the element symbol or polyatomic ion formula of the second substance in the compound including its oxidation number as a superscript
  - if the two oxidation numbers cancel each other out, you're done
  - if the two oxidation numbers do not cancel each other out then you need to move the oxidation numbers to the subscript position of the other element/polyatomic ion
    - if have to write a subscript behind a polyatomic ion then put the polyatomic in parentheses with the subscript outside of it
      - Ex. magnesium oxide
        - $Mg^{2+}O^{2-}$ (the oxidation #s cancel out, you're done)
      - Ex. magnesium acetate
        - $Mg^{2+}(C_2H_3O_2^{1-})_2$ (move the oxidation on magnesium to behind the acetate ion and move the oxidation number of acetate to behind the magnesium [because acetate's number is 1, you don't actually write it, it's understood])
        - To check to see if the formula is correctly written: multiply the subscript by the oxidation number/ionic charge, they should now cancel each other out
          - for Mg (1 x 2+) = 2+
          - for $C_2H_3O_2$ (2 x 1-) = 2-
          - 2+ and 2- cancel out, you're done

- Write the name of Covalent Compounds (nonmetals bonded with nonmetals)
  - if the 1st element does not have a subscript, just name it as it is written on the periodic table
  - if the 1st element does have a subscript, add the prefix from the table below that corresponds to that subscript
  - if the second element does not have a subscript, add the prefix mono- to the element and change the ending to –ide
    - Ex. CO
      - carbon **monoxide**
    - Ex. N_5S_3
      - **pentanitrogen trisulfide**

- Write the formula of Covalent Compounds
  - Write the symbol of the 1st element. If there is a prefix write the corresponding number as the subscript.
  - Do the same for the second element.
    - Ex. hexacarbon dinitride
      - C_6N_2
    - Ex. silicon decaselenide
      - $SiSe_{10}$

1	mono	6	hexa
2	di	7	hepta
3	tri	8	octa
4	tetra	9	nona
5	penta	10	deca

9. Know the following common Covalent Compounds:
   - glucose $C_6H_{12}O_6$
   - sucrose $C_{12}H_{22}O_{11}$
   - ammonia NH_3
10. Now that you have gone through the Summer Work Packet, look over the Summer Work "Assignment". Look at the types of questions on it and then go back and review those sections in the Packet. Once you feel comfortable with the info, take the Summer Work test without looking up the answers. If you get stuck, go back and review the section in the packet, but you will really need to be able to do those things without the Packet within the first 2 weeks of school. Good luck! Email me if you have questions: jenifertidwell@pickens.k12.sc.us.

Common Monatomic and Polyatomic Ions

Positive Ions (Cations) Formed by loss of e-		Negative Ions (Anions) Formed by gain of e-	
ammonium	NH_4^{1+}	acetate	$C_2H_3O_2^{1-}$,CH_3COO^{1-}
chromium(III), chromic	Cr^{3+}	carbonate	CO_3^{2-}
copper(I), cuprous	Cu^{1+}	bicarbonate, hydrogen carbonate	HCO_3^{1-}
copper(II), cupric	Cu^{2+}	chlorate	ClO_3^{1-}
hydronium	H_3O^{+}	chlorite	ClO_2^{1-}
iron(II), ferrous	Fe^{2+}	chromate	CrO_4^{2-}
iron(III), ferric	Fe^{3+}	dichromate	$Cr_2O_7^{2-}$
lead(II), plumbous	Pb^{2+}	cyanide	CN^{1-}
lead(IV), plumbic	Pb^{4+}	hydroxide	OH^{1-}
manganese(II), manganous	Mn^{2+}	hypochlorite	ClO^{1-}
mercury(I),mercurous	Hg_2^{2+}	nitrate	NO_3^{1-}
mercury(II), mercuric	Hg^{2+}	nitrite	NO_2^{1-}
nickel	Ni^{2+}	perchlorate	ClO_4^{1-}
silver	Ag^{+}	permanganate	MnO_4^{1-}
tin(II), stannous	Sn^{2+}	phosphate	PO_4^{3-}
tin(IV), stannic	Sn^{4+}	peroxide	O_2^{2-}
zinc	Zn^{2+}	silicate	SiO_3^{2-}
		sulfate	SO_4^{2-}
		sulfite	SO_3^{2-}

Notice:

1. think of the ions that end in –ate as the base unit
2. ions ending in –ite have 1 less oxygen than base
3. ions with the prefix hypo- and ending of –ite have 2 less oxygens than the base
4. ions with the prefix per- and ending of –ate have 1 more oxygen than the base

This may be helpful:

NiCK the MoNK CRaVeD a CLaM but ate a CaMeL SiNeW SuPPeR in PHoeNiX

NO_3^{1-} MnO_3^{1-} CrO_4^{2-} ClO_3^{1-} CO_3^{2-} SiO_3^{2-} SO_4^{2-} PO_4^{3-}

The # of consonants is the # of oxygens for the "base unit"
The # of vowels is the charge (these are all negative anions)
If you know these and understand how –ite, hypo- -ite, and per- affect the base unit, then it cuts down on memorizing)

Know the charge of ions by location on periodic table:

Group 1 Ions: 1+
Group 2 Ions: 2+
Group 13 Ions: 3+
Group 14 Ions: 4+/4-
Group 15 Ions: 3-
Group 16 Ions: 2-
Group 17 Ions: 1-
Group 18: no ions

Summer Work Assignment – H Chemistry **Name**_____**Class**_____

This must be turned in on the 1st day of class and will be checked for correctness. You are to do your own work. Please **show your work**. Use the rules for significant digits in working these problems. Use Formula Weights/Molecular Masses to 3 significant digits.

I. Make these conversions:

1. 625 nm = _____ hm
2. 0.000254 dg = _____ pg
3. 1.047 dm^3 = _____ cm^3
4. 0.0065 μL = _____ kL
5. 17 Mm = _____ m

II. Work these problems using the mole concept.

6. Find the molecular mass of hydrogen peroxide, H_2O_2.

7. Find the formula weight of sodium acetate, $NaC_2H_3O_2$.

8. Find the amount of grams in 2.50 moles of carbon dioxide, CO_2.

9. Calculate the number of molecules in 80.00 dm^3 of water at 4^0C.

10. Calculate the mass, in grams, of 8.90×10^{35} ionic units of $Sr(NO_3)_2$.

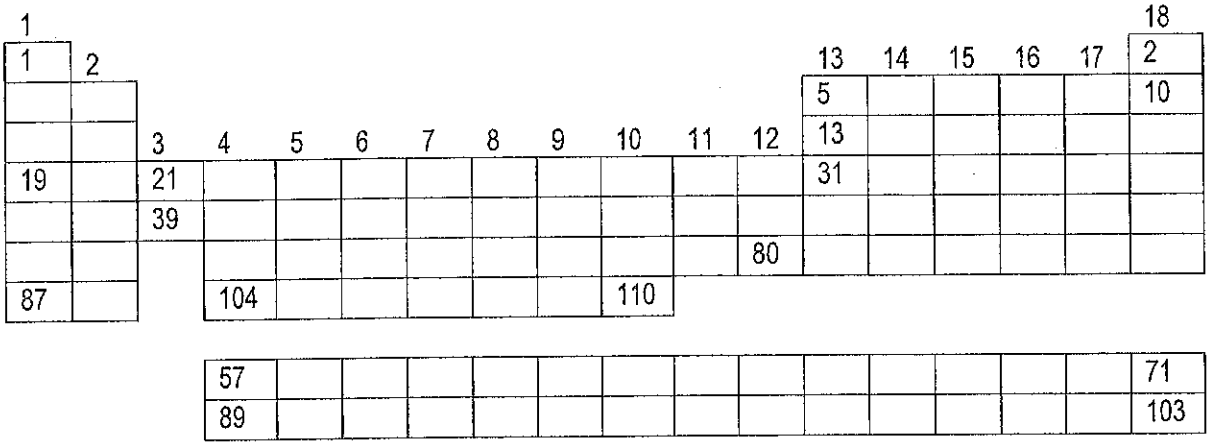
11. Find the number of moles in 3.2×10^{-3} grams of NaCl.

III. Name these ions or give the ion's formula.

12. _____ O_2^{2-}
13. _____ ferrous
14. _____ plumbic
15. _____ oxalate
16. _____ Hg^{2+} (old)
17. _____ CH_3COO^{1-}
18. _____ OH^{1-}
19. _____ ammonium
20. _____ ClO_2^{1-}
21. _____ tin(IV)

IV. Identify the following positions on the periodic table. Make sure I can understand how you are labeling these on the following table.

22. group 2 (or group II)
23. lanthanide series
24. alkaline earth metals
25. halogens
26. metalloids
27. nonmetals
28. nitrogen family
29. diatomic elements



V. Name the following compounds or write their formulas.

30. _____ carbon tetrachloride
31. _____ iron(III) nitrate
32. _____ aluminum hydroxide
33. _____ $CuSO_4$
34. _____ ammonium sulfite
35. _____ WBr_5
36. _____ stannous fluoride
37. _____ nitrogen (II) oxide
38. _____ PI_3

VII. Work the following problems. D = m/V

39. Find the density (in milligrams per cubic centimeter) of a rectangular, solid material whose mass is 950 grams. It is 37.0 cm long, 425 mm wide and 0.040 dm high.

40. Find the mass of 2.00 dm^3 of a gas whose density is 8.99×10^{-1} g/dm^3.

41. Find the volume of 50.0 kg of gold whose density is 19.3 g/cm^3.