Spring Break Worksheet – CHEM 121 NAME: _____

Directions: To be turned in upon entry to the first class immediately following Spring Break.

Solve the following equations using the quadratic formula and FOIL method, showing all of your work.

1) $3x^2 - 7x - 3 = 0$

2) $6x^2 - x - 5 = 0$

3) Solve the following, showing all of your work: 17.35 = (log (2.5x/3.5))

4) Solve the following, showing all of your work : 7.835 = (ln(2.65x/3.45))

NOTE of CAUTION: When dimensions are given as “l” and “w” and “h”, “l” goes with the longest edge and “w” values go with the shortest edge and “h” values are for height. It helps to draw and label a rough diagram similar to the above diagrams as you work the problems. Determine the surface areas of the following:

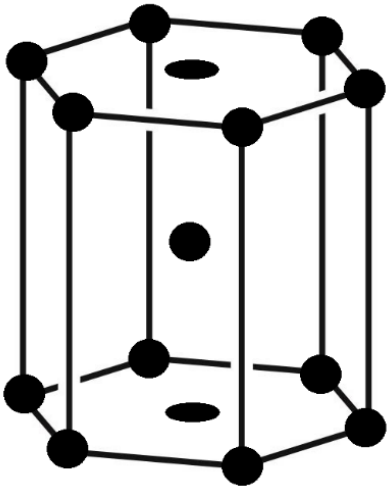
5) A square pyramid of “h” = 10 cm; “l” = 2 cm

6) A cone of “r” = 25 cm; “h” = 100 cm

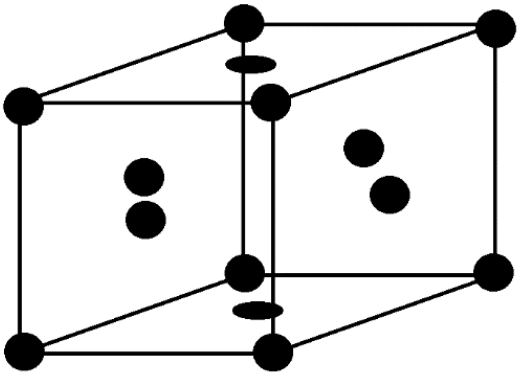
7) The inner and outer diameters of a thick-walled spherical metal shell are 18.5 and 24.6 cm, respectively. What is the volume occupied by the shell, itself?

8) Nifedipine is a medication that is administered intra-venously (IV) to patients who are suffering from angina. The usual dosage is 5 μg/kg body weight IV. Your patient weighs 235 lbs. What dosage will you administer to relieve his/her suffering?

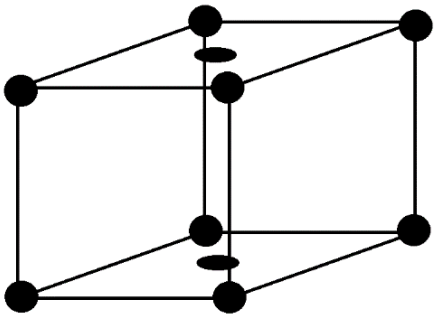
9) How many atoms are in the body centered, base centered hexagonal unit cell?



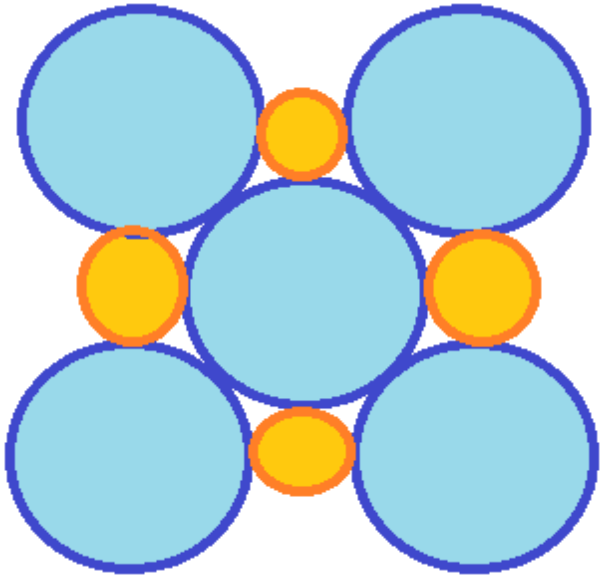
10) How many atoms are in the face centered unit cell?



11) How many atoms are in the base centered cubic unit cell?



12) If the edge length of a NaCl face centered cubic unit cell is 0.5628 nm, calculate the ionic radius of the chloride ion (Cl^-). Using your information, also calculate the ionic radius of the sodium ion (Na^+) in the face centered NaCl unit cell. Use the diagram at right to help you in your calculation[s].



13) Identify which of the following reactions are reduction or oxidation half reactions:

A) $Cu2+ + 1e- \rightarrow Cu^{+}$ B) $Fe \rightarrow Fe^{2+} + 2e^{-}$ C) $Zn \rightarrow Zn^{2+} + 2e^{-}$

D) $Mg^{2+} + 2e^{-} \rightarrow Mg$ E) $Fe \rightarrow Fe^{3+} + 3e^{-}$ F) $Hg_2^{2+} + 2e^{-} \rightarrow 2Hg$

G) $Li \rightarrow Li^{+} + 1e^{-}$ H) $Be^{2+} + 2e^{-} \rightarrow Be$ I) $F_2 + 2e^{-} \rightarrow 2F^{-}$

J) $Al \rightarrow Al^{3+} + 3e^{-}$

14)) Why are the oxidation half reactions oxidation? Why are the reduction half reactions reduction?

15) Given the following reactions, determine which reactant is oxidized and which reactant is reduced; identify the reducing agent and the oxidizing agent, as well:

A) $Mn + Zn^{2+} \rightarrow Mn^{2+} + Zn$ B) $2Al^{3+} + 3Pb \rightarrow 2Al + 3Pb^{2+}$ C) $Na + Cl \rightarrow Na^{+} + Cl^{-}$

D) $2Li + O \rightarrow 2Li^{+} + O^{2-}$ E) $2Na + S \rightarrow 2Na^{+} + S^{2-}$

16) Based upon your new understanding of "simple" redox reactions, balance the following reactions:

A) $Cu^{2+} + Zn \rightarrow Cu + Zn^{2+}$

B) $Fe + Fe \rightarrow Fe^{2+} + Fe^{3+}$

C) $Be^{2+} + Al \rightarrow Be + Al^{3+}$

D) $Zn + Mg^{2+} \rightarrow Zn^{2+} + Mg$

E) $Fe + Al \rightarrow Al^{3+} + Fe^{3+}$

F) $Fe + Be^{2+} \rightarrow Fe^{2+} + Be$

17) There are three isotopes of Magnesium: ^{24}Mg, ^{25}Mg and ^{26}Mg. There's 8 times as much ^{24}Mg as there is ^{25}Mg and ^{26}Mg. What is the average mass of Mg?

18) What are the two “magic numbers” for elements when they ionize? With which ionic form (cation or anion) do they align? Which groups on the periodic table “give” cations? Anions?

19) The most electronegative element on the periodic table is:

20) The most electropositive element on the periodic table is:

21) Explain how your responses to #’s 19 and 20 are dependent upon the first ionization energy for both elements.

22) The oxidizing agent is always _____.

23) The reducing agent is always _____.

24) The oxidizing agent _____ electrons.

25) The reducing agent _____ electrons.

26) Elements in Groups _____, _____ and _____ lose electrons when they ionize.

27) Elements in #26 have a _____ ionic radius compared to their atomic radius.

28) Elements in Groups _____, _____, and _____ gain electrons when they ionize.

29) Elements in #28 have a _____ ionic radius compared to their atomic radius.

30) Write the electronic structure for the sodium ion.

31) Write the electronic structure for the chloride ion.

32) Write the electronic structure for the P^{3-} ion.

33) Write the electronic structure for the Be^{2+} ion.

34) Write the electronic structure for the fluoride ion.

35) Write the electronic structure for the H^{+} ion.

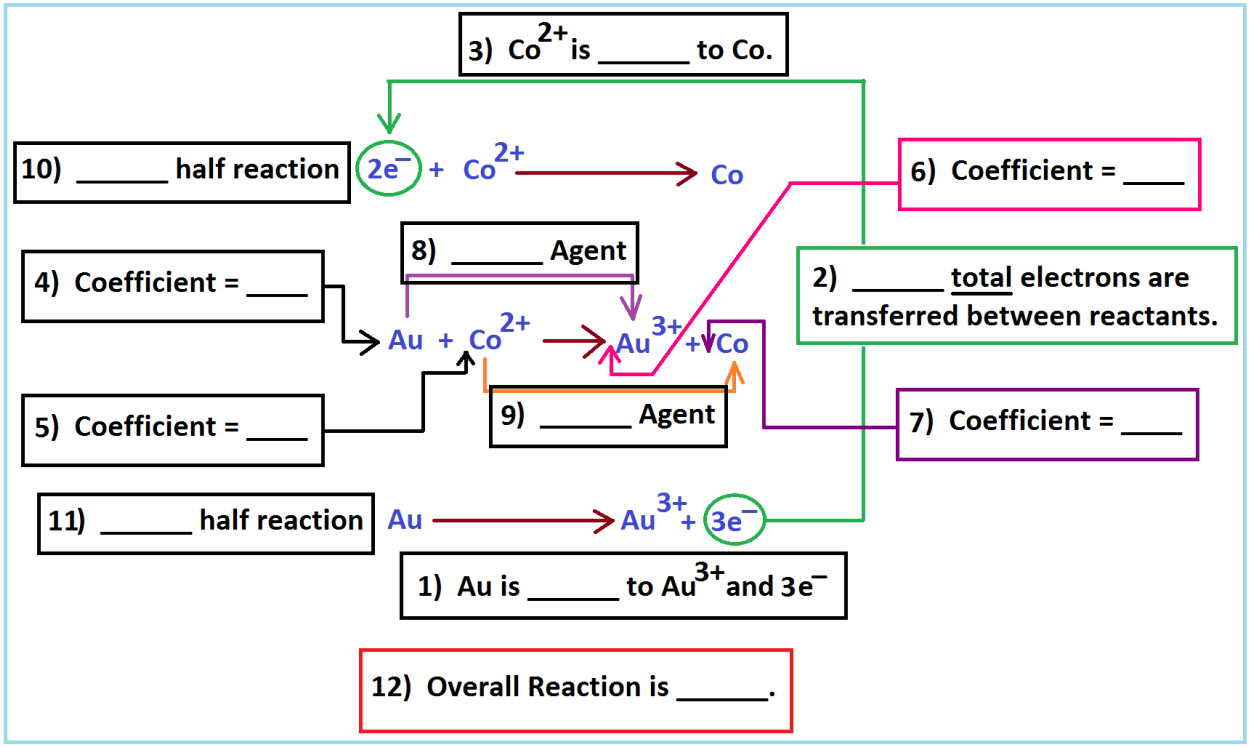
36) The K shell consists of the 1s subshell. The maximum number of electrons the K shell (or ANY s subshell) may hold is _____ electrons.

37) The L shell consists of the 2s and 2p subshells. The maximum number of electrons the L shell may hold is _____ electrons. The maximum number of electrons ANY s subshell may hold is _____ electrons. The maximum number of electrons ANY p subshell may hold is _____ electrons. The maximum number of electrons ANY p **sub-subshell** may hold is _____ electrons.

38) The M shell consists of the 3s, 3p and 3d subshells. The maximum numbers of electrons the M shell may hold is _____ electrons or _____ electrons. The maximum number of electrons ANY s subshell may hold is _____ electrons. The maximum number of of electrons ANY p subshell may hold is _____ electrons. The maximum number of electrons ANY p **sub-subshell** may hold is _____ electrons. The maximum numbers a d subshell may hold is _____ electrons. The maximum number of electrons a d sub-subshell may hold is _____ electrons.

39) The N shell consists of the 4s, 4p, 4d and 4f subshells. The maximum numbers of electrons the N shell may hold is _____ electrons or _____ electrons. The maximum number of electrons ANY s subshell may hold is _____ electrons. The maximum number of electrons ANY p subshell may hold is _____ electrons. The maximum number of electrons ANY p **sub-subshell** may hold is _____ electrons. The maximum numbers a d subshell may hold is _____ electrons. The maximum number of electrons a d **sub-subshell** may hold is _____ electrons. The maximum number of electrons any f subshell may hold is _____ electrons. The maximum number of electrons an f **sub-subshell** may hold is _____ electrons.

40) Complete the following in the provided spaces below.



1) 2)

3) 4)

5) 6)

7) 8)

9) 10)

11) 12)

41) In chemistry, there is a system known as the "ous" and "ic" system of nomenclature of cations. This system is used with metallic elements that have two (2) or more ionic forms and focuses on the two (2) most common ionic forms.

In this system, the cation with the lowest (least, smallest) charge has "ous" ("ous" is less") added to its stem, which may be English or Latin, depending on the metal, e.g., "ironous" doesn't "flow" – use "ferrous", instead.

The cation with the highest (biggest, most) charge has "ic" ("ic" is more) added to it in the same manner as the "ous" form, e.g., copper has two common oxidation states: +1 and +2. Cu^{1+} is the cuprous ion and Cu^{2+} is the cupric ion.

With that in mind, name the following ions using "ous" or "ic".

A) Fe^{2+}

B) Fe^{3+}

C) Pb^{2+}

D) Pb^{4+}

E) Zn^{2+}

F) Zn^{4+}

G) Cu^{1+}

H) Cu^{2+}

I) Hg_2^{2+} (careful with this one!)

J) Hg^{2+}

42) In order to separate metallic cations from each other, qualitative analysis schemes have been developed over the centuries: indeed, you had an experiment on qual in lab that illustrated some of these concepts.

To separate the cations from each other, one must form an insoluble precipitate between one metallic cation and an anion from an acid, base or salt. An insoluble precipitate is a solid that settles to the bottom of the mixture either on its own or with the help of a centrifuge. This means that chemical reactions must take place, e.g., when Ag(I) (another way of the writing the silver 1+ ion) reacts with the chloride ion from HCl (hydrochloric acid = $H^+ + Cl^-$), silver chloride (AgCl) forms and precipitates.

With this information, **complete and balance** the following reactions based on the separation scheme on p. 33 of your notes:

A) $Pb(II) + Cl^- \rightarrow$ _____

B) Hg(I) (careful with this one!) + $Cl^- \rightarrow$ _____

C) Cu(II) + S^{2-} → _____

D) Pb(II) + S^{2-} → _____

E) Sb(III) S^{2-} → _____

F) Hg(II) S^{2-} → _____

G) Ca(II) + CO_3^{2-} → _____

H) Ba(II) + CO_3^{2-} → _____

43) Complete the following data table just as you did for the experiment on Activity Series. Remember that the whole idea for scoring the reactions is based on the presence of bubbling and on the intensity of the bubbling immediately upon addition of the metal to the HCl, as well as at 20 minutes after adding the metal to the HCl.

Activity Series Record Table								
Metal	Mg	Zn	Cu	NiCr	Pb	Fe	Sn	Al
Observations immediately	Explosive bubbling	Vigorous bubbling	No bubbling	Sporadic bubbling	No bubbling	No bubbling	Light bubbling	No bubbling
Observations after 20 minutes	No bubbling	No bubbling	Sporadic bubbling	No bubbling	Light bubbling	Mild bubbling	No bubbling	No bubbling
Reactivity								
Order of reactivity								

44) Use the following information to develop your own separation scheme of each cation on the next page. As we discussed in class, the goal is to separate one cation from a solution of cations, one cation at a time, one reagent at a time and to not repeat the use of any reagent. You may leave the last ion in solution as we did in class. For this flowchart, write out the chemical formula of each precipitated salt (remember that the simplest definition of a salt is a cation plus an anion):

Reagent Dispensation Table				
Column 1	Column 2	Column 3	Column 4	Column 5
HCl	$H^+ + H_2S$	$NH_4^+ + H_2S$	$(NH_4)_2CO_3$	H_2SO_4

Tube Set-Up for Cation Analysis					
	Column 1	Column 2	Column 3	Column 4	Column 5
Row 1	$Hg_2(NO_3)_2$	$Hg_2(NO_3)_2$	$Hg_2(NO_3)_2$	$Hg_2(NO_3)_2$	$Hg_2(NO_3)_2$
Row 2	$Hg(NO_3)_2$	$Hg(NO_3)_2$	$Hg(NO_3)_2$	$Hg(NO_3)_2$	$Hg(NO_3)_2$
Row 3	$Ni(NO_3)_2$	$Ni(NO_3)_2$	$Ni(NO_3)_2$	$Ni(NO_3)_2$	$Ni(NO_3)_2$
Row 4	$Sr(NO_3)_2$	$Sr(NO_3)_2$	$Sr(NO_3)_2$	$Sr(NO_3)_2$	$Sr(NO_3)_2$

Results and Observations					
	Column 1	Column 2	Column 3	Column 4	Column 5
Row 1	Grey/Blk ppt	No ppt	No ppt	No ppt	No ppt
Row 2	White ppt	Muddy brn ppt	No ppt	No ppt	No ppt
Row 3	No ppt	No ppt	Tan ppt	No ppt	No ppt
Row 4	No ppt	No ppt	No ppt	White ppt	White ppt

Flowchart for #44:

45) Complete the following table:

Polyatomic Ion	Polyatomic Ion Name	Compound of Origin	Name of Compound
NO_3^-		HNO_3	
NO_2^-		HNO_2	
SO_4^{2-}		H_2SO_4	
SO_3^{2-}		H_2SO_3	
PO_4^{3-}		H_3PO_4	
NH_4^+		NH_3	

46) Using the table, below, write out the chemical/ion using the elemental symbol and charge(s):

Group 1	Group 2	Group 3	Group 4	Group 5
HCl Group	Acidic Hydrogen Sulfide Group	Basic Hydrogen Sulfide Group	Ammonium Carbonate Group	Soluble Group
Silver (I)	Mercury (II)	Aluminum (III)	Calcium (II)	Sodium (I)
Mercury (I)	Lead (II)	Chromium (III)	Strontium (II)	Potassium (I)
Lead (II)	Bismuth (III)	Iron (II & III)	Barium (II)	Magnesium (II)
	Copper (II)	Manganese (II)		Ammonium ion
	Cadmium (II)	Cobalt (II)		
	Arsenic (III & V)	Nickel (II)		
	Antimony (III & V)	Zinc (II)		
	Tin (II & IV)			

47) If the reaction $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ goes as written, complete and balance the following reactions:

A) $Pb(NO_3)_2 + NaCl \rightarrow$

B) $Hg_2(NO_3)_2 + NaCl \rightarrow$

C) $AgNO_3 + KCl \rightarrow$

D) $Pb(NO_3)_2 + KCl \rightarrow$

E) $Hg_2(NO_3)_2 + KCl \rightarrow$

F) $AgNO_3 + LiCl \rightarrow$

48) Write out the chemical formulas for each compound/molecule, below, and indicate the **effective (apparent) charge for the cation, anion and the overall molecule**!:

A) Barium chloride

B) Potassium dichromate

C) Barium sulfate

D) Barium chromate

E) Sodium carbonate

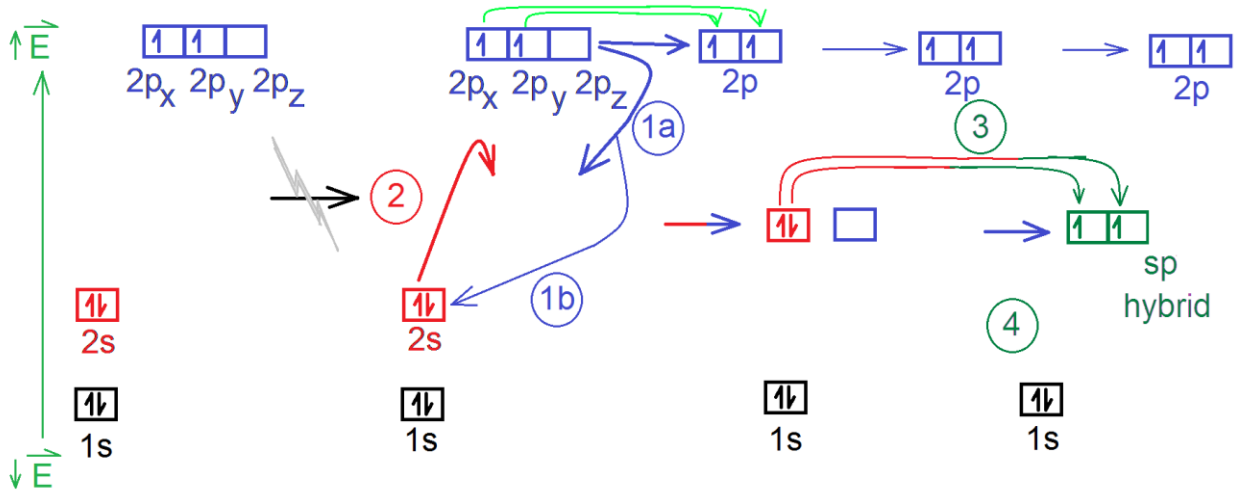
F) Aluminum nitrate

G) Boron nitrite

H) Magnesium phosphate

I) Aluminum phosphate

J) Carbonic acid



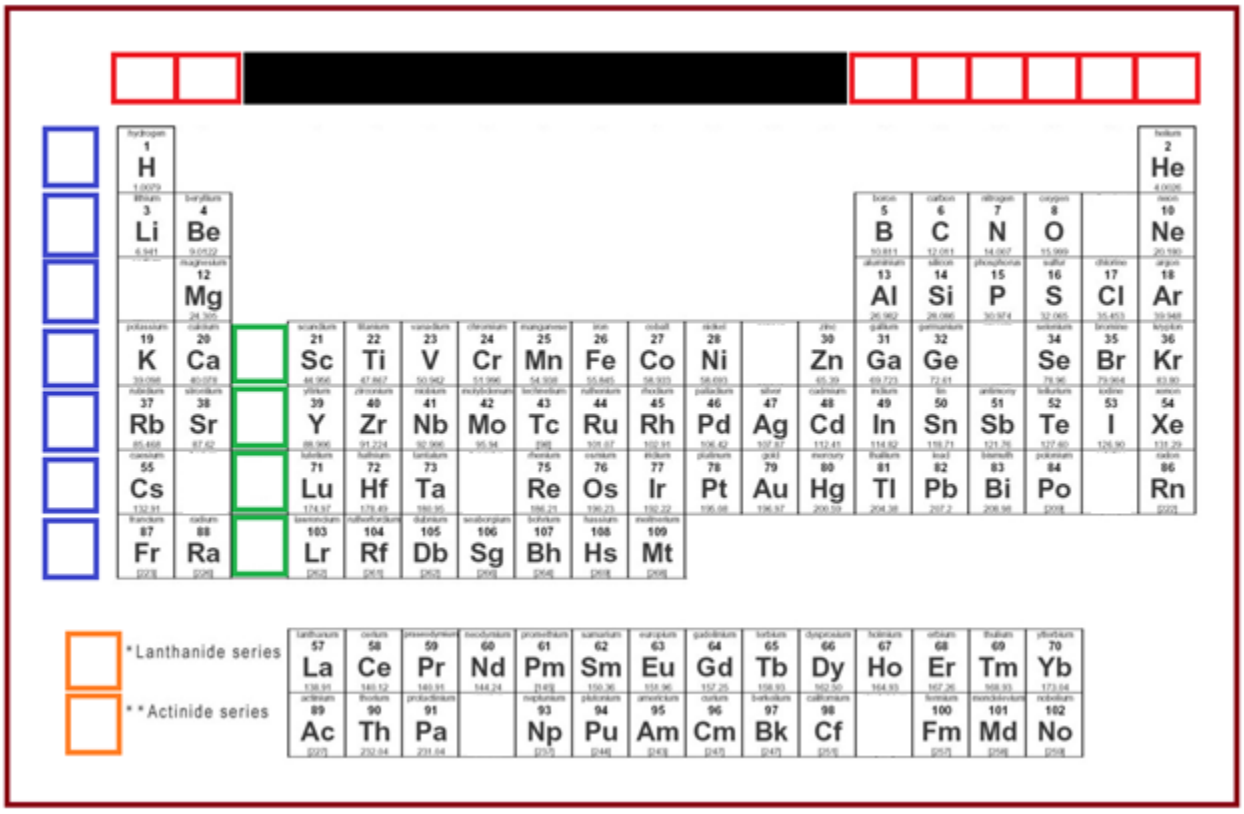
49) The above image represents the formation of an sp hybrid set of orbitals for carbon. It's called an sp hybrid because it took one of the s shells and one of the p orbitals to combine in such a manner that instead of having one pair of 2s electrons (that can't bond anything) with 2 unbonded, 2p, single electrons, there are now two single unbonded electrons (in an sp hybrid orbital), each of which is capable of sharing with another atom's electron to form a covalent σ bond; an additional two 2p electrons are available to form the 2^d and 3^d π bonds (combined, to make a triple bond between two carbon nuclei). In the space below, explain what is happening in the graphic.

50) Hybridizations that we don't go into (in detail, hence, they need to be cold memorized) in CHEM 121 include the dsp^2, dsp^3 and d^2sp^3 hybridizations. Diagram these three hybridizations' geometries and give one example of each; in addition, name the shape of the orbitals.

51) Given your knowledge of quantum numbers, does the following set of quantum numbers, 2, 0, -3, +½ follow the rules? Explain your response in detail.

52) How many mol of $C_6H_{12}O_6$ do you have if you have 45 g $C_6H_{12}O_6$?

53) Complete the following periodic table:



1) There are 2 parts to this question (top of next page are the reactions you need for this question): 1) balance the following reactions and 2) identify which of these reactions is redox decomposition, non-redox decomposition, redox combination, nonredox combination, single replacement or double replacement reactions (**PS – sometimes I don't follow the rules of chemistry when I write questions for students to balance – you may have to add or remove subscripts as you solve the problems – keep an eye on your apparent charges – do you see why you need to make sure your periodic table is completed correctly?** It's a good thing you've already memorized all of those polyatomic ions from the Lewis Structures Experiment, eh?):

A) $Mg + Cl_2 \rightarrow MgCl$

B) $Na + N_2 \rightarrow NaN_3$

C) $Ba + S \rightarrow BaS$

D) $NaOH + H_2SO_4 \rightarrow NaSO_4 + H_2O$

E) $LiCO_3 + HCl \rightarrow LiCl_2 + H_2O + CO_2\uparrow$

F) $Sr(NO_3)_2 + HCl \rightarrow SrCl + HNO_3$

G) $K + H_2O \rightarrow KOH + H_2\uparrow$

H) $Al + O_2 \rightarrow Al_2O_3$

I) $MnSO_4 + HNO_3 \rightarrow Mn(NO_3)_2 + H_2SO_4$

J) $Fe + O_2 \rightarrow Fe_3O_4$

54) $7 \cdot 10^{23}$ atoms of $SrCl_2$ are how many mols of $SrCl_2$?

55) Determine the % composition of Ca in $CaSO_4 \cdot 4H_2O$.

56) How many grams of $Al(OH)_3$ are required to make a solution 0.25 M in 500 mL of solution?

57) Given the following reaction: $N_2 + 3I_2 \rightarrow 2NI_3$, if you have 28 g N_2, how many grams of NI_3 will you be able to make? If you also have 50 g I_2 for the reaction, what is the limiting reagent?

58) For the reaction $SrCO_3 + 2HCl \rightarrow SrCl_2 + CO_2\uparrow + H_2O$, how many grams of $SrCl_2$ are produced when 5 mL of 4 M $SrCO_3$ are reacted with HCl?

59) For the following reaction: $CO_2 + NH_3 \rightarrow CH_4N_2O$ (urea) + H_2O, if you start with 6 g CO_2 and obtain 5 g urea, what is the per cent yield of urea?

60) An aluminum pipe of 150 g is at 5°C. If the ends of this pipe are plugged after 400 g of Pb at 400°C are poured into it, what is the final temperature of the system?

You may find the following table of assistance in the next problems:

Heat of Formation Values

ΔH_f° (kJ/mol) (concentration of aqueous solutions is 1*M*)

Substance	ΔH_f°	Substance	ΔH_f°	Substance	ΔH_f°	Substance	ΔH_f°
Ag(s)	0	CsCl(s)	−443.04	H_3PO_4(aq)	−1279.0	NaBr(s)	−361.062
AgCl(s)	−127.068	Cs_2SO_4(s)	−1443.02	H_2S(g)	−20.63	NaCl(s)	−411.153
AgCN(s)	146.0	CuI(s)	−67.8	H_2SO_3(aq)	−608.81	$NaHCO_3$(s)	−950.8
Al_2O_3	−1675.7	CuS(s)	−53.1	H_2SO_4(aq)	−814.0	$NaNO_3$(aq)	−447.48
$BaCl_2$(aq)	−871.95	Cu_2S(s)	−79.5	$HgCl_2$(s)	−224. 3	NaOH(s)	−425.609
$BaSO_4$	−1473.2	$CuSO_4$(s)	−771.36	Hg_2Cl_2(s)	−265.22	Na_2CO_3(s)	−1130.7
BeO(s)	−609.6	F_2(g)	0	Hg_2SO_4(s)	−743.12	Na_2S(aq)	−447.3
$BiCl_3$(s)	−379.1	$FeCl_3$(s)	−399.49	I_2(s)	0	Na_2SO_4(s)	−1387.08
Bi_2S_3(s)	−143.1	FeO(s)	−272.0	K(s)	0	NH_4Cl(s)	−314.4
Br_2	0	FeS(s)	−100.0	KBr(s)	−393.798	O_2(g)	0
CCl_4(l)	−128.2	Fe_2O_3(s)	−824.2	$KMnO_4$(s)	−837.2	P_4O_6(s)	−1640.1
CH_4(g)	−74.81	Fe_3O_4(s)	−1118.4	KOH	−424.764	P_4O_{10}(s)	−2984.0
C_2H_2(g)	226.73	H(g)	217.965	LiBr(s)	−351.213	$PbBr_2$(s)	−278.7
C_2H_4(g)	52.26	H_2(g)	0	LiOH(s)	−484.93	$PbCl_2$(s)	−359.41
C_2H_6(g)	−84.68	HBr(g)	−36.40	Mn(s)	0	SF_6(g)	−1220.5
CO(g)	−110.525	HCl(g)	−92.307	$MnCl_2$(aq)	−555.05	SO_2(g)	−296.830
CO_2(g)	−393.509	HCl(aq)	−167.159	$Mn(NO_3)_2$(aq)	−635.5	SO_3(g)	−454.51
CS_2(l)	89.70	HCN(aq)	108.9	MnO_2(s)	−520.03	SrO(s)	−592.0
Ca(s)	0	HCHO	−108.57	MnS(s)	−214.2	TiO_3(s)	−939.7
$CaCO_3$(s)	−1206.9	HCOOH(l)	−424.72	N_2(g)	0	TlI(s)	−123.5
CaO(s)	−635.1	HF(g)	−271.1	NH_3(g)	−46.11	UCl_4(s)	−1019.2
$Ca(OH)_2$(s)	−986.09	HI(g)	26.48	NH_4Br(s)	−270.83	UCl_5(s)	−1059
Cl_2(g)	0	H_2O(l)	−285.830	NO(g)	90.25	Zn(s)	0
Co_3O_4(s)	−891	H_2O(g)	−241.818	NO_2(g)	33.18	$ZnCl_2$(aq)	−488.19
CoO(s)	−237.94	H_2O_2(l)	−187.8	N_2O(g)	82.05	ZnO(s)	−348.28
Cr_2O_3(s)	−1139.7	H_3PO_4(l)	−595.4	Na(s)	0	$ZnSO_4$(aq)	−1063.15

61) Using the above table, determine the ΔH_f° for the following reaction: NH_3 (g) + HBr (g) $\rightarrow$ NH_4Br (s) (ΔH_f° for NH_3 (g) = -80 kJ/mol; for NH_4Br (s) = -271.54 kJ/mol). FYI: (l) = (aq).

62) If you had 34 grams of gaseous ammonia in #61, how much heat was actually generated in the formation of ammonium bromide by the reaction?

63) In advance of your week 10 experiment (Born Haber Cycles and Hess' Law), calculate the ΔH for the reaction CaC_2 (s) + $2H_2O$ (l) $\rightarrow$ $Ca(OH)_2$ (l) + C_2H_2 (g) given the following data:

Reaction	ΔH (kJ)
Ca(s) + ½ O2 $\rightarrow$ CaO (s)	-635.5
Ca(s) + 2C (graphite) $\rightarrow$ CaC_2 (s)	-62.8
CaO(s) + H_2O (l) $\rightarrow$ $Ca(OH)_2$ (l)	-653.1
C_2H_2 (g) + 2.5 O_2 $\rightarrow$ $2CO_2$ (g) + H_2O (l)	-1300
C(graphite) + O_2 (g) $\rightarrow$ CO_2(g)	-393.5

You may find this table of help:

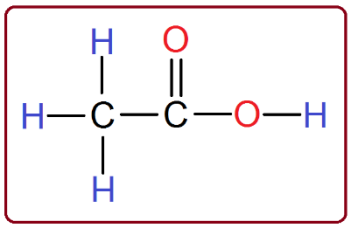
Average Bond Energies (kJ/mol)

Single Bonds						Multiple Bonds	
H—H	432	N—H	391	I—I	149	C=C	614
H—F	565	N—N	160	I—Cl	208	C≡C	839
H—Cl	427	N—F	272	I—Br	175	O=O	495
H—Br	363	N—Cl	200			C=O*	745
H—I	295	N—Br	243	S—H	347	C≡O	1072
		N—O	201	S—F	327	N=O	607
C—H	413	O—H	467	S—Cl	253	N=N	418
C—C	347	O—O	146	S—Br	218	N≡N	941
C—N	305	O—F	190	S—S	266	C≡N	891
C—O	358	O—Cl	203			C=N	615
C—F	485	O—I	234	Si—Si	340		
C—Cl	339			Si—H	393		
C—Br	276	F—F	154	Si—C	360		
C—I	240	F—Cl	253	Si—O	452		
C—S	259	F—Br	237				
		Cl—Cl	239				
		Cl—Br	218				
		Br—Br	193				

*C=O(CO_2) = 799

64) Using the above table, determine the ΔE for the following reaction: $H_2 + Cl_2 \rightarrow 2HCl$.

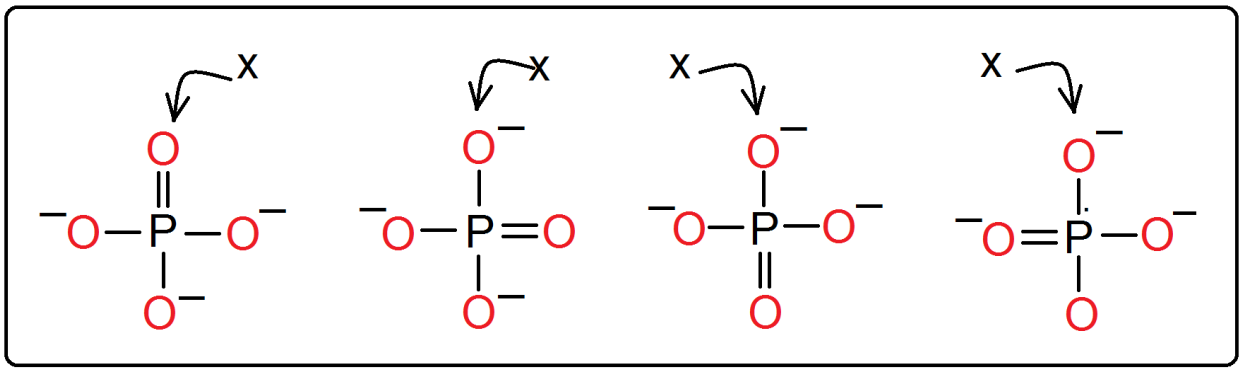
65) Using the above table, determine the ΔE for the following reaction: $CH_3OH + C{\equiv}O \rightarrow HC_2H_3O_2$. $HC_2H_3O_2$ has the following structure:



66) In the space below, hand-draw a graph that has Temperature (°C) on the vertical and Heat Added on the horizontal that illustrates the phase changes from a solid to a vapor. Make sure to include the following: latent heat, sensible heat, the 3 phases and freezing/thawing and condensing/vaporizing. Use arrows to show either direction the last 4 terms are going.

Here's something that will let you comingle Lewis Structures (lab) with Thermochemistry (reading) in your spare time: http://science.uvu.edu/ochem/index.php/alphabetical/q-r/resonance-theory/

67) According to resonance theory, each bond in the phosphate ion (PO_4^{3-}) is consistent with the observation that the four bonds in the phosphate ion have the same bond length. Given that the P–O bond energy is 376.6 kJ/bond and that the P=O bond energy is 460.2 kJ/bond, determine the bond energy for the O labeled "X" in the diagram, below.



68) A little aluminum boat (mass of 14.50 g) has a volume of 450.00 cm^3. The boat is placed in a small pool of water and carefully filled with pennies. If each penny has a mass of 2.50 g, how many pennies can be added to the boat before it sinks?

69) Gasoline is a non-polar liquid that will float on water. 450 grams of gasoline is spilled into a puddle of water. If the density of gasoline is 0.665 g/mL, what volume of gasoline is spilled?

70) A cup of gold colored metal beads was measured to have a mass 425 grams. By water displacement, the volume of the beads was calculated to be 48.0 cm^3. Given the following densities, identify the metal.

Gold: 19.3 g/mL
Copper: 8.86 g/mL
Bronze: 9.87 g/mL