Chemistry A Final Exam Details! (and Practice Problems!)

Schedule:
Periods 2 and 4 will have final exams on Tuesday, November 26.
Periods 1,3, and 5 will have final exams on Wednesday, November 27.
Each period will meet on both days of exams though.

	Tuesday November 26		Wednesday November 27	
	Time	Min	Time	Min
Per. 0	7:13-8:25	72	7:13-8:25	72
Per. 1	8:30-9:10	40	8:30-10:00	90
Per. 2	9:15-10:45	90	10:05-10:35	30
Per. 3	10:50-11:30	40	10:40-12:10	90
Lunch	11:30-12:10	40	12:10-12:50	40
Per. 4	12:15-1:45	90	12:55-1:25	30
Per. 5	1:50-2:30	40	1:30-3:00	90
Office Hours	2:30-3:30	60	3:00-3:30	30

Format:
The exam will be mostly multiple choice.
It will also have 0.5 to 1.5 pages of free response (Topics TBA soon. Will definitely include Lewis Dot structures.)
The exam will be worth between 11 and 13% of your overall grade in the class.

What to Bring:
pencil(s) and eraser(s)
non-graphing calculator (if you have one.. otherwise you can borrow one)
Optional: a 3x5 notecard (3 inches by 5 inches) with writing on ONE SIDE ONLY.
It must be handwritten (can not be typed or photocopied) and you will turn it in with your exam.

Formulas and numbers to know by heart:
(and be able to solve for any variable in each formula)

$$\text{Molarity} = \frac{\text{moles solute}}{\text{Liters solution}}$$

$E = h\nu$ $\quad c = \lambda\nu$ $\quad c = 3.00 \times 10^8$ m/s
Conversion factors for going between moles/grams/molecules/atoms
Electron configurations – be able to write out the chart with the arrows on it, or use the periodic table for the order.
Percent yield formula, and Percent error formula

What to study:
The final exam will be cumulative for the whole trimester.
Study worksheets, notes, labs*, and the book.
* especially the MgO Lab, the silver nitrate lab, and the molarity of $CaCl_2$ labs.
See also practice quizzes/previous study guides (all of these are still up on the website):
WS 6.6 (this was a practice quiz over formulas, sig figs, units)
- Chapter 2-7 Study Guide
- Reactions and Stoichiometry Practice Quiz
- WS 8.6 (This was a review sheet over all the types of reactions)
- Light and electron configurations practice Quiz (on the back of WS 4.1)
- Quantum, Stoichiometry, and Molarity Test Study Guide
- The practice problems on pages 3h-10 of this study guide!

Info you'll be given:
See the back of this sheet for a mini-version of the yellow data sheet you'll get on the test.
There is a full size version on the website.

PLEASE DO NOT WRITE ON THIS SHEET!
TURN IT IN WHEN YOU TURN IN YOUR TEST. THANK YOU!

Latin Prefixes:

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

Activity Series

Li
K
Ba
Sr
Ca
Na
Mg
Al
H(H_2O)
Zn
Cr
Fe
Co
Ni
Sn
Pb
H(acid)
Cu
Ag
Hg
Pt
Au

Activity Series

F_2
Cl_2
Br_2
I_2

H_2 O_2 F_2 Br_2 I_2 N_2 Cl_2

h = 6.63×10^{-34} J·s
1 mole = 6.02×10^{23}

Metric Prefix	Symbol	Meaning
Mega-	M	10^6
kilo-	k	10^3
deci-	d	10^{-1}
centi-	c	10^{-2}
milli-	m	10^{-3}
micro-	μ	10^{-6}
nano-	n	10^{-9}

Other Conversions

1 inch = 2.54 cm (exactly)
1 foot = 12 inches (exactly)
1 hour = 60 minutes (exactly)
1 minute = 60 seconds (exactly)
1 mile = 5280. feet
1 mile = 1.61 km
1 pound = 453.6 grams
1 mL = 1 cm^3 (exactly)

	1A (1)	2A (2)	3B (3)	4B (4)	5B (5)	6B (6)	7B (7)	8B (8)	(9)	(10)	1B (11)	2B (12)	3A (13)	4A (14)	5A (15)	6A (16)	7A (17)	8A (18)
1	Hydrogen 1 H 1.0079																	Helium 2 He 4.0026
2	Lithium 3 Li 6.941	Beryllium 4 Be 9.0122											Boron 5 B 10.811	Carbon 6 C 12.011	Nitrogen 7 N 14.0067	Oxygen 8 O 15.9994	Fluorine 9 F 18.9984	Neon 10 Ne 20.1797
3	Sodium 11 Na 22.9898	Magnesium 12 Mg 24.3050											Aluminum 13 Al 26.9815	Silicon 14 Si 28.0855	Phosphorus 15 P 30.9738	Sulfur 16 S 32.066	Chlorine 17 Cl 35.4527	Argon 18 Ar 39.948
4	Potassium 19 K 39.0983	Calcium 20 Ca 40.078	Scandium 21 Sc 44.9559	Titanium 22 Ti 47.867	Vanadium 23 V 50.9415	Chromium 24 Cr 51.9961	Manganese 25 Mn 54.9380	Iron 26 Fe 55.845	Cobalt 27 Co 58.9332	Nickel 28 Ni 58.6934	Copper 29 Cu 63.546	Zinc 30 Zn 65.38	Gallium 31 Ga 69.723	Germanium 32 Ge 72.61	Arsenic 33 As 74.9216	Selenium 34 Se 78.96	Bromine 35 Br 79.904	Krypton 36 Kr 83.80
5	Rubidium 37 Rb 85.4678	Strontium 38 Sr 87.62	Yttrium 39 Y 88.9059	Zirconium 40 Zr 91.224	Niobium 41 Nb 92.9064	Molybdenum 42 Mo 95.96	Technetium 43 Tc (97.907)	Ruthenium 44 Ru 101.07	Rhodium 45 Rh 102.9055	Palladium 46 Pd 106.42	Silver 47 Ag 107.8682	Cadmium 48 Cd 112.411	Indium 49 In 114.818	Tin 50 Sn 118.710	Antimony 51 Sb 121.760	Tellurium 52 Te 127.60	Iodine 53 I 126.9045	Xenon 54 Xe 131.29
6	Cesium 55 Cs 132.9055	Barium 56 Ba 137.327	Lanthanum 57 La 138.9055	Hafnium 72 Hf 178.49	Tantalum 73 Ta 180.9479	Tungsten 74 W 183.84	Rhenium 75 Re 186.207	Osmium 76 Os 190.23	Iridium 77 Ir 192.22	Platinum 78 Pt 195.084	Gold 79 Au 196.9666	Mercury 80 Hg 200.59	Thallium 81 Tl 204.3833	Lead 82 Pb 207.2	Bismuth 83 Bi 208.9804	Polonium 84 Po (208.98)	Astatine 85 At (209.99)	Radon 86 Rn (222.02)
7	Francium 87 Fr (223.02)	Radium 88 Ra (226.0254)	Actinium 89 Ac (227.0278)	Rutherfordium 104 Rf (267)	Dubnium 105 Db (268)	Seaborgium 106 Sg (271)	Bohrium 107 Bh (272)	Hassium 108 Hs (270)	Meitnerium 109 Mt (276)	Darmstadtium 110 Ds (281)	Roentgenium 111 Rg (280)	Copernicium 112 Cn (285)	Ununtrium 113 Uut Discovered 2004	Ununquadium 114 Uuq Discovered 1999	Ununpentium 115 Uup Discovered 2004	Ununhexium 116 Uuh Discovered 1999	Ununseptium 117 Uus Discovered 2010	Ununoctium 118 Uuo Discovered 2002

Cerium 58 Ce 140.116	Praseodymium 59 Pr 140.9076	Neodymium 60 Nd 144.242	Promethium 61 Pm (144.91)	Samarium 62 Sm 150.36	Europium 63 Eu 151.964	Gadolinium 64 Gd 157.25	Terbium 65 Tb 158.9254	Dysprosium 66 Dy 162.50	Holmium 67 Ho 164.9303	Erbium 68 Er 167.26	Thulium 69 Tm 168.9342	Ytterbium 70 Yb 173.054	Lutetium 71 Lu 174.9668
Thorium 90 Th 232.0381	Protactinium 91 Pa 231.0359	Uranium 92 U 238.0289	Neptunium 93 Np (237.0482)	Plutonium 94 Pu (244.664)	Americium 95 Am (243.061)	Curium 96 Cm (247.07)	Berkelium 97 Bk (247.07)	Californium 98 Cf (251.08)	Einsteinium 99 Es (252.08)	Fermium 100 Fm (257.10)	Mendelevium 101 Md (258.10)	Nobelium 102 No (259.10)	Lawrencium 103 Lr (262.11)

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Table of Common Ions !

Cations

Al^{+3}	aluminum
NH_4^{+1}	ammonium
Sb^{+3}	antimony
Ba^{+2}	barium
Bi^{+3}	bismuth
Cd^{+2}	cadmium
Ca^{+2}	calcium
Cr^{+2}	chromium II (chromous)
Cr^{+3}	chromium III (chromic)
Co^{+2}	cobalt
Cu^{+1}	copper I (cuprous)
Cu^{+2}	copper II (cupric)
Au^{+1}	gold I (aurous)
H^{+1}	hydrogen
H_3O^{+1}	hydronium
Fe^{+2}	iron II (ferrous)
Fe^{+3}	iron III (ferric)
Pb^{+2}	lead II (plumbous)
Pb^{+4}	lead IV (plumbic)
Li^{+1}	lithium
Mg^{+2}	magnesium
Mn^{+2}	manganese II (manganous)
Mn^{+3}	manganese III (manganic)
Hg_2^{+2}	mercury I (mercurous)
Hg^{+2}	mercury II (mercuric)
Ni^{+2}	nickel
K^{+1}	potassium
Ag^{+1}	silver
Na^{+1}	sodium
Sr^{+2}	strontium
Sn^{+2}	tin II (stannous)
Sn^{+4}	tin IV (stannic)
Zn^{+2}	zinc

Anions (monoatomic)

Br^{-1}	bromide
Cl^{-1}	chloride
F^{-1}	fluoride
H^{-1}	hydride
I^{-1}	iodide
N^{-3}	nitride
O^{-2}	oxide
P^{-3}	phosphide
S^{-2}	sulfide

Anions (polyatomic)

$C_2H_3O_2^{-1}$	acetate
AsO_4^{-3}	arsenate
HCO_3^{-1}	bicarbonate
HSO_4^{-1}	bisulfate
HSO_3^{-1}	bisulfite
BO_3^{-3}	borate
BrO_3^{-1}	bromate
BrO_2^{-1}	bromite
CO_3^{-2}	carbonate
ClO_3^{-1}	chlorate
ClO_2^{-1}	chlorite
CrO_4^{-2}	chromate
CN^{-1}	cyanide
OCN^{-1}	cyanate
$Cr_2O_7^{-2}$	dichromate
OH^{-1}	hydroxide
BrO^{-1}	hypobromite
ClO^{-1}	hypochlorite
NO_3^{-1}	nitrate
NO_2^{-1}	nitrite
$C_2O_4^{-2}$	oxalate
ClO_4^{-1}	perchlorate
MnO_4^{-1}	permanganate
O_2^{-2}	peroxide
PO_4^{-3}	phosphate
SiO_3^{-2}	silicate
SO_4^{-2}	sulfate
SO_3^{-2}	sulfite
SCN^{-1}	thiocyanate
$S_2O_3^{-2}$	thiosulfate

Negative Ions (Anions) +	Positive Ions (Cations) →	Compounds with the Solubility:
Essentially all	Alkali ions (Li^+, Na^+, K^+, Rb^+, Cs^+, Fr^+)	soluble
Essentially all	hydrogen ion [$H^+(aq)$]	soluble
Essentially all	ammonium ion (NH_4^+)	soluble
Nitrate, NO_3^-	essentially all	soluble
Acetate, CH_3COO^- / $C_2H_3O_2^{-1}$	essentially all	soluble
Chloride, Cl^-; Bromide, Br^-; Iodide, I^-	Ag^+, Pb^{2+}, Hg_2^{2+}, Cu^+, Tl^+	NOT soluble
	all others (including Cu^{+2})	soluble
Sulfate, SO_4^{2-}	Ca^{2+}, Sr^{2+}, Ba^{2+}, Pb^{2+}, Ra^{2+}	NOT soluble
	all others	soluble
Sulfide, S^{2-}	alkali ions, $H^+(aq)$, NH_4^+, Be^{2+}, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Ra^{2+}	soluble
	all others	NOT soluble
Hydroxide, OH^-	alkali ions, $H^+(aq)$, NH_4^+, Sr^{2+}, Ba^{2+}, Ra^{2+}, Tl^+	soluble
	all others	NOT soluble
Phosphate, PO_4^{3-}; Carbonate, CO_3^{2-}; Sulfite, SO_3^{2-}	alkali ions, $H^+(aq)$, NH_4^+	soluble
	all others	NOT soluble

* "Soluble" means that at least 0.10 mole of compound can dissolve per liter of solution.

Practice Problems for the Chem A Final Exam!
(Solutions will be posted in the hall outside of room 418 and on the website)
http://blogs.4j.lane.edu/hocken_s/

1. Make the following conversions:
a. 75 milligrams to grams
b. 6.00 x 10^7 micrograms (μg) to kilograms (kg)
c. 472 centimeters to feet
d. 8.0 feet per minute to millimeters per hour
e. 100. cubic inches to cubic centimeters.
f. 14.7 pounds per square inch to kilograms per square meter. (1 pound = 453.8 grams)
g. 0.00246 square millimeters (mm^2) to square nanometers (nm^2)

2. Round each calculator answer to the correct number of significant figures

a. 112.000 / 2.10 = 53.333333 ----->__________
b. 112.000 + 2.10 = 114.1 -----> ___________
c. 12.5 x 16 = 200 ----->_____________
d. 153.48 – 2.13 = 151.35 ----> ______________
e. 0.00022 x 198 = 0.04356 ----->__________
f. 3335.67 / 74.126 = 45 ---->________
g. 75.9762 - 73.97 = 2.0062 ----->________
h. 75.97 - 73.97 = 2 ----->_____________

3. Iridium has two common isotopes. 62.7% of Iridium ions are Ir-193 (Mass = 192.963 amu) and the remainder are Ir-191 (mass = 190.9606 amu).
a. Calculate the atomic mass of iridium based on the data.
b. How many protons and neutrons are in Ir-193? p______ n______
c. How many protons and neutrons are in Ir-191? p______ n_______

For **#4 and 5**, you should be able to answer all of the problems **without your blue ion sheet.** (you'll need a periodic table for some of them though.)

4. Calcium (Ca) is element #20.
a. What is the charge on a calcium atom? ______
b. What is the charge on a calcium ion? ______
c. How many protons and how many electrons are in a calcium atom? p ______ e _______
d. How many protons and how many electrons are in a calcium ion? p ______ e _______
e. Which noble gas has the same number of electrons as a calcium ion? ______

Arsenic (As) is element #33.
f. What is the charge on an arsenic atom? ______
g. What is the charge on an arsenide ion? _______
h. How many protons and how many electrons are in an arsenic atom? p ______ e _______
i. How many protons and how many electrons are in an arsenide ion? p ______ e _______
j. Which noble gas has the same number of electrons as the arsenide ion? ______

5. Give the symbol for four ions that have the same number of electrons as Neon.

6a. Fill out the chart:

Symbol	#protons	# neutrons	#electrons	mass#	charge	atomic #
$^{75}As^{+5}$	________	_________	_________	______	________	_______
______	_________	36	28	66	________	_______
_______	________	_________	54	131	________	53
_______	________	10	10	______	-2	_______
_______	________	_________	9	19	________	9

6b. How many protons and neutrons are in the most common isotope of phosphorus? p____ n______

7. Formula Writing: Fill in the missing name or formula. Classify any compounds as ionic or covalent.

copper (II) sulfate Iron (III) phosphate		zinc phosphate	chlorine
N_2O_4	PF_5	B_2O_3	Al_2O_3
Na_3PO_4	Cl_2O_7	$PbCO_3$	Sn_3N_4
ammonium carbonate	Iron (II) carbonate	Ag_2SO_3	SO_3
ferric hydroxide	CO_2	$SiBr_4$	zinc acetate
BrO Br_2O	Helium nitrogen	CuO	Cu_2S

8. a. Write a balanced chemical equation for the reaction that would occur if iodine and iron reacted to form ferric iodide. Include phase subscripts and balance the reaction.

b. What type of compound formed in this reaction? Explain how you know.
c. When the iodine reacted, did it need to gain or lose electrons to form the compound? ___________
d. When the iron reacted, did it need to gain or lose electrons to form the compound? ____________

9. Consider the elements barium (Ba), oxygen (O_2), sulfur (S), chlorine (Cl_2), potassium (K), and neon (Ne).
a. List any pairs of elements (from the list) that could bond together covalently:
b. When the covalent compounds form, what would each element need to do with its electrons to form the compound? (gain? lose? share?)
c. List any pairs of elements (from the list) that could bond together ionically.
d. List the formulas of any ionic compounds that could form.
e. When the ionic compounds form, what would each element need to do with its electrons to form the compound? (gain? lose? share?)

10. Consider the elements phosphorus (P), Fluorine (F_2), and copper (Cu).
a. If fluorine bonds with phosphorus, what will the fluorine need to lose, gain, or share electrons?
b. If fluorine bonds with copper, will the fluorine need to lose, gain, or share electrons?

11. a. Which can more commonly form ions with an "ide" ending: metals or nonmetals?
b. Explain why, in terms of how metals and nonmetals change their numbers of electrons when they form ions.

12. Moles! Make the following conversions.
a. 3.08×10^{22} iron atoms to moles
b. 3.32 grams of hydrogen gas to moles
c. 10.0 moles of carbon dioxide to grams
d. 3.2×10^{20} molecules of carbon dioxide to grams.
e. 3.2×10^{20} molecules of carbon dioxide to atoms.
f. 24 grams of iron to atoms.
g. 16.2 grams of nitrogen triiodide to molecules.
h. 0.0121 moles of nitrogen triiodide to molecules.
i. 0.0121 moles of nitrogen triiodide to atoms.

13. a. Determine the percent composition of each element in $(NH_4)_2S$.
b. How many grams of nitrogen are in 20.0 grams of ammonium sulfide?
c. What mass of carbon is in 15.0 grams of glucose sugar ($C_6H_{12}O_6$)?
d. If you needed to extract 20.0 kg iron from iron III oxide, what mass of iron III oxide would you start with?

14. a. What is the empirical formula of $C_8H_{12}O_4$? of $C_{25}H_{30}$? of $C_6H_{12}O_6$?
b. A compound with a molar mass of roughly 80 amu is 85.7% carbon (by weight), and the remainder is hydrogen. Find the empirical formula and the molecular formula.
c. A compound is 26.6 %potassium, 35.3% chromium, and 38.1% oxygen by mass. Find the empirical formula.
d. A compound is 46.6 % C, 6.84 % H, and 46.5% oxygen by mass. Calculate the empirical formula.
e. The compound in (d) has a molar mass between 400 and 450 g/mole. Find the molecular formula.
f. A compound contains 8.68 grams of carbon per 1.18 grams hydrogen and 2.54 grams nitrogen. Calculate the empirical formula of the compound.

15. A crucible containing copper powder is heated until the copper oxidizes to form copper oxide. The following data is obtained:

Mass of crucible: 26.000 g
Mass of crucible and copper powder (before reaction): 27.021 g
Mass of crucible and copper oxide product (after reaction): 27.272 g

a. Determine these masses:

the mass of copper powder, before the reaction:

the mass of copper oxide that formed:

the mass of oxygen that bonded with copper:

b. What is the percent oxygen in the copper oxide product?

c. Was the product copper (I) oxide or copper (II) oxide? (which one)

16. An experiment was done to determine the percent iron in iron (III) sulfate. Some solid iron (III) sulfate was dissolved into water, and then was reacted with Zinc in a single replacement reaction. The iron that formed was washed, dried, and weighed, and the following data was obtained.

Mass of empty beaker: 54.44 g
Mass of beaker and solid iron (III) sulfate: 58.84 grams
Mass of empty evaporating dish: 42.21 grams
Mass of evaporating dish and iron powder that formed: 43.47 grams

a. Use the lab data to calculate the percent iron in iron (III) sulfate.
b. Write the formula for iron (III) sulfate.
c. Use your formula to calculate the book value for the percent iron in this compound.
d. What was the percent error for the experiment?
e. Write a balanced reaction for zinc reacting with the iron (III) sulfate, with phase subscripts.

17. Reactions! Predict products for each reaction. A few are N.R. Do phase subscripts and balancing.

a. Ca (s) + N_2 (g) ------>________

b. $FeCl_3$ (aq) + Ag_2SO_4(aq) ------>________

c. Al (s) + $Ni(NO_3)_2$(aq) ------>________

d. C_4H_{10} (l) + O_2 (g) ------>________

e. HNO_3(aq) + Al (s) ------>________

f. H_2O (l) + Al (s) + ------>________

g. $C_{10}H_{16}O$ (l) + O_2 (g) ------>________

h. HCl(aq) + Li_2CO_3(aq) ------>________

i. K(s) + O_2 (g) ------>________

j. F_2 (g) + $FeCl_3$(aq) ------>________

k. C_3H_7OH (l) + O_2 (g) ------>________

l. Zn (s) + $Al(NO_3)_3$(aq) ------>________

m. H_2O (l) + Li (s) + ------>________

n. P(s) + Na(s) ------>________

o. I_2 (s) + $NaCl$ (aq)------>________

p. $Al(NO_3)_3$ (aq) + $NaCl$ (aq) ------>________

q. HCl(aq) + $Ba(OH)_2$ (aq) ------>________

r. $FeCl_3$ (aq) + $AgNO_3$(aq) ------>________

s. $Pb(NO_3)_4$(aq) + Zn (s) ------>________

t. Pb (s) + H_2O (l) ------>________

u. Al (s) + $HC_2H_3O_2$(aq) ------>________

v. HNO_3(aq) + $MgCO_3$ (s) ------>________

w. $Al(NO_3)_3$ + Li_2CO_3(aq) ------>________

x. K(s) + Cl_2 (g) ------->________

y. N_2 (g) + Na(s) ------> ________

z. C_9H_{20} (l) + O_2 (g) ------>________

18. $3\ Zn_{(s)} + 7\ H_2SO_{4(aq)} + K_2Cr_2O_{7(aq)}$ -----> $Cr_2(SO_4)_{3(aq)} + 7\ H_2O_{(l)} + 3\ ZnSO_{4(aq)} + K_2SO_{4(aq)}$

a. If 10.0 grams of H_2SO_4 react, what mass of zinc sulfate will be produced?
b. If 6.55 grams of zinc sulfate are collected in (a), what was the percent yield?
c. How many moles of H_2SO_4 are needed to produce 0.211 moles of chromium sulfate?
d. How many water molecules will form, if 0.0201 moles of zinc react?
e. How many moles of H_2SO_4 must react in order to form 0.34 moles of potassium sulfate?

19. $2\ Fe_{(s)} + 6\ HCl_{(aq)}$ -------> $2\ FeCl_{3(aq)} + 3\ H_{2(g)}$
a. If 50.0 grams of iron are allowed to react with 85.0 grams of HCl, how many grams of iron chloride can form?
b. If 1.0×10^{23} iron atoms are allowed to react with 22.0 grams of acid, how many moles of hydrogen gas can form?
c. If 0.10 moles of iron are allowed to react with 14.2 grams of acid, what mass of hydrogen gas can form?

Suppose that a 0.100 mole piece of iron is placed into a solution containing 0.200 moles of hydrochloric acid, and is left alone for a few days.
d. When the reaction is done, how many moles of hydrogen gas should have formed?
e. What one of these shows reasonable values for the amounts of Fe and HCl that are leftover after the rxn? You should be able to choose the right answer without doing any more math.

a. 0.000 moles of iron, and 0.150 moles of HCl
b. 0.000 moles of iron, and 0.250 moles of HCl
c. 0.133 moles of iron, and 0.000 moles of HCl
d. 0.033 moles of iron, and 0.000 moles of HCl

20. a. Calculate the molarity of a solution that contains 5.48 grams of $CaBr_2$ per 425 mL solution.
b. What mass of LiCl must be dissolved, in order to make 1450 mL of 0.400 Molar LiCl?
c. If a solution contains 0.292 moles of LiCl per 150. mL solution, what is the molarity?
d. How many moles of $CaBr_2$ would be required to make 200. mL of 0.350 M $CaBr_2$ solution?
e. What is the molarity of a solution containing 10.0 grams $C_6H_{12}O_6$ per 50.0 mL solution volume?
f. Which of the $CaBr_2$ solutions (above) was more dilute? _____ Which was more concentrated? ______

21. An experiment was done to determine molarity of a hydrochloric acid (HCl) solution. The solution of hydrochloric acid is added to some zinc wire in a beaker, and is allowed to react for several days. The zinc wire that remains after the reaction is washed, dried, and weighed. The same beaker was used throughout the experiment, and the following data was obtained:

Volume of acid used (measured by grad. cylinder): 60.0 mL
Mass of empty beaker: 52.00 g
Mass of beaker and zinc wire (before the reaction): 58.33 grams
Mass of beaker and zinc wire (after drying in the oven): 56.77 grams

a. Write the reaction that occurred between zinc and hydrochloric acid. Include subscripts.
b. Determine the mass of zinc that was consumed by the reaction with HCl.
c. Use stoichiometry to determine the moles of HCl required to react with the mass of zinc calculated in (b).
d. Calculate the molarity of the HCl solution.
e. What would be a sign that the reaction was complete.. how would the contents of the beaker look when the HCl was first added, vs how would it look after the reaction was done?
f. Which substance was the limiting reactant in this experiment?

22. For each atom or ion:
a. Write the electron configuration.
b. Underline the valence electrons, and indicate the number of valence electrons it has.

Am	At
Cs	Mg
Ge	magnesium ion
Br	bromide ion
S	sulfide ion
C	Nb

c. Give the formula for 3 other ions (include at least 1 cation and 1 anion) that have the same number of electrons as bromide ion.

d. Give the formula for 3 ions (include at least 1 cation and 1 anion) that have the same number of electrons as Xenon.

23. For each pair, which "thing" has more energy?
(assume that the electrons mentioned are in the same type of element.)

a. An electron in a 4s orbital or An electron in a 3s orbital

b. EM radiation with a frequency of 1.21×10^{14} Hz. or with a frequency of 8.21×10^{13} Hz.

c. An electron in a 5s orbital or An electron in a 5f orbital

d. EM radiation with a wavelength of 1774 nm or with a wavelength of 344 nm.

e. yellow light or green light

f. An electron that is 0.2 nm away from the nucleus, or an electron that is 0.08 nm away from the nucleus.

g. a radio wave or an infrared wave

h. ultraviolet radiation or microwave radiation

24. For each pair, indicate whether they are attracted to or repelled by each other, and explain your answer.

a. the nucleus and an electron

b. an electron and another electron

c. an electron and a proton

25. Use your answer(s) to #24 to explain why higher n-level has higher/lower (which one?) potential energy.

26a. Determine the frequency of EM radiation with a photon energy of 6.99×10^{-26} J.

b. Determine the photon energy of EM radiation with a wavelength of 4.1 nm.

c. Find the wavelength, in nm, of EM radiation with a frequency of 1.21×10^{14} Hz.

d. Find the frequency of EM radiation with a wavelength of 5.8×10^{-6} meters.

e. Find the wavelength of EM radiation with a photon energy of 7.18×10^{-18} J.
Report your answer in m and nm.

C Li Bk Zr B Pb P Br Ba Ni Au Xe W Sm Se K

27. Choose from the above list of elements to answer the questions below.

An element with 5 valence electrons.___________

An element with 7 valence electrons. ___________

An element in the same family as magnesium. ___________

An element in the same period as magnesium. ___________

A halogen. ___________

An alkali earth metal. ___________

A metal with 4 valence electrons. ___________

A nonmetal with 4 valence electrons. ___________

An element with an electron configuration ending in p^3. ___________

An alkali metal. ___________

An actinide. ___________ A lanthanide. ___________

An element with partially filled f-orbitals. ___________

An element with partially filled d-orbitals. ___________

A representative element. ___________

A transition metal. ___________

A noble gas. ___________

An inner transition metal. ___________

An element with 1 valence electron. ___________

An element with 3 valence electrons. ___________

An element with 8 valence electrons. ___________

An element in the same family as oxygen. ___________

An element with an electron configuration ending in p^6. ___________

An element with an electron configuration ending in d^2. ___________

An element that tends to form a +1 ion. ___________

An element that is completely inert (non-reactive.) ___________

An element that tend for form ions by gaining 2 electrons. ___________

An element that tends to form ions by gaining 1 electron. ___________

28. a. Draw the Lewis dot structure for each of these.

PI_3

SO_3

HOBr (O is the central atom)

CH_2S
(C is the central atom)

$CFBr_2H$
(C is the central atom)

CO_3^{-2}

IO_3^{-1}

IO_2^{-1}

CF_2H_2
(C is the central atom)

SO_2

NO_2^{+1}

OF_2

OH^{-1}

NH_3

PO_4^{-3}

NO_3^{-1}

SO_3^{-2}

CSe_2

SSe_2

SI_2

CN^{-1}

H_2

F_2

O_2

N_2

b. The lines in your dot structures represent bonds. Are these ionic or covalent bonds (which one)? Explain your answer in terms of what is going on with the electrons.