Chemistry IA: Fall Final Exam Review Sheet!

Bring: Non-graphing calculator, #2 pencil, eraser.
Bring: A 3x5 notecard, with writing on ONE SIDE only.
(The card must be handwritten; may not be typed or photocopied.)

Formulas to know by heart. (Be able to solve for any variable in each formula)
$D = m/V$
Conversion factors for going between moles/grams/molecules/atoms
Molarity = $\frac{\text{moles solute}}{\text{Liters solution}}$ $\quad mol = M \times L$
$E = h\nu$
$c = \lambda\nu$ (and know that $c = 3.00 \times 10^8$ m/s)
Electron configurations – be able to use the periodic table for the order
Percent yield formula
Percent error formula
Empirical Formula
Percent Composition Formula

What to study:

The final exam will be cumulative for the whole trimester.
The final exam will be multiple choice.
Study notes, labs, and the book.

The following information will be given:

Conversion Factors:

1 inch = 2.54 centimeters(exactly)
1 foot = 12 inches (exactly)
1 calorie = 4.184 Joules
1 pound = 454 grams

Metric Prefix	Symbol	value
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}

1 = mono, 2 = di, 3 = tri, 4 = tetra, 5 = penta, 6 = hexa, 7 = hepta, 8 = octa, 9 = nona, 10 = deca
$h = 6.63 \times 10^{-34}$ J·s
ion sheet with solubility chart
periodic table
A chart of density values
1 mole = 6.02×10^{23} particles
Activity series of metals and halogens

CHEM A EXAM REVIEW!! Name: _____

1. Titanium has a density of 4.5 g/cm^3. Find the volume of 12.3 grams of titanium.

2. A metal's density is determined using water displacement.
Use the following data to calculate the density of the metal.

Mass of empty beaker: 62.33 g
Mass of beaker and chunk of metal: 78.73 grams
Initial water level in a graduated cylinder: 43.8 mL
Volume of water and metal together: 45. 9 mL

3. Make the following conversions:

a. 75 milligrams to grams

b. 8.0 feet per minute to millimeters per hour

c. 100. cubic inches to cubic centimeters.

4. 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. 0.0022 x 198 = 0.4356 ----->_____

e. 3335.67 / 74.126 = 45 ---->_____

f. 75.9762 - 73.97 = 2.0062 ----->_____

g. 75.97 - 73.97 = 2 ----->_____

5.

Symbol	**#protons**	**# neutrons**	**#electrons**	**mass#**	**charge**	**atomic #**
$^{75}As^{+5}$	_____	_____	_____	_____	_____	_____
_____	_____	36	28	66	_____	_____
_____	_____	_____	54	131	_____	53

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

7. 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_____

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

9. 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

NO	N_2O	Helium	nitrogen	CuO	Cu_2S

10. a. Write the formula for iron (III) iodide.

b. Write a balanced chemical equation for the reaction that would occur if iodine and iron reacted to form iron (III) iodide. Include phase subcripts.

c. Which element is oxidized (loses electrons) in this reaction? _____

d. Which element is reduced (gains electrons) in this reaction _____

f. What type of compound (ionic or covalent) is formed in this reaction? Explain how you know.

11. a. Which subsances form ions with an “ide” ending: metals or nonmetals?

b. What is the difference between an ion that ends in "ide," "ite," and "ate"?

12. Moles! Make the following conversions.

a. 3.08×10^{22} iron atoms to moles

b. 3.32 grams of hydrogen gas (H_2) to moles

c. 10.0 moles of carbon dioxide to grams

d. 3.2×10^{20} molecules of carbon dioxide to grams.

13. a. Determine the percent composition of nitrogen in $(NH_4)_2S$.

b. How many grams of nitrogen are in 20.0 total grams of ammonium sulfide [$(NH_4)_2S$]?

14. a. What is the empirical formula of $C_8H_{12}O_4$? _____

b. A compound with a molecular weight 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.

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 molarity of a hydrochloric acid 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. Recall that the formula for a solution's molarity is equal to the moles solute per liter solution. Calculate the molarity of the HCl solution.

f. Which substance was the limiting reactant in this experiment?

18. 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. $K(s) + O2\,(g)$ ------>_____

g. $F_2\,(g) + FeCl_3(aq)$ ------>_____

h. $I_2\,(s) + NaCl\,(aq)$------>_____

i. $Al(NO_3)_3\,(aq) + NaCl\,(aq)$ ------>_____

j. $HCl_{(aq)} + LiOH_{(aq)}$ ------>_____

k. $FeCl_{3(aq)} + AgNO_{3(aq)}$ ------>_____

h. $Pb(NO_3)_{4(aq)} + Zn_{(s)}$ ------>_____

19. $3\ Zn_{(s)} + 7\ H_2SO_{4(aq)} + K_2Cr_2O_{7(aq)} \text{ -----> } Cr_2(SO_4)_{3(aq)} + 7\ H_2O_{(l)} + 3\ ZnSO_{4(aq)} + K_2SO_{4(aq)}$

a. If 10.0 grams of sulfuric react, what mass of zinc sulfate will be produced? (assume excess other reactants)

b. If 6.55 grams of zinc sulfate are collected in (a), what was the percent yield?

20. $2\ Fe_{(s)} + 6\ HCl_{(aq)} \text{ -------> } 2\ FeCl_{3(aq)} + 3\ H_{2(g)}$

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? This is a limiting reactant problem!

21. 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	C
Ge	magnesium ion
Nb	bromide ion

22. 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.

23a. Determine the frequency, in Hertz, of EM radiation with a photon energy of 6.99×10^{-26} J.

b. Determine the energy, in Joules, of EM radiation with a wavelength of 4.1 nm.