Name_____

Chem 101, Summer 1999
Exam II

Attached is a periodic table you may use. Scratch paper is available at the front of the room.

1. Draw the Lewis dot structures for single atoms of the following elements:

a.	Potassium	_____	d.	Oxygen	_____
b.	Stontium	_____	e.	Selenium	_____
c.	Phosphorus	_____	f.	Iodine	_____

2. Predict the charge (sign and magnitude) on the simple ions that these same elements are likely to form to produce ionic compounds:

a.	Potassium	_____	d.	Oxygen	_____
b.	Stontium	_____	e.	Selenium	_____
c.	Phosphorus	_____	f.	Iodine	_____

3. Write the chemical formula and give the name for four binary ionic compounds that are likely to form from the elements listed in the first two problems.

	Chemical formula	Name
a.	_____	_____
b.	_____	_____
c.	_____	_____
d.	_____	_____

4. Name the following binary ionic compound, all of which contain transition metal ions:

a.	$CrCl_2$	_____
b.	Fe_2O_3	_____
c.	$CuBr_2$	_____
d.	CuBr	_____
e.	Co_2S_3	_____

5. Write the chemical formula for the following binary ionic compounds:

a.	Tin(II) iodide	_____	d.	Cobalt(I) sulfide	_____
b.	Cobalt(I) nitride	_____	e.	Mercury(II) oxide	_____
c.	Platinum(IV) chloride	_____	f.	Lead(II) fluoride	_____

6. Name the following binary covalent molecules:

   a. N_2O_4 _____

   b. N_2O _____

   c. P_2O_5 _____

7. Draw Lewis structures for each of the following molecules:

   a. $HClO_3$
   (Each O atom is bonded to the Cl atom and the H is bonded to one of the O atoms.)

   b. SO_3
   (Each O atom is bonded to the S atom.)

8. Draw Lewis structures for each of the following polyatomic ions:

   a. NO_3^-
   (Each O atom is bonded to the N atom.)

   b. SO_3^{2-}
   (Each O atom is bonded to the S atom.)

9. Classify the bonds in the following binary molecules as *nonpolar covalent*, *polar covalent* or *ionic*: (The electronegativity values for the atoms involved are Cl(3.0), N(3.0), O(3.5), Ba(1.5), Li(1.0), H(2.1), I(2.5).

   a. NCl_3 _____

   b. $BaCl_2$ _____

   c. LiI_2 _____

   d. H_2O _____

10. The following ionic compounds are soluble in water. Identify the ionic species that each will produce:

   a. Li_2SO_4 _____

   b. $BaCl_2$ _____

   c. $Ca(NO_3)_2$ _____

11. Balance each of the following reaction equations, then write them in their *total ionic* form, cancel out any spectator ions, and write them again in their *net ionic* form.

a. Equation: $Cl_2(aq) + NaBr(aq) \rightarrow NaCl(aq) + Br_2(aq)$

Total: _____

Net: _____

b. Equation: $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + NaCl(aq)$

Total: _____

Net: _____

12. Classify each of the following reactions, first as either *redox* or *non-redox*, then classify them as *combination*, *decomposition*, *single replacement*, or *double replacement*. For any of the reactions that are redox reactions, circle the reactant that is serving as the *oxidizing agent*:

a. $N_2O_4(g) + H_2O(l) \rightarrow 2HNO_3(aq)$ _____ _____

b. $Cr_2O_3(s) + 2Al(s) \rightarrow 2Cr(s) + Al_2O_3(s)$ _____ _____

c. $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$ _____ _____

13. One of the reasons we breathe in oxygen is to obtain energy from the oxidation of the foods we eat. Below is the balance equation for the oxidation of the sugar glucose ($C_6H_{12}O_6$) to carbon dioxide and water:

$$C_6H_{12}O_6(aq) + 6O_2(aq) \rightarrow 6CO_2(aq) + 6H_2O(l)$$

a. How many grams of water are produced for every 10.0 *g* of glucose oxidized?

b. How many grams of oxygen are needed for the complete oxidation of 10.0 *g* of glucose?

14. Ammonia, carbon dioxide, and water vapor react to form ammonium bicarbonate:

$$NH_3(aq) + CO_2(aq) + H_2O(l) \rightarrow NH_4HCO_3(aq)$$

a. If 2.00 mol of NH_3, 150 g of CO_2 and 30 g of H_2O are reacted, what is the maximum amount (theoretical yield), in grams, of NH_4HCO_3 that can be produced?

b. If the actual yield from this reaction is 98.2 g, what is the percent yield?

Score_____