

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. Strontium _____ | 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. Strontium _____ | 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. | _____ | _____ |

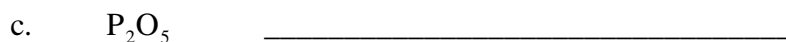
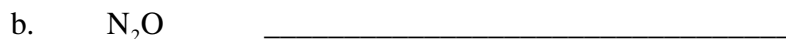
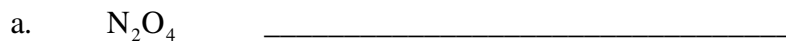
4. Name the following binary ionic compound, all of which contain transition metal ions:

- | | | |
|----|--------------------------------|-------|
| a. | CrCl ₂ | _____ |
| b. | Fe ₂ O ₃ | _____ |
| c. | CuBr ₂ | _____ |
| d. | CuBr | _____ |
| e. | Co ₂ S ₃ | _____ |

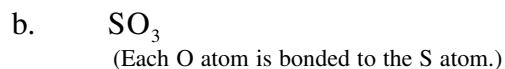
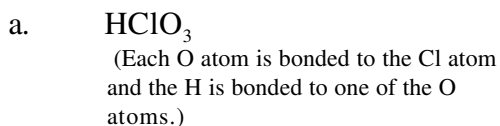
5. Write the chemical formula for the following binary ionic compounds:

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

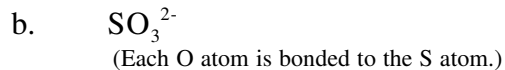
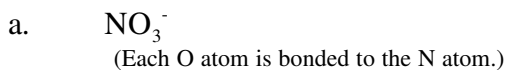
6. Name the following binary covalent molecules:



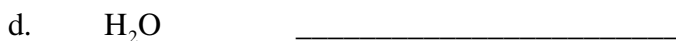
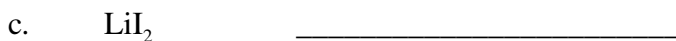
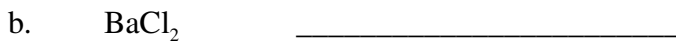
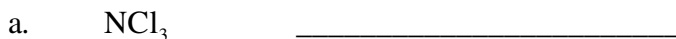
7. Draw Lewis structures for each of the following molecules:



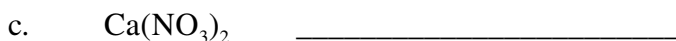
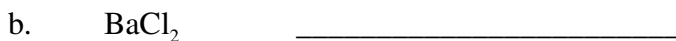
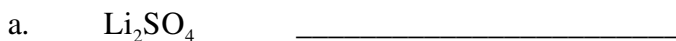
8. Draw Lewis structures for each of the following polyatomic ions:



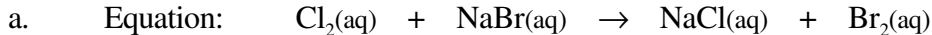
9. Classify the bonds in the following binary molecules as *nonpolar covalent*, *polar covalent* or *ionic*: (The electronegativity values for the atoms involved are Cl(3.0), N(3.0), O(3.5), Ba(1.5), Li(1.0), H(2.1), I(2.5).



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



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.



Total: _____

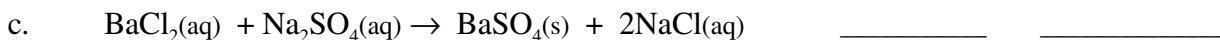
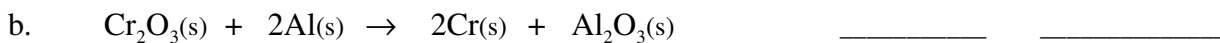
Net: _____



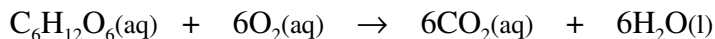
Total: _____

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*:



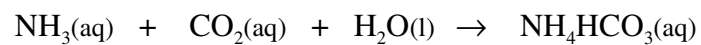
13. One of the reasons we breathe in oxygen is to obtain energy from the oxidation of the foods we eat. Below is the balance equation for the oxidation of the sugar glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) to carbon dioxide and water:



- 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:



- 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 _____