CHEM1210: TEST 3, Fall 2004

Show all of your work. Students should make use of the conversion factor method throughout and express their answers in scientific notation.

1. (a) Why did Mendeleev arrange the elements in his periodic table according to atomic mass (A) and not the atomic number (Z) as they are arranged today?

   (b) If Mendeleev arranged the elements according to their mass, why was Te (*Mm* = 127.6) placed before I (*Mm* =126.9) in the Mendeleev table?

2. Complete the following:

   (a) 'The modern statement of the periodic law states that the properties of the elements are a periodic function of _____'

   (b) The horizontal rows of the Periodic Table are called _____, vertical columns of elements in the periodic table are called _____.

3. (a) Explain why atomic size increases as you move down the table.

   (b) Explain why atomic size decreases as you move across the table.

4. Write a complete chemical equation to represent the ionization of a potassium atom using Lewis electron-dot symbols. Is this oxidation or reduction? Explain.

5. Predict the bonding in the following compounds:

   (a) $CaCl_2$ solid (b) CO gas (c) KNO_3 solid (d) I_2 solid

6. Draw Lewis structures **and** determine the shape of:

(a) Ammonia (NH_3) (b) Ammonium ion (NH_4^+)

7. An unknown substance is a liquid that boils at 78 ˚C and dissolves in water but does not conduct electricity, is it ionic, polar covalent, nonpolar covalent or metallic?

8. Complete the following (there are 4 pieces of missing information marked with a '?')

Characteristic	**Ionic**	**Covalent**	**Metallic**
STATE	ions	?	atoms
Melting Point	high	low	varies
Conductivity Solid Melted Water	 N Y Y	 N N N	 Y Y NA
Solubility	Y in Polar solvent	Non-Polar compounds soluble in Non-Polar solvents, Polar compounds soluble in Polar solvents	No
Examples	?	?	?

9. (a) How many atoms are present in one mole of n element?

(b) Determine the mass in grams of one atom of gold.

10. Complete, balance and **classify** the following chemical reactions:

(a). Nitrogen reacts with hydrogen to produce ammonia.

(b) Copper metal reacts with oxygen and forms copper (I) oxide.

(c) Zinc reacts with hydrochloric acid.

(d) Silver nitrate and potassium chloride solutions are mixed.

BONUS:

11. Ammonium nitrate is used as a high explosive. The chemical decomposes to give nitrogen gas, oxygen gas, and water vapor. Write a balanced equation for this decomposition.

12. An ancient method of producing iron metal was to heat iron ore (Fe_2O_3) with charcoal C.

(a) Write a balanced equation for the reaction.

(b) What substance is the reducing agent?

(c) Which substance is reduced?