

**The exam will cover the material presented in Lectures 7-14**

### **General Notes:**

PAY ATTENTION TO SIGNIFICANT FIGURES!!! On the quizzes, a lot of you are still getting points off for significant figure errors – and by now, you should be checking your answers for the correct number of significant figures automatically, almost without even thinking.

**DON'T FORGET TO BRING A STANDARD CALCULATOR TO THE EXAM – YOU WILL NOT BE ALLOWED TO USE CELL PHONES, PDAs, MINI-COMPUTERS, ETC.**

### **Chapter 3**

#### Energy levels of electrons

Understand the following terms:

- principal energy level
- sublevel
- *s*, *p*, *d* and *f* orbitals
- electron spin

#### Atomic structures

Know how to write electron configurations (*e.g.*,  $1s^22s^22p^2$  for carbon) and orbital diagrams (boxes and arrows) for a given element or ion.

Understand the rules governing the order in which electrons fill up the orbitals in an element

Know the difference between valence electrons and core electrons (and know how to determine the number of valence electrons that an element has)

Know how to draw the electron-dot symbols for an element

Have a basic understanding of how electron configuration determines the chemical properties of elements in a group (*i.e.*, elements in the same column in the periodic table). For example, why do all of the Group 1A elements (H, Li, Na, K, etc.) form cations with a +1 charge? Why do all of the group 7A elements (halogens: F, Cl, Br, etc.) form anions with a –1 charge?

### **Chapter 4**

Know what ions are and how they are formed

-- both positive ions (cations) and negative ions (anions)

Understand the difference between how metals and non-metals form ions

Know which types of ions are formed by the elements in different groups in the periodic table (be able to determine the charge of the ions formed by different elements)

-- know which elements form only one type of ion and which elements can form more than one type of ion

Know the difference between monoatomic and polyatomic ions.

- you will need to memorize the *names*, *formulas*, and *charges* of common polyatomic ions. Refer to the table of polyatomic ions that I showed during lecture. You should definitely memorize the ions listed in the left column of the table, and you should try to memorize the ions listed in the right column of the table as well.

Know what ionic bonds are, how ionic compounds are formed, and some general properties of ionic compounds

Know how to give names for ionic compounds

- know which metals form only one type of positive ion and which metals form multiple positive ions (and how this affects naming compounds with these metals)

You should be able to:

- write the name of an ionic compound if you are given its chemical formula
- write the chemical formula of an ionic compound if you are given its name

## CHAPTER 5

Understand the difference between ionic bonding and covalent bonding

- know the difference between polar and non-polar covalent bonds

Know how to draw Lewis structures for atoms, ions, ionic compounds, and covalent compounds

Understand how to determine the three-dimensional shape of molecules using VSEPR theory.

Know what **electronegativity** is and how it can be used to predict whether a bond between any two atoms is non-polar covalent, polar covalent, or ionic in character.

Be able to determine whether a molecule is polar or non-polar

You should be able to:

- write the name of a covalent compound if you are given its chemical formula
- write the chemical formula of a covalent compound if you are given its name

## CHAPTER 6

### Chemical equations

Be familiar with chemical equations and what information is contained in a chemical equation

**Be able to balance a chemical equation**

### The Mole

Have Avogadro's number committed to memory (you won't be given this on the exam):

$$1 \text{ mole} = 6.022 \times 10^{23} \text{ objects}$$

Make sure that you are clear about what a mole is. You should be able to determine how many atoms and/or molecules are contained in one or more moles of a substance (remember the analogy between one mole and one dozen).

*Be able to answer questions like:*

How many atoms are in 0.5 mol of gold?

How many H<sub>2</sub>O molecules are there in 2 moles of water?

How many hydrogen atoms are there in 2 moles of water?

How many oxygen atoms are there in 2 moles of water?