Review Package #3

Atomic Models and Subatomic Particles
The Periodic Table
Chemical Bonding

1. **Atomic Models and Subatomic Particles:**

   A. **Subatomic Particles and Average Atomic Mass:**
   - Subatomic particles: protons, neutrons and electrons – properties and how to calculate numbers of each
   - Atomic mass and atomic number
   - Ions
   - Isotopes and calculations of average atomic mass

   B. **Quantum Molecular Model**
   - Electron orbitals
   - Electron configurations of neutral atoms and ions
   - Significant figures (multiplication, division, adding and subtracting)

   C. **History of the Atomic Models**
   - Identifying which scientists made which discoveries

2. **Elements and the Periodic Table:**

   A. **Organization of the Periodic Table**
   - The history of the periodic table
   - metals, non-metals, and semi-metals
   - chemical families; Alkali metals, Alkaline Earth metals, Halogens, Noble Gases

   B. **Periodic Trends**
   - Atomic radius, and ionic radius (sizes of atoms versus their ions)
   - Ionization energy
   - Electronegativity

3. **Chemical Bonding:**

   A. **Electrons, Electronegativity and Bonding (text pgs. 225-231)**
   - valence, bonding, lone-pair electrons
   - types of chemical bonds; ionic, covalent, polar-covalent
   - predicting bond formation based on electronegativity differences
   - electron dot diagrams for elements

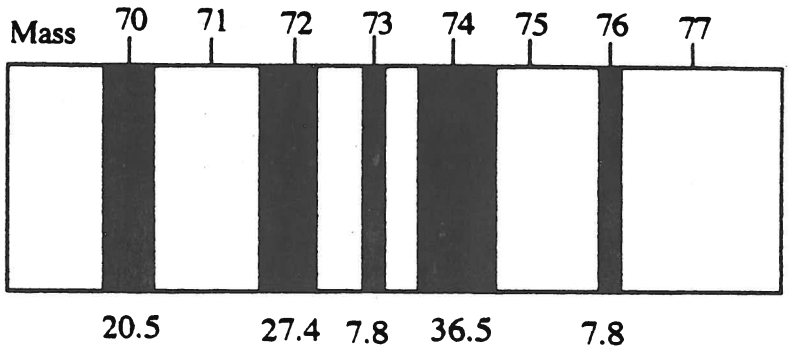
   B. **Lewis Structures to Represent Bonding (text pgs. 236-243)**
   - Rules for drawing Lewis structures (Octet rule)
   - Single, double and triple bonds (bonding capacity)
   - Lewis structures for simple ions, polyatomic ions and simple molecules

Atomic Models and Subatomic Particles:

1. Complete the following table.

Symbol	Atomic Mass	Atomic Number	Number of Protons	Number of Neutrons	Number of Electrons
	52	24			24
			15	17	15
	127	52			54
		26		30	23
Ca				21	
Hg^{2+}	201				
			36	47	36
Br^{-}				43	36
Ga^{3+}	70				28
N^{3-}		7		7	

2. An element is analyzed by a mass spectrometer and the following spectrum resulted for the naturally occurring isotopes.



a) Calculate the average atomic mass for this element.

b) What element was analyzed?

c) Write the symbol for the most abundant isotope of this element, including the atomic mass, and the atomic number.

3. Write the core-notation electron configuration for the elements listed below.

Be	_____	Ar	_____
C	_____	V	_____
N	_____	Cu	_____
Na	_____	Ge	_____
S	_____	Br	_____

4. Complete the following table.

Symbol	Number of Protons	Number of Neutrons	Number of Electrons	Electron Configuration
$^{70}_{31}Ga^{3+}$				
$^{37}_{17}Cl^{-}$				
$^{39}_{19}K^{+}$				
$^{65}_{29}Cu^{2+}$				
$^{32}_{16}S^{2-}$				
$^{30}_{15}P^{3-}$				
$^{87}_{38}Sr^{2+}$				
$^{59}_{27}Co^{2+}$				

5. In the table below briefly summarize the MAJOR contribution(s) the scientist made to our understanding of the atom.

Scientist	Major Contribution(s)
Dalton	
Bohr	
Thompson	
Chadwick	
Rutherford	

Elements and the Periodic Table:

1. What is a period of the periodic table? _____

_____

2. What is a group or family of the periodic table? _____

_____

3. Complete the following table, stating the name of the family (if we named it), the number of valence electrons and the charge on the ions that are usually produced from the elements in the group.

Family Members	Family Name	Number of Valence Electrons	Charge on the Ions Usually Formed
Li, Na, K, Rb, Cs, Fr			
B, Al, Ga, In, Tl			
F, Cl. Br, I, At			
Be, Mg, Ca, Sr, Ba, Ra			
N, P, As, Sb, Bi			
He, Ne, Ar, Kr, Xe, Rn			
O, S, Se Te, Po			

4. Define the following terms:

a) Atomic Radius:

_____

_____

b) Ionization Energy:

_____

_____

c) Electronegativity:

_____

_____

5. Correctly fill in the blanks below with either "increases" or "decreases"

a) As you move from left to right across the periodic table:

Atomic radius _____

Ionization Energy _____

Electronegativity _____

b) As you move down the periodic table:

Atomic radius _____

Ionization Energy _____

Electronegativity _____

6. a) Which of the following has the LARGEST atomic radius?

i) Li, Na, K, Rb _____

ii) Na, Mg, Al, Si _____

iii) Mg, Os, Cl _____

iv) Na^+, Mg^{2+}, Al^{3+} _____

v) P^{3-}, S^{2-}, Cl^- _____

vi) N, O, F, Cl _____

b) Which of the following has the LARGEST ionization energy?

i) Li, Na, K, Rb _____

ii) Na, Mg, Al, Si _____

iii) Mg, Os, Cl _____

iv) Na^+, Mg^{2+}, Al^{3+} _____

v) P^{3-}, S^{2-}, Cl^- _____

vi) N, O, F, Cl _____

c) Which of the following has the SMALLEST electronegativity value?

i) Li, Na, K, Rb _____

ii) Na, Mg, Al, Si _____

iii) Mg, Os, Cl _____

vi) N, O, F, Cl _____

Chemical Bonding:

1.a) Define valence electrons: _____

_____

b) How many valence electrons does each of the following families contain?

i. Alkali metals: _____

ii. Alkaline earth metals: _____

iii. The Boron family: _____

iv. The Carbon family: _____

v. The Nitrogen family: _____

vi. The Oxygen family: _____

vii. The Halogens: _____

viii. The Noble gases: _____

2. Describe what is happening to the electrons involved in a:

a) Covalent bond: _____

_____

b) Polar-covalent bond: _____

_____

c) Ionic bond: _____

_____

3. Name the two types of intermolecular bonds:

_____ and _____

4. Draw the electron dot diagrams and Lewis structures for each of the following:

a) Al

b) Ca

c) F^-

d) S^{2-}

e) CH_3OH

f) BF_3

g) SO_3

h) H_2O

i) C_2H_2

j) CO_3^{2-}

k) N_2

l) C_2HBr_3