Chemistry 112 | Chapter 7 Ionic Bonding | November 3, 2014

Name MASTER

***Part I* Matching** - Match each item on the left with the correct statement on the right below. (7 pts)

H 1. electrons
E 2. transition metal
D 3. metal
B 4. group
C 5. halide ion
G 6. cation
I 7. anion

A) horizontal row in the periodic table
B) vertical column in the periodic table
C) type of ion formed by group 17 elements.
D) type of element that is a good conductor of heat and electric current
E) type of element characterized by the presence of electrons in the d orbital
F) ½ the distance between the nuclei of two atoms when the atoms are joined
G) type of ion formed by Group 2 elements
H) subatomic particles that are transferred to form positive and negative ions
I) type of ion formed from Group 16 elements

Part II Multiple Choice – Write the letter of the best answer in the space provided to the left of each question. (15 pts)

C 1. The number of valence electrons in an atom is equal to the
A. number of electrons in the atom.
B. charge on a positive or negative ion formed by the atom.
C. number of electrons in the outermost energy level of the atom.
D. number of electrons needed to fill the outermost energy level of the atom.

D 2. When a barium atom loses two electrons to form a Ba^{2+} ion, the electrons are lost from the:
A. 5s orbital
B. 5p orbital
C. 4f orbital
D. 6s orbital

B 3. The element bromine is a:
A. period 3 halogen.
B. period 4 halogen.
C. period 17 halogen.
D. none of the above.

B 4. Which of the following atoms would you expect to have the largest atomic radius?
A. Li
B. K
C. Ca
D. Br

C 5. How many valence electrons does an atom of any halogen have?
A. 4
B. 6
C. 7
D. 8

D 6. When an aluminium atom loses its valence electrons, the charge on the resulting ion is:
A. 2^+
B. 2^-
C. 3^-
D. 3^+

B 7. The electron configuration of a fluoride ion, F^-, is
A. $1s^2 2s^2 2p^5$.
B. the same as a neon atom.
C. $1s^2\ 2s^2\ 2p^6\ 3s^1$.
D. the same as a potassium ion.

A 8. To attain a noble gas configuration a sulphur atom must:
A. gain two electrons.
B. lose one electron.
C. lose two electrons.
D. gain three electrons

C 9. In which energy level are the valence electrons of strontium (Sr) found?
A. 3rd
B. 4th
C. 5th
D. 6th

A 10. What is the charge of a cation?
A. a positive charge
B. no charge
C. a negative charge
D. The charge depends on the size of the nucleus.

B 11. How many valence electrons are there in gallium (Ga)?
A. 2
B. 3
C. 4
D. 5

D 12. Which of the following elements will attain a pseudo-noble gas configuration when it forms an ion?
A. Iodine (I)
B. Molybdenum (Mo)
C. Rubidium (Rb)
D. Silver (Ag)

B 13. Which of the following elements is in the same period as phosphorus (P)?
A. Carbon (C) C. Nitrogen (N)
B. Magnesium (Mg) D. Oxygen (O)

C 14. Which of the following pairs of elements are ***unlikely*** to form an ionic compound?
A. Na and Cl C. C and O
B. Ca and P D. Li and N

A 15. Which of the following is true about the electron configurations of the noble gases?
A. The valence shell is completely filled.
B. The highest occupied s and p sublevels are partially filled.
C. The electrons with the highest energy are in a d sublevel.
D. The electrons with the highest energy are in an f sublevel.

***Part III* Short answer** – Answer in the space provided.

1. For each element whose ground state valence shell electron configurations is given below: (6 pts)
(i) identify the element.
(ii) state the period it is in
(iii) write the symbol of the ion formed

	a. $2s^2 2p^5$	b. $3s^2 3p^3$	c. $5s^2$
(i)	fluorine	phosphorus	strontium
(ii)	2	3	5
(iii)	F^{1-}	P^{3-}	Sr^{2+}

2. Draw dot diagrams for the ions formed from each of the following atoms. (3 pts)

a) Se $[\ddot{S}e]^{2-}$

b) Fr Fr^{+}

c) Pb (expected ion) Pb^{4+}

3. Name each of the ions from question 2. (3 pts)

a) selenide ion

b) francium ion

c) lead (IV) ion

4. Using a dot diagram, determine the formula of the ionic compound formed when barium reacts with phosphorus. (2 pts)

Ba_3P_2

5. Write the electron configurations for following ions. (2 pts)

a. Ca^{2+} $1s^2 2s^2 2p^6 3s^2 3p^6$

b. N^{3-} $1s^2 2s^2 2p^6$

Part III Essay Questions – Answer each question in the space provided.

1. Why do metals tend to form cations when they react to form compounds? (2 pts)

low shielding
valence e^- close to nucleus
easy for them to gain e^- due to high electronegativity

2. Explain why solid ionic compounds do not conduct electricity but melted or aqueous solutions of ionic compounds do. (3 pts)

Solids - ions locked in place due to strong attraction, e^- can't move around
Melted/Aqueous - ions are free to move which means e^- can travel between ion

3. Metals are used in many applications in our everyday lives due to the fact that they conduct electricity and heat, are ductile and malleable? Explain why metals have these properties. (3 pts)

Low ionization energy means valence e^- are weakly held to.
Valence e^- create sea of e^- for cations to move in.
This means electricity can pass through and force can be applied and ions will move around each other without breaking.