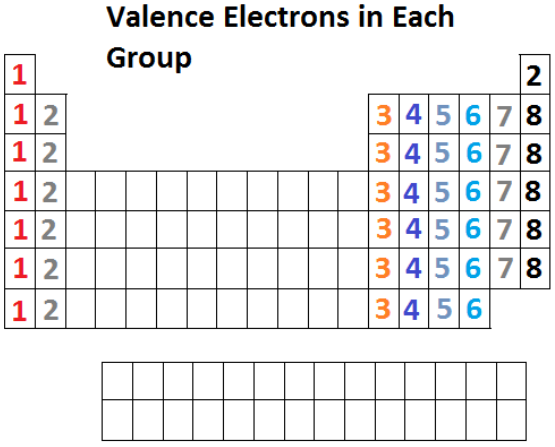
TOPIC: 1.8 VALENCE ELECTRONS AND IONIC COMPOUNDS

ENDURING UNDERSTANDING:	
SPQ-2	The periodic table shows patterns in electronic structure and trends in atomic properties.
LEARNING OBJECTIVE:	
SPQ-2.B	Explain the relationship between trends in the reactivity of elements and periodicity.
ESSENTIAL KNOWLEDGE:	
SPQ-2.B.1	The likelihood that two elements will form a chemical bond is determined by the interactions between the valence electrons and nuclei of elements.
SPQ – 2.B.2	Elements in the same column of the periodic table tend to form analogous compounds
SPQ – 2.B.3	Typical charges of atoms in ionic compounds are governed by their location on the periodic table and the number of valence electrons.
EQUATION(S):	
	N/A

NOTES:

An ionic bond always involves the transfer of electrons from the least electronegative species to the most electronegative. Traditionally, ionic compounds are described as being between a metal and a nonmetal. Based on electron configuration, elements will either lose or gain electrons in order to have a complete s^2p^6 outer valence shell. This loss or gain of electrons leads to the formation of positive or negative ions. Ionic compounds are held together by an electrostatic force.

In order to maintain neutrality, the number of electrons lost must equal the number of electrons gained. Because the number of electrons lost or gained is based on electron configurations, elements in the same group will form the same M_nNm_n analogous compounds. For example, all group I metals (Lithium – Cesium) will have the following format when combined with any group VII halogen (Fluorine – Astatine): LiF or LiCl. Any group II metal, when combined with a group VII halogen would be CaF_2 or $MgCl_2$. Again, these analogous structures are because of the need to maintain neutrality. Nonmetals only want to gain enough electrons to fill their octet. Metals only want to give away enough electrons to have a pseudo-noble gas configuration.



http://kinga2.weebly.com/unit-3-periodic-table.html

I DO:

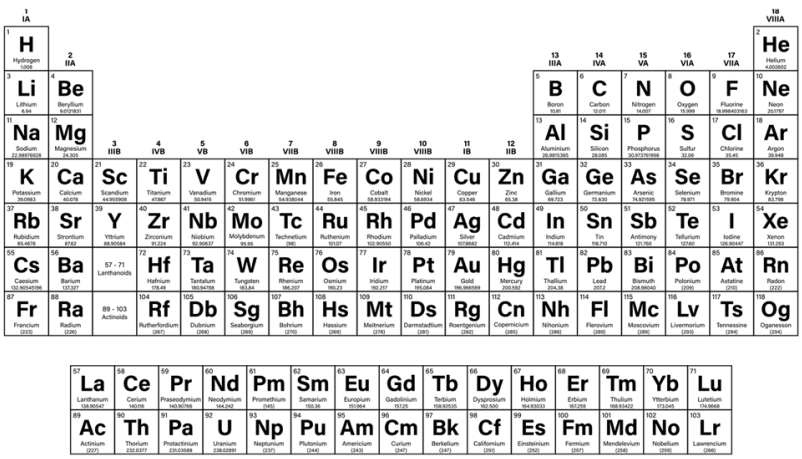
Calcium reacts with a certain element to form a compound with the general formula CaX_2. What would be the most likely formula for a compound formed between sodium and element X?

A) NaX_2
B) Na_2X
C) Na_2X_2
D) NaX

Since Ca forms +2 charge, X must form -1. Na forms +1 ∴ NaX will follow the rule of zero charge.

WE DO:

Element 117 was recently discovered and is named Tennessine. Assuming that periodic trends are followed, write the noble gas electron configuration and predict the formula when it forms an ionic compound with Mg.

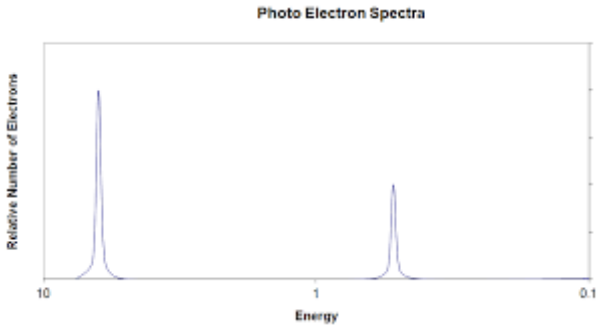


YOU DO:

1) Which of the following has the same number of electrons as Cl^{-1}?
   a) F^{-1}
   b) S
   c) Al^{3+}
   d) K^{+}

2) KCl dissolves in water, forming a solution able to conduct electricity. Which of the following would behave similarly?
   a) $PbCl_2$
   b) LiK
   c) LiCl
   d) $SrCl_2$

3) The complete photoelectron spectrum for an element is shown. What oxide compound would it most likely form?
   a) XO_2
   b) X_2O
   c) XO
   d) X_2O_2



4) Identify the correct electron configuration for the aluminum ion.
   a) $1s^2 2s^2 2p^6$
   b) $1s^2 2s^2 2p^6 3s^2 3p^1$
   c) $1s^2 2s^2 2p^6 3s^2 3p^6$
   d) $1s^2 2s^2 2p^6 3s^2$