

B. The Octet Rule

The noble gasses do not react with other elements. In other words, noble gasses are very stable. Let's look at the electron configuration of noble gasses (note: K is the name given to shell 1, L to 2, etc.)

Element	Shell (periods)					
	1	2	3	4	5	6
He	2					
Ne	2	8				
Ar	2	8	8			
Kr	2	8	18	8		
Xe	2	8	18	18	8	
Rn	2	8	18	32	18	8

The Octet rule and ion formation

As stated, when atoms form ions they seek an electron configuration like that of the nearest noble gas. Nearest refers to the number of representative elements between an element and a noble gas. For example Br is 1 space removed from Kr, but 7 spaces removed from Ar (see your periodic table). So, Br would gain 1 electron to form Br⁻. Similarly, Mg would lose 2 electrons to become Mg²⁺.

Q3-Complete the chart:	Br	P	Ne	Al	Ca
Nearest Noble gas (spaces removed)	Kr (1)				
Resulting ion	Br ⁻				

Q3- Write the ions that each of the following atoms would likely to form:

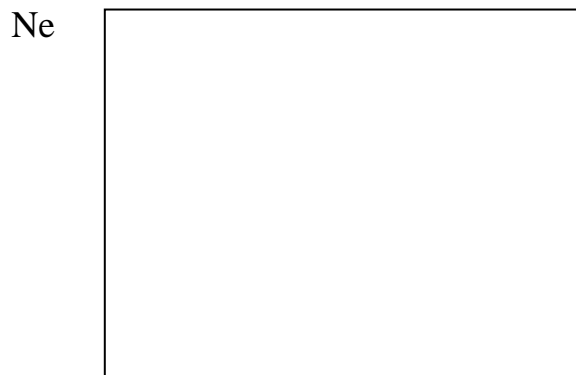
F O S Li Kr

Most Noble gasses have 8 electrons in their outer shell. This is a stable conformation.

Octet Rule: When atoms form ions or combine in compounds they obtain electron configurations of the nearest noble gas (usually this means that there will be 8 outer electrons).

Ion: charged particle

Q4 – Draw an F⁻ ion and Ne atom. How do they compare?



C. Types of bonds

There are two main types of bonds: ionic and covalent. Ionic bonding occurs between metals and non-metals. Covalent bonding occurs between two non-metals (When two metals combine an alloy, a mixture, is formed).

Na ⁺	+	Cl ⁻	= Ionic		H	+	O	= Covalent
(metal)		(non metal)			(non metal)		(non metal)	

To name ionic compound, you simply write the name of the metal then write the name of the non-metal + -ide. To name the covalent compound (or molecular compounds), you need to write the prefixes for both nonmetals then add -ide to the second atom except do not write "mono" for the first non-metal atom.

Example: Ionic compound LiCl – Lithium Chloride
 Molecular (Covalent) compound CO₂ - Carbon dioxide

Greek Prefixes	
1	Mono
2	Di
3	Tri
4	Tetra
5	Penta
6	Hexa
7	Hepta
8	Octa
9	nona
10	deca

Q5 – Identify each compound as ionic or covalent then write the compound name.

: MgO _____
 CaCl₂ _____
 SO₂ _____
 PbCl₂ _____
 CCl₄ _____
 CH₄ _____
 KI _____
 H₂O _____

i. Ionic bonding illustrated

The formation of a positive ion is always coupled with the formation of a negative ion. For example, when Na combines with Cl, the Na becomes positive and the Cl becomes negative. The positive and negative ions are then attracted to each other. There are three ways to illustrate this:

B-R diagram (Bohr – Rutherford)

Lewis Diagram

Chemical Equation

Q6 - Use all three methods (chemical reaction equation, B-R diagrams, and Lewis diagrams) to show how bonds form between: Mg + O (follow the octet rule)

B-R diagram (Bohr – Rutherford)

Lewis Diagram

Chemical Equation

ii. Covalent bonding illustrated

Covalent bonding occurs between two non-metals. Covalent bonding is different from ionic bonding because electrons are shared instead of transferred. Yet, covalent bonding still follows the octet rule. Let's look at the bond that is formed between H and F.

B-R diagram (Bohr – Rutherford)

Lewis Diagram

Chemical Equation

Q7 – Use all three methods (chemical reaction equation, B-R diagrams, and Lewis diagrams) to show how bonds form between: $2\text{H} + \text{O}$ to form water H_2O (follow the octet rule)

B-R diagram (Bohr – Rutherford)

Lewis Diagram

Chemical Equation

Q8 - Draw Lewis dot diagrams to represent the following compounds CCl_4 , HCl , H_2O , H_2

Lewis Diagram – CCl_4

Lewis Diagram

Lewis Diagram

Lewis Diagram

Homework:

I. Ionic Compounds

NAMING BINARY COMPOUNDS

A. Name the following ionic compounds.

1. BaCl_2 _____
2. NaF _____
3. Ag_2O _____
4. CuBr _____
5. CuBr_2 _____
6. FeO _____
7. Fe_2O_3 _____
8. MgS _____
9. Al_2O_3 _____
10. CaI_2 _____
11. K_2S _____
12. CrCl_2 _____
13. CrCl _____
14. CaO _____
15. Ba_3P_2 _____
16. Hg_2I_2 _____
17. Na_2O _____
18. BeS _____
19. MnO _____
20. Mn_2O_3 _____

B. WRITING BINARY FORMULAS

Write the formulas for the compounds formed from the following Ions.

1. Na^{+1} , Cl^{-1} _____
2. Ba^{+2} , F^{-1} _____
3. K^{+1} , S^{-2} _____
4. Li^{+1} , Br^{-1} _____
5. Al^{+3} , Cl^{-1} _____
6. Zn^{+2} , S^{-2} _____
7. Ag^{+2} , P^{-3} _____
8. Mg^{+2} , P^{-3} _____
9. Ni^{+2} , O^{-2} _____
10. Ni^{+3} , O^{-2} _____
11. Fe^{+2} , O^{-2} _____
12. Fe^{+3} , O^{-2} _____
13. Cr^{+2} , S^{-2} _____
14. Cr^{+3} , S^{-2} _____
15. Cu^{+1} , Cl^{-1} _____
16. Cu^{+2} , Cl^{-1} _____
17. Pb^{+4} , O^{-2} _____
18. Pb^{+4} , O^{-2} _____
19. Mn^{+2} , Br^{-1} _____
20. Mn^{+4} , Br^{-1} _____

II. Covalent (molecular) Compounds

NAMING BINARY COMPOUNDS

A. Name the following molecular (covalent) compounds.

1. CO _____
2. CO_2 _____
3. NH_3 _____
4. CH_4 _____
5. C_2H_6 _____
6. C_4H_{10} _____
7. SO_2 _____
8. O_3 _____
9. SF_6 _____
10. SiO_2 _____

III. Polyatomic Ions

A. List of Polyatomic Ions:

- NH_4^{+1} _____
- OH^{-1} _____
- NO_3^{-1} _____
- SO_4^{-2} _____
- CO_3^{-2} _____
- HCO_3^{-1} _____
- PO_4^{-3} _____

B. NAMING IONIC COMPOUNDS WITH POLYATOMIC IONS.

1. NH_4Cl _____
2. LiNO_3 _____
3. CaSO_4 _____
4. NaHCO_3 _____
5. K_3PO_4 _____