

**Outline Unit 4 - Chemical Bonding & Molecules****Essential Skills/ State Standards:**

1. Know how to use the periodic table to determine the number of electrons available for bonding.
2. Know atoms combine to form molecules by sharing electrons to form **covalent** or **metallic bonds** or by exchanging electrons to form **ionic bonds** and how **electronegativity** and **ionization energy** relate to bond formation.
3. Know salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by **electrostatic attraction**.
4. Know chemical bonds between atoms in molecules such as H<sub>2</sub>, CH<sub>4</sub>, NH<sub>3</sub>, H<sub>2</sub>CCH<sub>2</sub>, N<sub>2</sub>, Cl<sub>2</sub>, and many large biological molecules are **covalently bonded**.
5. Know how to draw **Lewis dot structures**
6. Know large molecules (**polymers**), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits (**monomers**). Know the name of the monomers that make up each of these polymers.
7. Know the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.

**Vocabulary**

- Ionic bond
- Covalent bond
- Metallic bond
- Polar
- non-polar
- octet rule
- Lewis dot structure
- Electronegativity
- valence electron
- ion
- Crystal lattice
- Electrostatic attraction
- VSEPR Theory
- lone pair electrons
- hydrogen Bond
- intermolecular force
- intramolecular force
- conductivity
- solubility
- melting point
- HONC rule
- single, double, & triple bond
- polymers
- monomers
- Proteins, amino acids, polypeptide
- nucleic acid, nucleotide, polynucleotide
- starch, polysaccharide, carbohydrate, monosaccharide
- Lipids, triglycerides, glycerol & fatty acids

**Extra Credit Book Assignments (Chapters 6 and 7 in Chem. book)**

Topic	Read	Problems
1. Intro. to Bonding	Pg 161-163	Sec Rev 6-1, pg 163 (#1-4)
2. Covalent Bonding	Pg 164- 175	Sec Rev 6-2, pg 175 (#1- 4)
3. Ionic Bonding	Pg 176 -180	Sec Rev 6-3, pg 180 (#1-4)
4. Molecular Geometry	Pg 183-193	Review Probs, pg 197 (#45-48)

**Study Guide** (Use notes, book assignments, and other worksheets for a complete review)

1. Compare an
- Ionic bond**
- to a
- covalent bond**
- to a
- metallic bond**
- :

	Between what types of elements?	What happens to the electrons?	melting point (high/low)?	Soluble in H <sub>2</sub> O?	Conducts electricity?	Shapes it can form?
<b>Ionic</b>						
<b>Covalent</b>						
<b>Metallic</b>						

2. Elements to bond	S & O	Cl & Cl	Mg & O	Na & F	Ag & Au
<b>Bond Type</b>					
<b>How do you know?</b>					

3. How does the
- electronegativity**
- of the two elements bonding influence the
- bond type**
- ? (ex: 2 strongly electronegative elements bond vs. 1 strong & 1 weak).

4. a. Draw the ionic structure of a NaCl as it would appear on the molecular level    b. How does
- electrostatic attraction**
- (aka
- electromagnetic**
- ) keep these ionic compounds together?

5. a. Indicate the bond type for each compound b. Draw a Lewis dot structure for each of the following:



6. a. How many electrons are shared in a single bond, double bond and triple bond?

b. What type of bond do they occur between (ionic, covalent, metallic)?

c. Compare the bond energy & length between atoms bonded with single, double, & triple bonds.

7.

	a. H <sub>2</sub> O	b. NBr <sub>3</sub>	c. SiO <sub>2</sub>	d. SiCl <sub>3</sub> Br
a) Draw VSEPR 3-D drawing:				
b) <u>polar</u> or <u>non-polar</u> ?				
c) Show arrows & partial charges where needed				
Name of shape?				

8. What is the HONC rule? How does it help make drawing structural formulas easier for large, organic molecules?

9. Explain why molecular shape is important in terms of how your body functions.

10. a. Compare a **Polar covalent bond** to a **Non-polar covalent bond**. b. Give an example of each.

11. a. How do 2 polar molecules interact with each other (attracted or not)? b. 2 nonpolar molecules?

c. 1 polar & 1 non polar?

d. 1 polar & one ionic?

12. **Water** has many unique properties due to the fact that **hydrogen bonds** occur between water molecules.

a. Draw a picture of hydrogen bonds between 3 water molecules.

b. Explain why hydrogen bonds are formed.

c. How does this affect the behavior of water molecules?

13. Classify the following as being either a **intermolecular** or **intramolecular** force & explain why:

hydrogen bond=

metallic bond=

covalent bond=

ionic bond=

14. a. Why is the **carbon** atom the backbone to so many large, complex biological molecules (proteins, carbohydrates, lipids, and nucleic acids)?

15. <u>Class</u>	<u>Polymer</u>	<u>Monomer</u>	<u>2 common exs:</u>
a. <b>Carbohydrates</b>			Starches & _____
b. <b>Nucleic Acids</b>	Poly- nucleotide		
c. <b>Protein</b>	Poly- Peptide		
d. <b>Lipids</b>	Tri-glyceride	Glycerol & fatty acids	