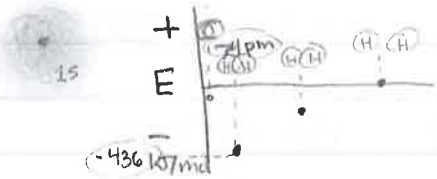
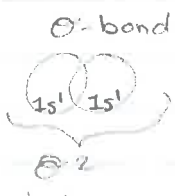
10-25 (unit 4)

Covalent-molecular (electron-shared bonds)

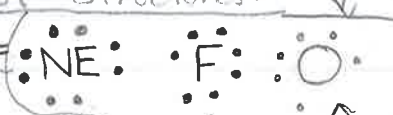


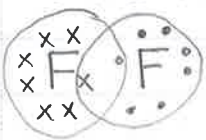


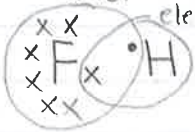
(2 electrons in a sigma bond)

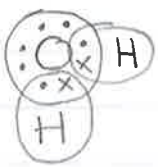
- if they get close enough, they can share electrons, as if they were a $1s^2$.
- Lewis Dot Structures: →  covalent electron-shared bonds

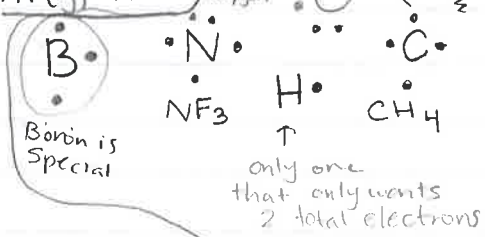
Steps for creating good Lewis Dot Structures:

1. Sketch the elements involved= 

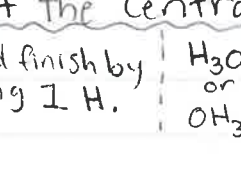
 $F-F$ F_2

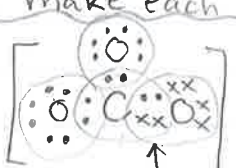
 $HF_{(g)}$ $H-F$

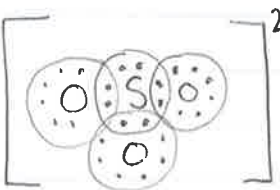
 OH_2 *(Groups in the same period have the same Lewis Dot Structure)

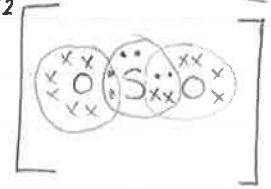


2. Adjust the central element for charge if its an ion

H_3O^+ or OH_3^+ 

3. Add Bonding atoms 1 at a time and make each bonding atom have "octet" as we go. CO_3^{2-} 

SO_3^{2-} 

SO_2 

	length	bond energy
H - H	74 pm	436 kJ/mol
F - F	142	115
I - I	267	151

	L	BE
I - F	191	273
Avg I_2 + F_2	205	153

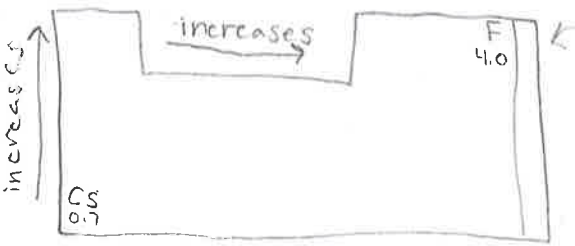
bond energy - $H + H \rightarrow H_2$, $\Delta E = -436$ kJ/mol

- bond forming ALWAYS releases energy (exothermic)

$H_2 \rightarrow H + H$ $\Delta E = +436$ kJ/mol

- breaking bonds ALWAYS takes energy

Periodic Trend - Electronegativity



relative affinity for electrons

Polar covalent

$\delta^+ I - F \delta^-$

2.5 4.0

δ - a little bit

Polar covalent - slightly stronger than a regular covalent bond.

Chapter 7 Day 1 (Sections 7.1 – 7.6) (Unit 4) 25 October 2019

1. Look up the bond dissociation energy for Cl_2 from Table 2 on page 226 – or from your information sheet. Complete the value for ΔE for these. Identify each as exothermic or endothermic.

$2\ Cl(g) \rightarrow Cl_2(g)$ ΔE =
$Cl_2(g) \rightarrow 2\ Cl(g)$ ΔE =

2. Look up the melting and boiling points for KBr, HBr (not HBr(aq)) and Br_2. Classify each as ionic or covalent. Classify each covalent as polar or non-polar covalent.

	mp	bp

3. How much energy does it take to break each of these bonds in kJ/mol? Circle the strongest bond to hydrogen.

(a) N – H (b) Br – H

(c) S – H (d) C – H

(e) F – H (f) O – H

4. Determine the difference in electronegativities for each of these. Circle the most polar bond to hydrogen.

(a) N – H (b) Br – H

(c) S – H (d) C – H

(e) F – H (f) O – H

5. Sketch Lewis dot structures for these atoms. How many bonds does each need to make in order to form an octet?

N Bonds needed:	**Br** Bonds needed:	**S** Bonds needed:
C Bonds needed:	**Ne** Bonds needed:	**F** Bonds needed:

6. Use the information above to sketch the Lewis dot structures of the compounds expected between the following atoms bonded to hydrogen atoms.

N Formula:	**Br** Formula:	**S** Formula:
C Formula:	**Ne** Formula:	**F** Formula:

7. Sketch Lewis dot structures for each of these species.

Carbonate	Sulfite
Carbon disulfide	Ammonium
Nitrite	Borohydride, BH_4^-

Questions in final exam format (multiple choice):

8. Which electrostatic forces hold atoms together in a molecule?

A. electron-electron forces
B. electron-nucleus forces
C. nucleus-nucleus forces
D. all three forces

9. Of the following elements, which has the **lowest** electronegativity?

A. Sn B. As C. S D. Ti

10. The compound CCl_4 contains

A. ionic bonds.
B. nonpolar covalent bonds.
C. polar covalent bonds, with partial negative charges on the Cl atoms.
D. polar covalent bonds, with partial negative charges on the C atoms.

11. The phosphorus atom in PCl_3 would be expected to have a

A. partial positive (δ+) charge.
B. partial negative (δ-) charge.
C. 3+ charge.
D. 3- charge.

Next week in lab we will be doing practical work with Lewis dot structures and molecular shape. The pre-lab is available at the lab website and you should start using it to brush up on sketching Lewis dot structures.

Now try these problems from the book:

Section 7.1. (Covalent bonding in molecules) Problem 32 and 40
Section 7.2. (Bond strength) Problem 42
Section 7.3. (Electronegativity and polar bonds) Problems 1, 2, 48, 50, 52, 54, and 58
Section 7.4. (Ionic vs. covalent compounds) Problem 62
Section 7.5. (Octet rule) Problems 5 and 6
Section 7.6. (Drawing Lewis dot structures) Problems 7, 8(a, b, c, f), 9, 10, 66(skip e), 74, and 76. (Skip expanded octets for now)
Practice Test Questions 1 – 9.