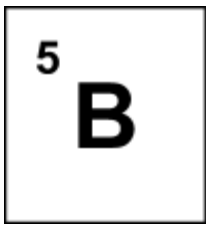
Chemistry 20	Unit 1
Lesson 1: Atomic Numbers and Trends of the Periodic Table	84 mins

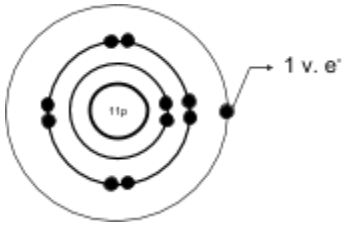
Atomic Numbers and Trends of the Periodic Table

- # of protons
- # of electrons (based off charge)

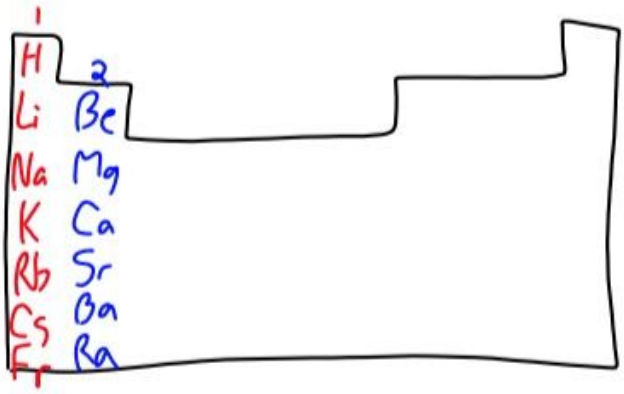


5 protons/5 electrons

Group 1 Elements

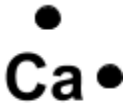
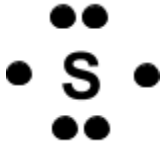
^{3}Li	
^{11}Na	

- Elements with the same # of v.e⁻ will have the same <u>chemical properties</u>
  - Behavior when <u>mixed</u>
    - Mixed with water, burned, etc.



Lewis Symbols

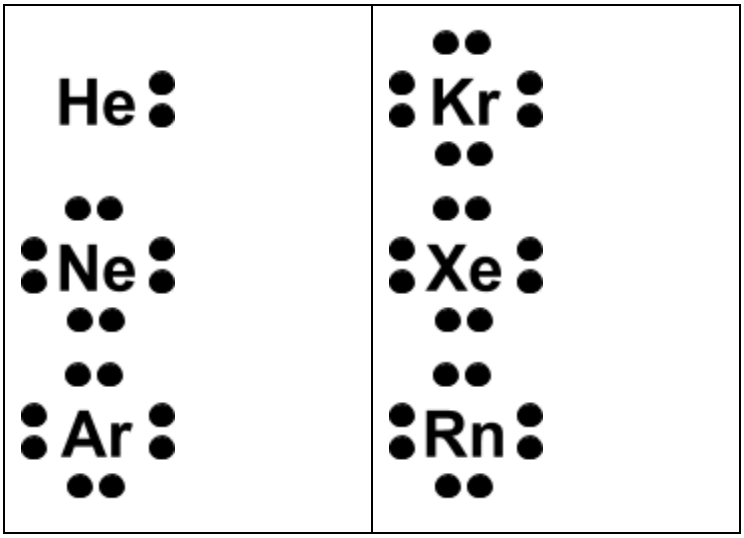
- Only draw the valence and the chemical symbol

	**Group 1 (1 v.e$^-$)**
	**Group 2 (2 v.e$^-$)**
	**Group 13 (3 v.e$^-$)**
	**Group 14 (4 v.e$^-$)**
	**Group 15 (5 v.e$^-$)**
	**Group 16 (6 v.e$^-$)**
	**Group 17 (7 v.e$^-$)**
	**Group 18 (8 v.e$^-$)**

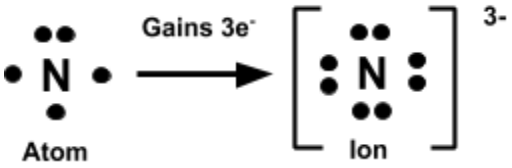
Chemistry 20	Unit 1
Lesson 2: Lewis Diagrams - For Compounds	84 mins

The Octet Rule

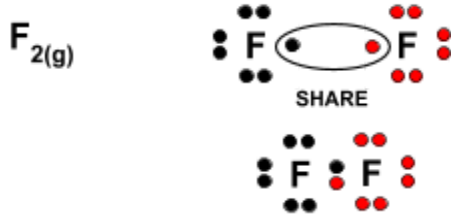
- Group 18 - the noble gases
  - Unreactive! (<u>stable</u>)

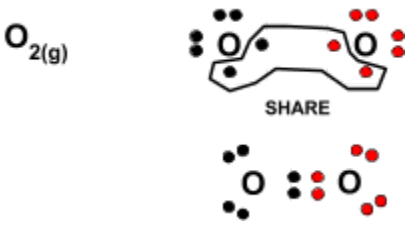


- The Octet Rule
  - ALL elements WANT Full Valence Shells!
  - Full Valence = Stability
  - Everyone wants to be like a noble gas.



- Diatomic Elements
  - Elements of the same type can share electrons to become octet!





- Lewis Diagrams - For Compounds
  - Elements in compounds will “share” electrons
    1. Count Valence e^- (group number)
    2. Propose a structure
    3. Bond atoms <u>together</u> (1 pair e^-)
    4. Assign remaining valence e^-

Ex.1

$HCl_{(aq)}$

1. Count Valence e^-

   1 + 7 = 8e^-
2. Propose a structure

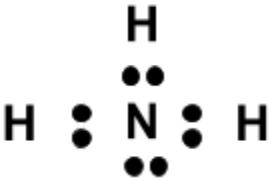
3. Bond Atoms together (1 pair e^-)

4. Assign remaining valence e^-

Ex.2

$NH_{3(g)}$

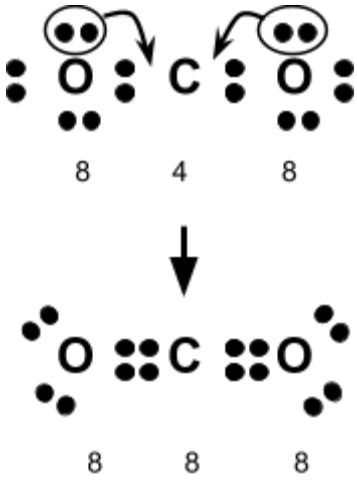
5 + 1(3) = 8e^-



Ex.3

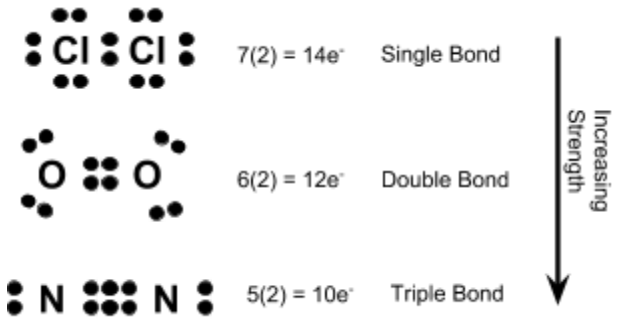
$CO_{2(g)}$

4 + 6(2) = 16e^-

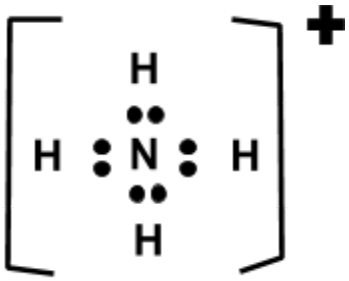
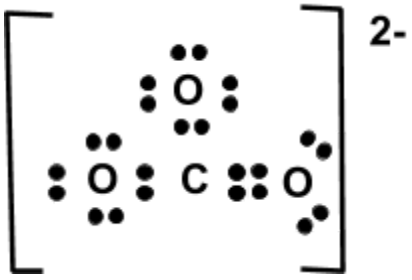


Chemistry 20	Unit 1
Lesson 3: Lewis Diagrams Continued	84 mins

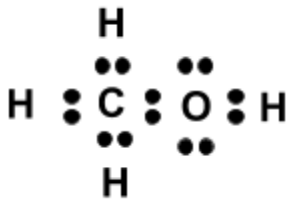
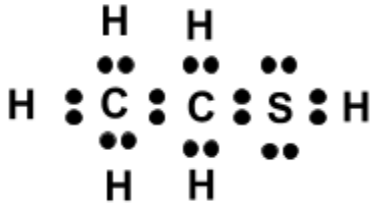
Lewis Diagrams Continued

The more shared electrons the bond, the more strength the bond has	

Ions - Lewis Diagrams

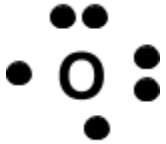
Ions written in lewis form will have square brackets indicating charge. - When calculating v.e⁻ remember to include the charge. - + charge (subtract) or - charge (add)	$NH_4^{+}{}_{(aq)}$ 5 + 1(4) - 1 = 8e⁻  $CO_3^{2-}{}_{(aq)}$ 4 + 6(3) + 2 = 24e⁻ 

Compounds - Lewis Diagrams

- Propose a structure, rearrange until the struct works	$CH_3OH_{(aq)} = CH_4O_{(aq)}$?? 4 + 1(4) + 6 = 14e$^-$  $CH_3CH_2SH_{(l)}$ 4(2) + 1(6) + 6 = 20e$^-$ 

Chemistry 20	Unit 1
Lesson 4: Bonding Capacity and Electronegativity	84 mins

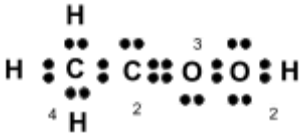
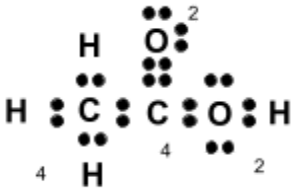
Bonding Capacity

Element	# Bonding e^-	# bonds <u>commonly formed</u>
	4	4
	3	3
	2	2
	1	1

Ex.

$CH_3COOH_{(aq)}$

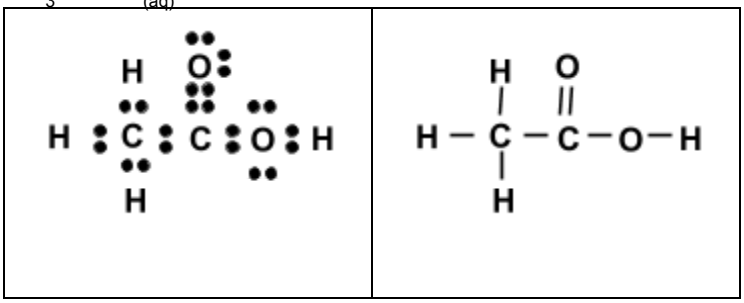
VS

	 BETTER

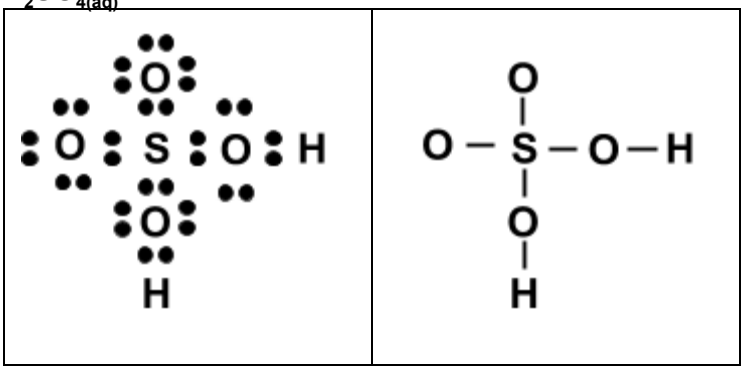
Structural Formulas

- Omit lone pairs of electrons and only refer to bonding

$CH_3COOH_{(aq)}$



$H_2SO_{4(aq)}$

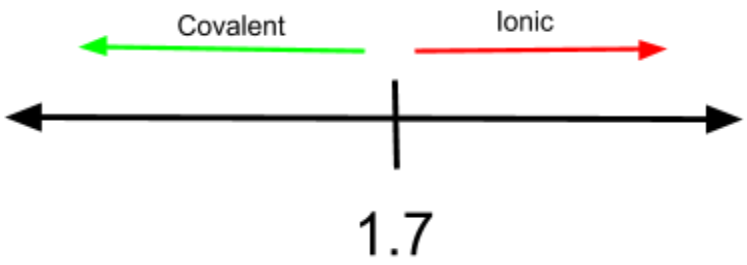


Again… kinda

Electronegativity

- How hard atoms pull on e^-
- Determines the nature of chemical bonds
- Remember that Metal-Non-metal thing… this is why I said most of the time

Electronegativity Difference



$KCl_{(s)}$
K (0.8)
Cl (3.2)
Difference in Electronegativity: 3.2 - 0.8 = 2.4
2.4 > 1.7 ∴ Ionic

$AlP_{(s)}$
Al (1.6)
P (2.2)
Difference in Electronegativity: 2.2 - 1.6 = 0.6
0.6 < 1.7 ∴

	covalent

Lewis Diagrams and Structural Formulas

Name:_____

If you encounter any difficulties, please refer to your notes or section 3.2 of your textbook.

Complete the following table by stating each entity's chemical formula, calculating the number of valence electrons in each entity, drawing a Lewis diagram, and then drawing a structural formula.

Chemical Name:	**Chemical Formula:**	**Lewis Diagram:**	**Structural Formula:**
Elemental hydrogen	$H_{2(g)}$		
Elemental bromine	$Br_{2(l)}$		
Hydrogen iodide	$HI_{(g)}$		
Carbon monoxide	$CO_{(g)}$		

Methanol	$CH_3OH_{(l)}$		
Chlorite ion	$ClO_2^-{}_{(aq)}$		
Ethane	C_2H_6		
Ethene	C_2H_4		
Acetylene	C_2H_2		
Ethanol	CH_3CH_2OH		

Hydrazine	N_2H_4		
Dichloromethane	CH_2Cl_2		
Oxygen diastatide	$OAt_{2(g)}$		
Hydrogen peroxide	H_2O_2		
3-dichloroprop-1-yne	$CHCCHCl_2$		
Dichloroethane	CH_2Cl_2		

Methanal	$HCHO$		
Hydrogen peroxide	H_2O_2		
Dichloroethyne	C_2Cl_2		
Hydronium ion	H_3O^+		
Nitrosyl ion	NO^+		
Carbonate ion	$CO_3^{2-}{}_{(aq)}$		

Challenge Problems:

Try drawing Lewis Diagrams and their corresponding structural formulas for each of the following compounds!

1,2-dichloroben zene (*Hint: some structures are based on rings, not chains of carbon atoms*)	$C_6H_4Cl_2$		
Butanoic acid	C_3H_7COOH		
Phosphoric acid	H_3PO_4		

Methyl ethanoate	CH_3COOCH_3		