

Lab - Lewis Electron Dot Models

A chemical bond is a strong attractive force between atoms or ions in a compound. Electrons in the outermost orbitals, s and p, are involved in chemical bonding. The type of atoms involved determines the type of bond.

This has everything to do with **ELECTRONEGATIVITY!**

Ionic bond – transfer electrons and create charge as one atom gains electrons and the other atom loses

Covalent bond- shared electrons to achieve noble gas configuration

- **Non polar covalent** – shared electrons equally
- **Polar covalent**- unequal sharing of electrons

*The group number = the number of valance electrons for the representative elements (IA – VIIA)

A Lewis dot diagram- DOTS = #OF VALANCE ELECTRONS

Example:

- K group IA = 1 dot; 1 valance electron
- Br group VIIA = 7 dots; 7 valance electrons

The atoms are trying to follow the octet rule to achieve stability and thus a noble gas configuration..... S^2P^6

In general:

1. Hydrogen- NO DOTS!!!
2. Follow the **NAS** step by step:
 - a. N= electrons needed to obtain full octet
(This equals 8! Exceptions are: H=2, Be=4, B=6)
 - b. A= valance electrons available OR actual (check out the group number)
 - c. S= N-A electrons shared
3. Draw the skeleton diagram. Put the least electronegative element in the center of the diagram (Never hydrogen)

Example: HCN

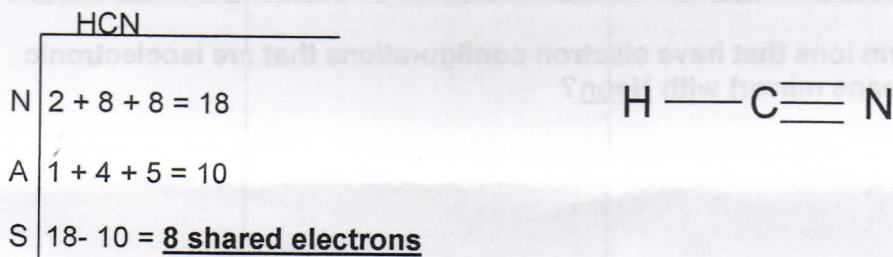


Diagram is complete and correct. Hydrogen is stable with 2 electrons (1 bond), carbon is stable with 8 electrons (4 bonds), and nitrogen is stable with 8 electrons (3 bonds and 1 unshared lone pair of electrons)

Lab Activity - Chemical concepts: Molecular bonding

Materials needed: Element squares and bingo chips

Part I - Elements

1. Locate data table 1
2. Fill in group number, electron configuration, and dot diagram.

Part II- Covalent Compounds (non-metal + non-metal)

1. Locate data table 2
2. Calculate NAS for each molecular compound
3. Find the element squares for each atom in the compound. Choose a color of bingo chip to represent an atom. For example I will only use red chips for hydrogen and blue chips for carbon. The number of bingo chips used will = ACTUAL in NAS calculation.
4. Build a dot diagram for each atom in the molecule.
5. Observe how the dot diagrams come together.
6. Do this for each compound listed in data table 2

Conclusion questions:

1. Why do all elements in group 7A have similar chemical and physicals?
2. Why can any atom have no more than 8 valance electrons? (think about which orbitals the valance electrons are located)
3. Is there a relationship between the number of valance electrons and electronegativity?
4. Write the electron configurations for the following:

Zn^{+2}	N^{-3}	O^{-2}
Al^{+3}	Br^{-1}	C^{-4}

5. From Data Table 1, which atoms form ions that have electron configurations that are isoelectronic (exactly like noble gas, hence, - iso means mirror) with Neon?
6. If the polar bonds are symmetrical then the compound is considered non polar, how can you take a symmetrical tetrahedral compound CH_4 and make it polar? What has to change?
7. Why is it possible for fluorine to bond with xenon?

Data table 1

Element	Group #	Electron configuration	Dot diagram
1. H			
2. Li			
3. Be			
4. B			
5. C			
6. N			
7. O			
8. F			

Data table 2: covalent compounds

Formula	Dot diagram	Molecular geometry	Polar or non-polar?	Hybridization of Central Atom
1. SO ₂				
2. CH ₄				
3. AlCl ₃				
4. CHCl ₃				

5. SO_4^{2-}				
6. OH^-				
7. BF_3				
8. N_2				
9. CH_2Cl_2				
10. BeH_2				
11. SiCl_4				
12. PCl_3				

Be sure to answer all conclusion questions!!!