Lab: Lewis Electron Dot Symbols

Outcomes: By the end of this section, you will be able to:

a) Write Lewis symbols for neutral atoms, ions and molecules

b) Understand the covalent bond

1) Introduction

All compounds do not have ionic compound properties because all atoms do not ionize and form ionic bonds. H_2, O_2, and H_2O are examples of simple molecules that form a covalent bond by sharing at least one pair of electrons rather than losing or gaining electrons. For example, a hydrogen molecule (H_2) has one electron in the outer orbital, while two hydrogen atoms share one electron in the valence orbital. As a result, two hydrogen atoms share two electrons, forming a single hydrogen molecule, as shown in Figures 1 and 2.

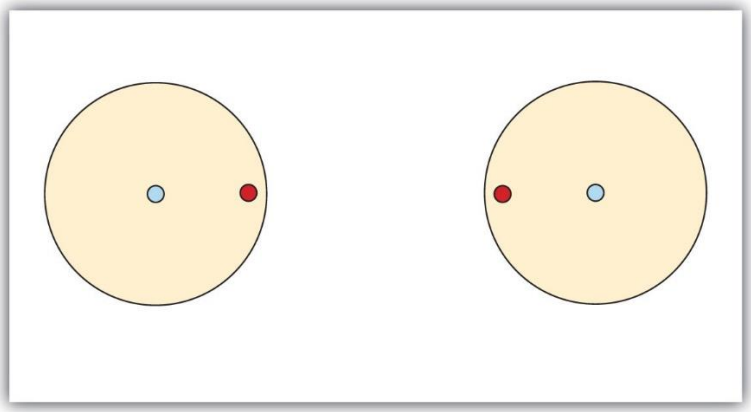


Figure 1: Individual Hydrogen Atoms

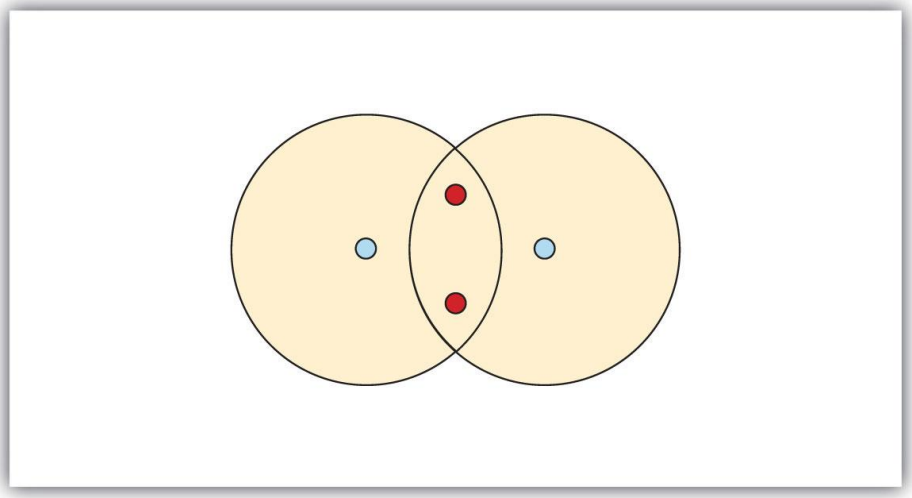


Figure 2: The Hydrogen Molecule

https://wou.edu/chemistry/courses/online-chemistry-textbooks/ch150-preparatory-chemistry/ch150-chapter-4-covalent-bonds-molecular-compounds/

Lewis electron dot diagrams are used to explain covalent bonds with the following steps: a- c.

a) Two Separate Hydrogen Atoms:

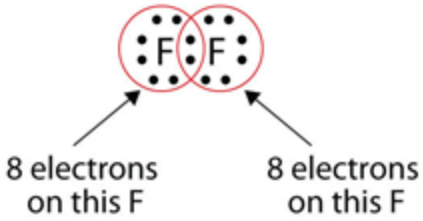
b) Hydrogen Molecule.

c) Hydrogen molecule is further simplified by using a dash.

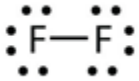
Another simple molecule F2 which has one covalent by sharing one electron from each F atom by the following steps;

a) Two Separate Fluoride Atoms

b) Fluorine Molecule



c) Fluorine molecule is further simplified by using a dash line.



Two F share two electrons, which are known as bonding pairs, and electrons that are not shared by two F are known as lone pairs, as shown in step c. As we can see, H_2 and F_2 are diatomic gases that form covalent compounds due to their covalent bonds. Nonmetallic atoms and hydrogen combine to form new covalent compounds. The Lewis dot symbols for the common nonmetallic elements in Period 2 are listed in Table 3. The dots represent electrons in the valence orbital, and one can predict the number of bonds for each element based on the dots. For example, because C has four dots, it is likely that the carbon has four hydrogen bonds to meet the octet rule, which requires 8 electrons at the valence orbitals. As you can see, carbon shared 8 electrons with hydrogen, while each carbon shared two electrons with carbon.

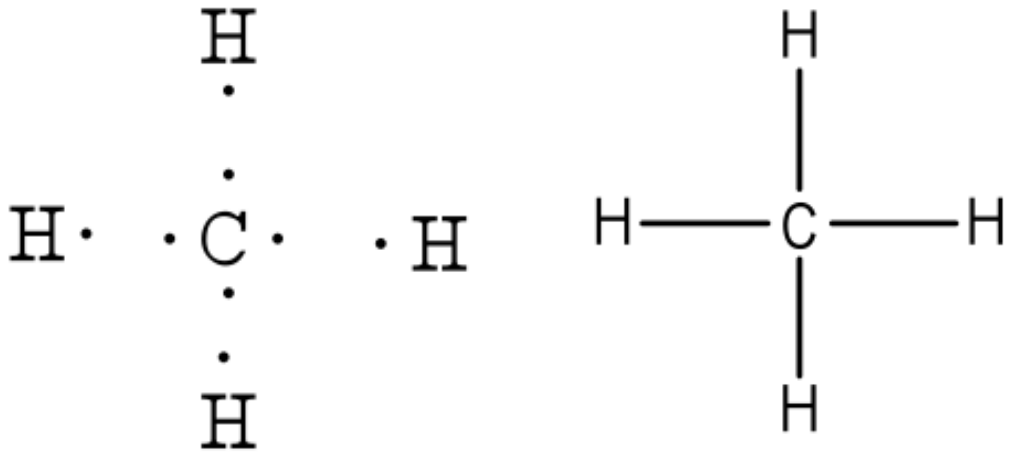


Figure 3: Lewis structure for methane (CH_4).

Element	Electron config.	Electron dot symbol
Li	$[He]2s^1$	Li·
Be	$[He]2s^2$	·Be·
B	$[He]2s^22p^1$	·B·
C	$[He]2s^22p^2$	·C·
N	$[He]2s^22p^3$	·N:
O	$[He]2s^22p^4$	:O:
F	$[He]2s^22p^5$	:F:
Ne	$[He]2s^22p^6$	:Ne:

Table 3: Lewis Dot Symbols of the Elements in period 2

https://chem.libretexts.org/Courses/Valley_City_State_University/Chem_121/Chapter_8%3A_Chemical_Bonding_and_Molecular_Structures/8.1%3A_Lewis_Dot_Symbols_and_the_Octet_Rule

Questions

1) Draw the Lewis electron dot symbol for each atom

a) Boron

b) Nitrogen

c) Oxygen

d) Fluorine

2) Drew the Lewis structure for the following ions:

a) Hydronium ion ($H3O^+$)

b) Nitrate ion ($NO3^-$)

c) Bromide (Br^-)

3) Drew the Lewis structure for the following molecules

a) Carbon Dioxide (CO_2)

b) Water (H_2O)

c) Sodium Chloride (NaCl)