

**Aim:** How do nonmetals bond with each other?

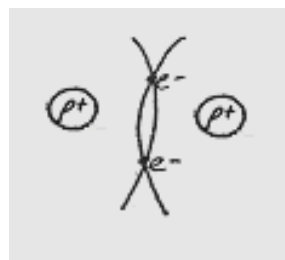
**Nonmetal + Nonmetal = Covalent Bond**

gain  $e^-$

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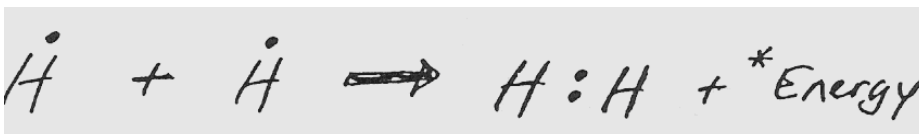
sharing

valence  $e^-$



Analogy/Demo: two people sharing a book

1. A **covalent** bond is formed by the **overlap** of  $e^-$  clouds (orbitals, shells). Since **both nuclei are attracted to the same  $e^-$** , the atoms get bonded (“stuck”) to each other. Now, the  $e^-$  belong to both atoms; they **share** the  $e^-$ .
2. Lewis  $e^-$  Dot Diagram



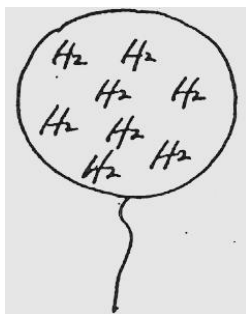
-place the  $e^-$  shared **between** the atoms

-1 pair of valence  $e^-$  shared is called a **single** covalent bond

-Energy is **released** when the atoms bond to each other because they become **more stable**.

*REMEMBER: bonds formed, energy released; bonds broken, energy absorbed*

3. Therefore, a sample of hydrogen consists of  $H_2$  **molecules** -2 or more atoms sharing electrons. In other words, hydrogen is a “molecular” substance.



$Na^+Cl^-$   $Na^+Cl^-$   $Na^+Cl^-$

$Cl^-$   $Na^+Cl^-$   $Na^+Cl^-$   $Na^+$

$Na^+Cl^-$   $Na^+Cl^-$   $Na^+Cl^-$

Note: There are no molecules in ionic compounds; just ions.

4. Go to handout: “Top Six Molecules”

**Draw the Lewis (electron dot) structures** of the following compounds.

REMEMBER: shared electrons are placed between the atoms involved.

The Top Six Molecules

<p>1) <math>\text{H}_2\text{O}</math></p> $\begin{array}{c} \text{H} : \ddot{\text{O}} : \\   \\ \text{H} \end{array}$	<p>4) <math>\text{CH}_4</math></p> $\begin{array}{c} \text{H} \\   \\ \text{H} : \ddot{\text{C}} : \text{H} \\   \\ \text{H} \end{array}$
<p>2) <math>\text{NH}_3</math></p> $\begin{array}{c} \text{H} : \ddot{\text{N}} : \text{H} \\   \\ \text{H} \end{array}$	<p>5) <math>\text{CO}_2</math></p> $\begin{array}{c} \text{:} \ddot{\text{O}} \text{:} : \text{C} : : \ddot{\text{O}} \text{:} \\ \uparrow \quad \quad \uparrow \\ \text{Double} \quad \text{Double} \\ \text{Bond} \quad \text{Bond} \end{array}$
<p>3) <math>\text{HCl}</math></p> $\text{H} : \ddot{\text{Cl}} :$	<p>6) <math>\text{H}_2\text{O}_2\text{N}_2\text{Cl}_2\text{Br}_2\text{I}_2\text{F}_2</math> <i>or</i> <i>singles</i></p> <p> <math>\swarrow</math> <i>single</i>     <math>\swarrow</math> <i>Double</i>     <math>\swarrow</math> <i>Triple</i> </p>