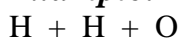


**Homework 4/25-26/07: Covalent Bonding and Lewis Structures**

Recall that in **ionic bonding** formed by metals and nonmetals, electrons are *transferred* in an attempt to complete each atom's **octet**, creating ions that are then electrostatically attracted to each other to form the ionic bond. In **covalent bonding**, electrons are *shared* among neutral nonmetal atoms. By sharing, each atom is able to complete its **octet**.

To draw a Lewis Dot Structure for covalently bonded compounds, simply add up the available **valence shell electrons** from each atom, divide by two to find the number of "electron pairs," and arrange four pairs around each atom to give each one an **octet**. Note that when laying out the atoms, the first atom listed in a compound is generally the **central atom** except when it is hydrogen. (*Hydrogen must always be on the outside... Do you know why?*) **Failure of the Octet Rule:** Note that not all elements want to achieve an octet. Remember that Hydrogen and Helium only want TWO electrons in their valence. Elements below Period 2 have "unfilled d orbitals" and therefore can accommodate MORE bonding and *exceed* the octet rule with numbers of electron pairs on the central atom.

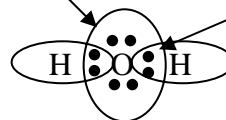
**Example: H<sub>2</sub>O**

$$1 + 1 + 6 = 8 \div 2 = \boxed{4 \text{ pairs}}$$

Now arrange the four pairs around the Oxygen:



Note that Oxygen now has an octet and each hydrogen has the two electrons that it needs to complete its valence shell.



1. Give the total number of valence electrons in each of the following molecules:

- a. CBr<sub>4</sub> \_\_\_ b. NO<sub>2</sub> \_\_\_ c. C<sub>6</sub>H<sub>6</sub> \_\_\_ d. H<sub>2</sub>O<sub>2</sub> \_\_\_  
 e. PH<sub>3</sub> \_\_\_ f. CCl<sub>4</sub> \_\_\_ g. C<sub>2</sub>H<sub>6</sub> \_\_\_ h. OF<sub>2</sub> \_\_\_

2. Draw the Lewis structure for each of the following:

- a. NH<sub>3</sub> b. NCl<sub>3</sub> c. Cl<sub>4</sub> d. SiBr<sub>4</sub> e. NBr<sub>3</sub> f. PH<sub>3</sub> g. SF<sub>2</sub> h. HBr i. CCl<sub>4</sub>