

Name: _____

Per: _____

Bond and Molecule Polarity

Polar Covalent Bonds

Polar covalent bonds are formed by *unequal sharing* of electrons between two different nonmetal atoms.

Facts related to polar covalent bonds are summarized below.

Concept Facts: Study to remember these facts

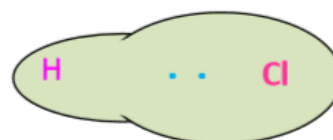
- Sharing of electrons in polar covalent bonding is unequal
- Electronegativity difference between the two nonmetal atoms is generally greater than 0 but less than 1.7
- Polar covalent bonds are the most common bond between atoms of molecular substances

Examples of substances containing polar covalent bond.

H ₂ O	HCl	NH ₃
water	hydrogen chloride	ammonia

NOTE: Each formula consists of two different nonmetal atoms.

Unequal sharing of electrons in a polar covalent bond.



A molecule of HCl

The electrons (• •) shared by H and Cl are located closer to the Cl atom. This represents unequal sharing of electrons.

The electrons are closer to Cl because Cl has a greater electronegative value than H.

1. Define **Polar Bond**:

2. What property of the atoms is used to tell whether a bond is polar? Where can these values be found?

3. Which substances from the Covalent Puzzle summary sheet contain polar bonds?

Nonpolar Covalent Bonds

Nonpolar covalent bonds are formed by *equal sharing* of electrons between two of the same nonmetal atoms.

Facts related to nonpolar covalent bonds are summarized below.

Concept Facts: Study to remember these facts

- Sharing of electrons in nonpolar covalent bonds is equal
- Electronegativity difference is zero
- Nonpolar covalent bonds are commonly found in *diatomic* (two-atom) elements.

Example of substances containing nonpolar covalent bonds.

H₂
Hydrogen

N₂
Nitrogen

NOTE: Each formula consists of the same nonmetal atom.

Equal sharing of electrons in a nonpolar covalent bond.



A molecule of H₂

The electrons (• •) shared by the H atoms are equal distance from both atoms. This represents equal sharing.

The electrons are shared equally because identical atoms have the same electronegativity value.

1. Define **Nonpolar Bond**:

2. What type of molecules ALWAYS have nonpolar covalent bonds?

4. Which substances from the Covalent Puzzle summary sheet contain nonpolar bonds?

Molecule Polarity

The physical properties of a substance are dictated in part by whether or not a molecule is polar. For example, oil and water do not mix because water is polar whereas oil is nonpolar. Another example is carbon dioxide and water. At room temperature, carbon dioxide is a gas while water is a liquid because carbon dioxide is nonpolar while water is polar. In this activity, you will explore the factors that contribute to a molecule's polarity or nonpolarity.

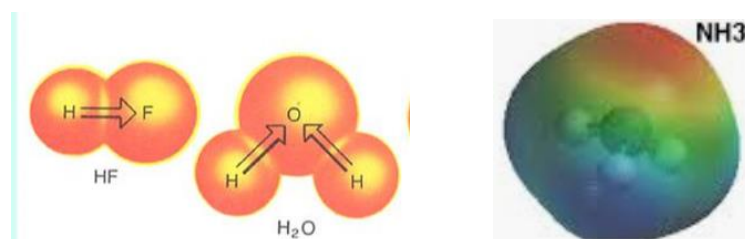
Polar Molecules contain a permanent positive end and a permanent negative end.

This requires **two** things to be true:

1. The molecule must contain polar bonds.
2. The molecule must have an uneven (asymmetrical) distribution of charge.

If the molecule has polar bonds and there is no symmetry to cancel out + and – charges- the molecule is polar. Dipole arrows are used to show the direction of the greatest electronegativity.

Examples of Polar molecules:



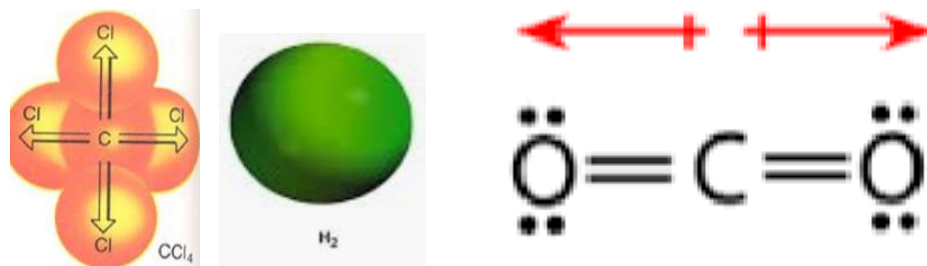
1. What is required for a molecule to be polar?
2. Which molecules from the Covalent Puzzle summary sheet are polar? Draw the Lewis Diagrams of these molecules below and use dipole arrows to show why the molecule is polar.

Nonpolar molecules are electrically neutral. They have a symmetric distribution of charge.

If all the bonds in the molecule are nonpolar- the molecule itself will be nonpolar.

Because of symmetric pull of charge- molecules that have polar bonds are nonpolar if the + and – charges in the molecule cancel each other out.

Examples of Nonpolar molecules:



1. What is required for a molecule to be nonpolar?
2. Which molecules from the Covalent Puzzle summary sheet are nonpolar? Draw the Lewis Diagrams of these molecules below and use dipole arrows to show why the molecule is nonpolar.