

Unit 5

NAME

Class Work

1/13/14

5.11 Polar and Nonpolar Compounds, Polarity

SPARK

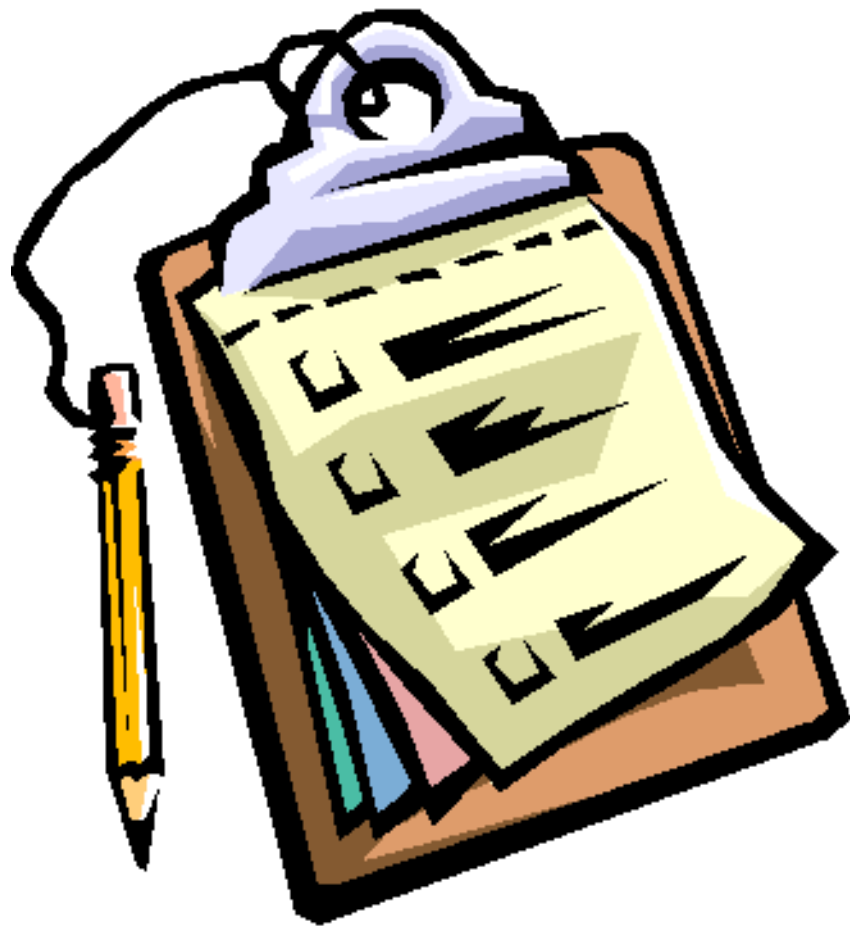
Complete your SPARK on your guided notes paper!

Objective

SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

Agenda:

- SPARK/Objective
- Notes
- Practice
- Exit Ticket
- Homework



Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

Review

- This type of bond occurs when one atom **transfers** electrons to another.
- This type of bond occurs when one atom **shares** electrons.

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

Tug of War



vs.



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Electron Tug of War

Diagram 1



Diagram 2



Polarity:** property of molecules with poles (or uneven charges)

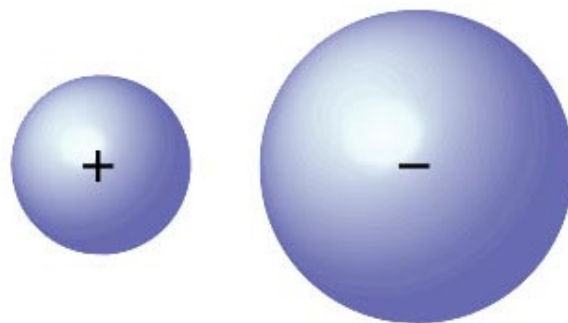
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Electronegativity Difference

EN Difference	Bond Character
> 2.0	ionic
1.0-2.0	Very polar covalent
0.4-1.0	Moderately polar covalent
0-0.4	non-polar covalent

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IONIC BONDS
(difference in EN >2.0 = METAL and
NONMETAL)
ex. NaCl

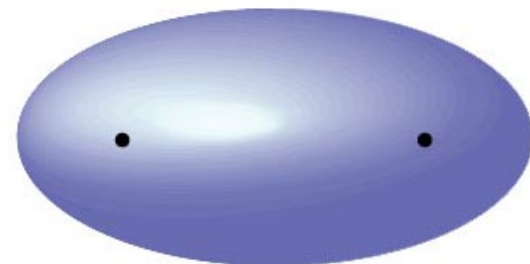


Electrons fully transferred
(cation and anion formed)

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

Nonpolar Covalent (difference in EN = 0-0.4)

ex. N_2 or O_2



**Electrons shared
equally**

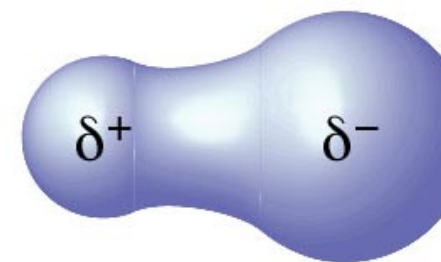
(little or no charge difference between atoms)

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

Polar Covalent

(difference in EN >0.4 , < 2)

ex. NO, HO, HF



**Electron shared unequally
(charge difference between
atoms)**

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

In an ionic bond, what happens to the valence electrons?

In a covalent bond, what happens to the valence electrons?

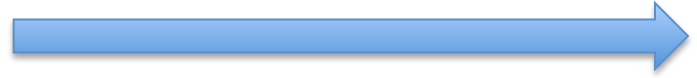
Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

In a nonpolar covalent bond, what happens to the valence electrons?

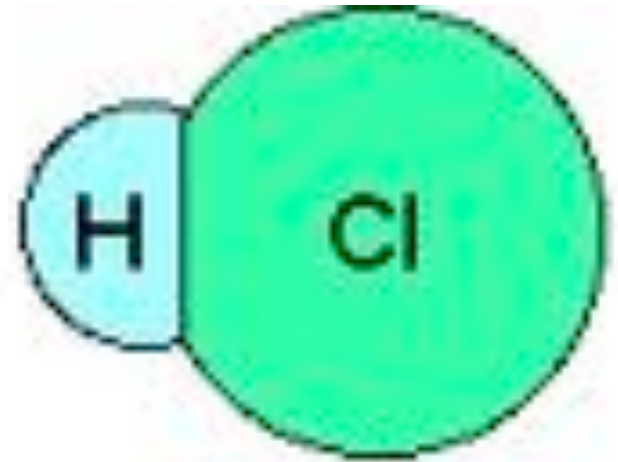
In a polar covalent bond, what happens to the valence electrons?

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

Polar Bonds



Which atom attracts electrons more? How do you know?



Is HCl polar or non-polar?

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

The electrons in a bond between two iodine atoms (I_2) are shared....

equally, and the resulting bond is

non-polar covalent

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

The electrons in a bond between hydrogen and oxygen atoms are shared....

unequally, and the resulting bond is

very polar covalent

EN difference =

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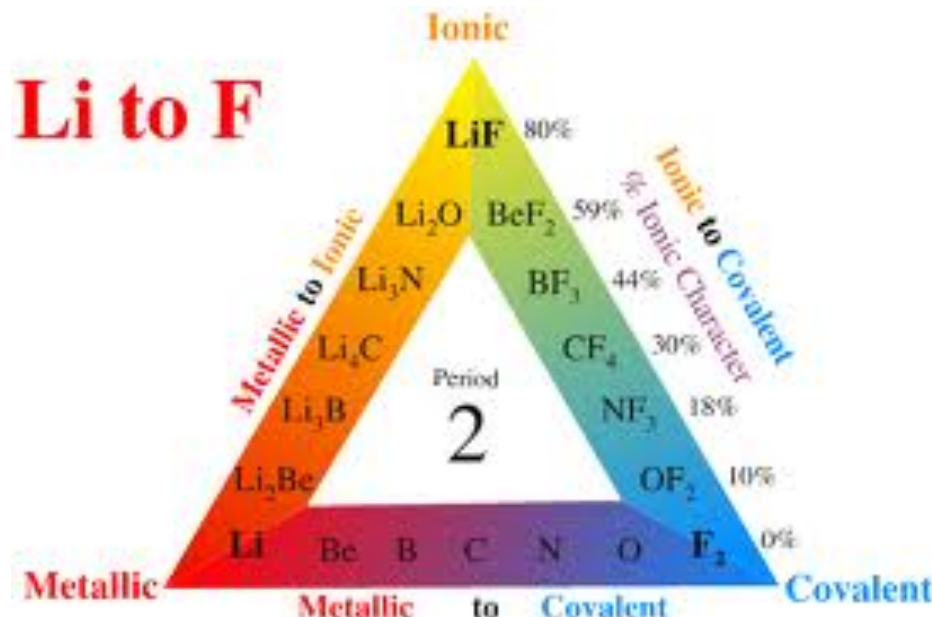
Practice

- Predict the polarity of the covalent bonds that form between each pair of atoms (ionic, very polar covalent, moderately polar covalent, non-polar covalent):

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on its bond polarity and symmetry

Bond Character

- The larger the difference in electronegativity, the more **ionic character** the bond has
- The smaller the difference in electronegativity, the more **covalent character** the bond has

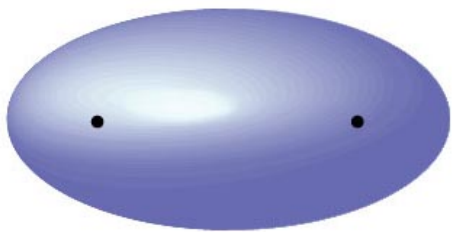


Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

Practice

- Which elements will form a bond with the most ionic character?
 - a) H and F
 - b) C and H
 - c) C and O
 - d) F and C

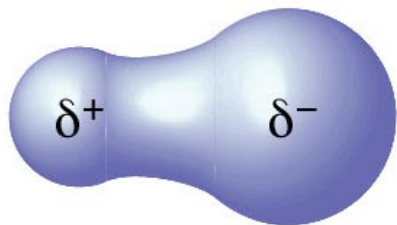
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(a)

- Nonpolar Covalent

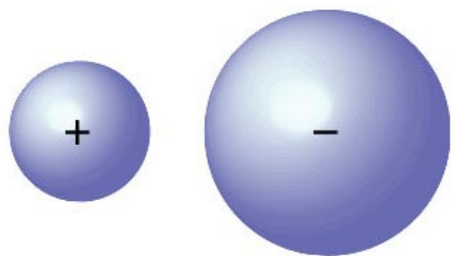
- Electrons are shared equally
- Ex: bond between 2 identical nonmetals



(b)

- Polar Covalent

- Electrons are not shared equally
- One atom is more electronegative



(c)

- Ionic

- Electrons are transferred
- One atom is much more electronegative

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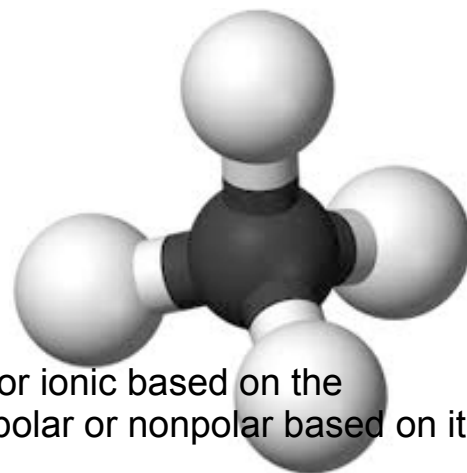
Practice Polar Bonds

- a) Draw the Lewis dot structure, b) Label each bond as polar (P) or non-polar (NP) c) For polar covalent bonds, draw a δ^- or δ^+ on the atom for each bond. d) Label the shape that the molecule will have (use your notes from 5.10).

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on it's bond polarity and symmetry

Polarity of Bonds vs. Molecules

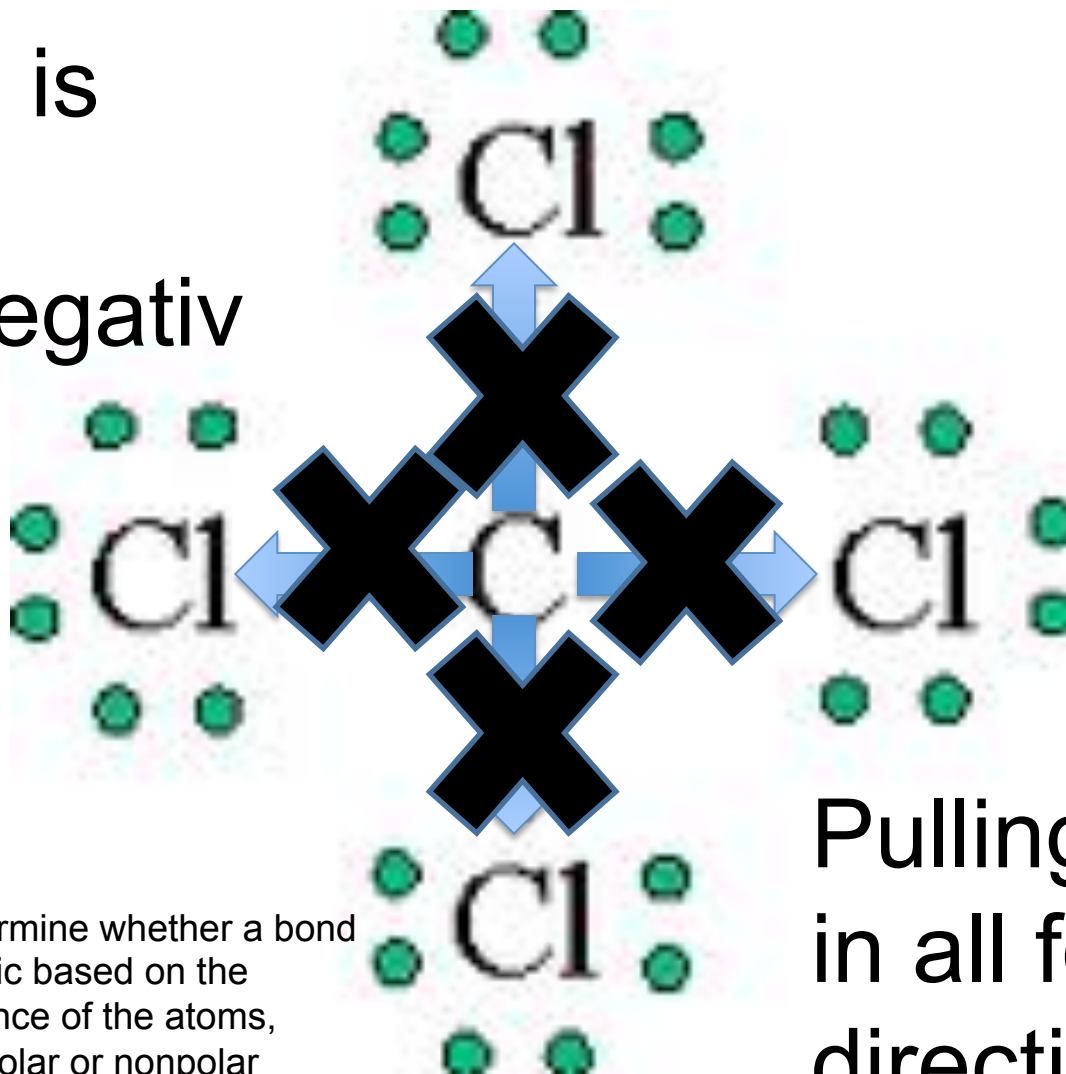
- Molecules can be non-polar even if bonds are polar
 - Molecules need to be **symmetrical** for this to occur
- Ex: CCl_4



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Symmetrical Compounds

Chlorine is
more
electronegative

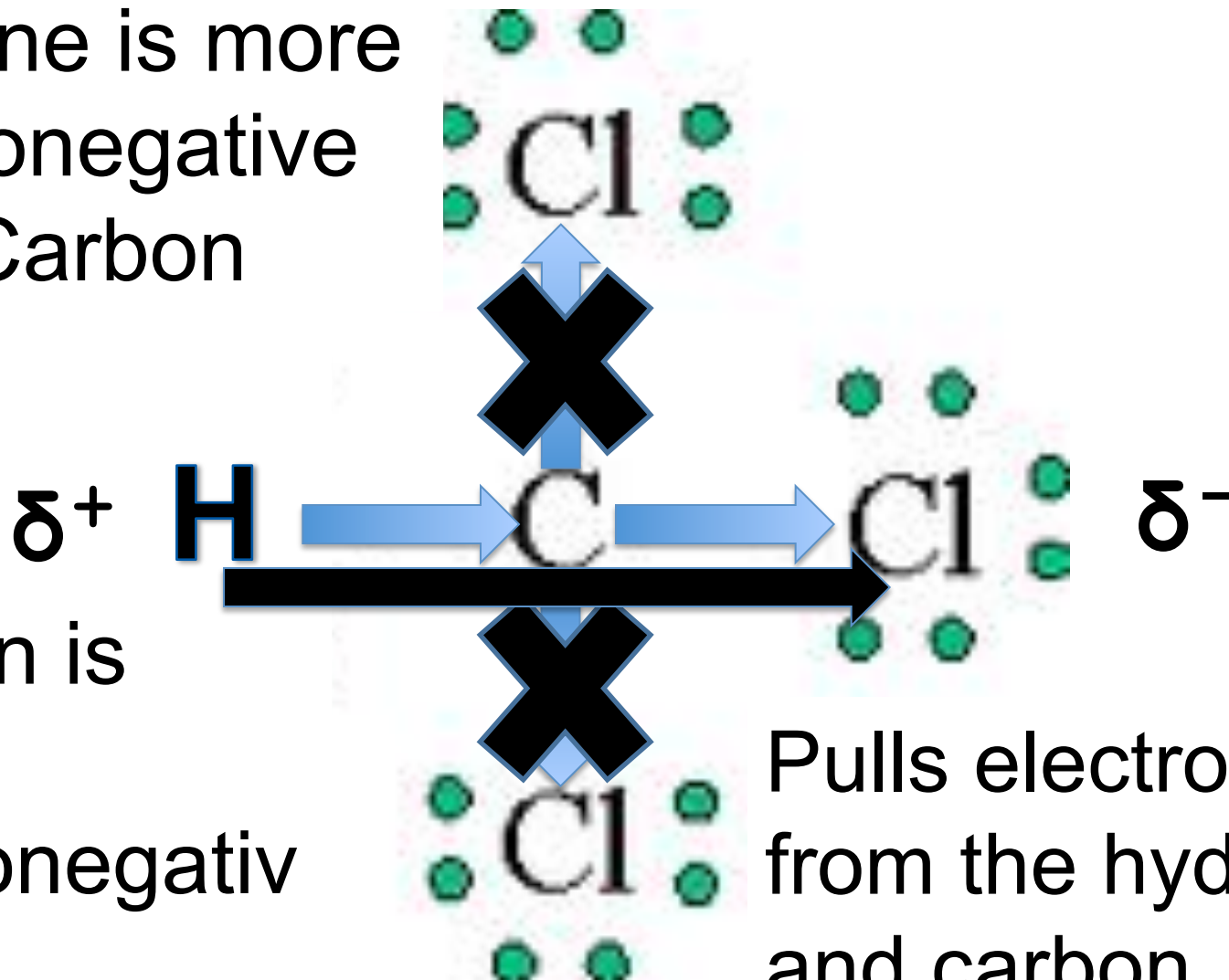


Pulling evenly
in all four
directions!!

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on its bond polarity and symmetry

Non-Symmetrical Compounds

Chlorine is more electronegative than Carbon

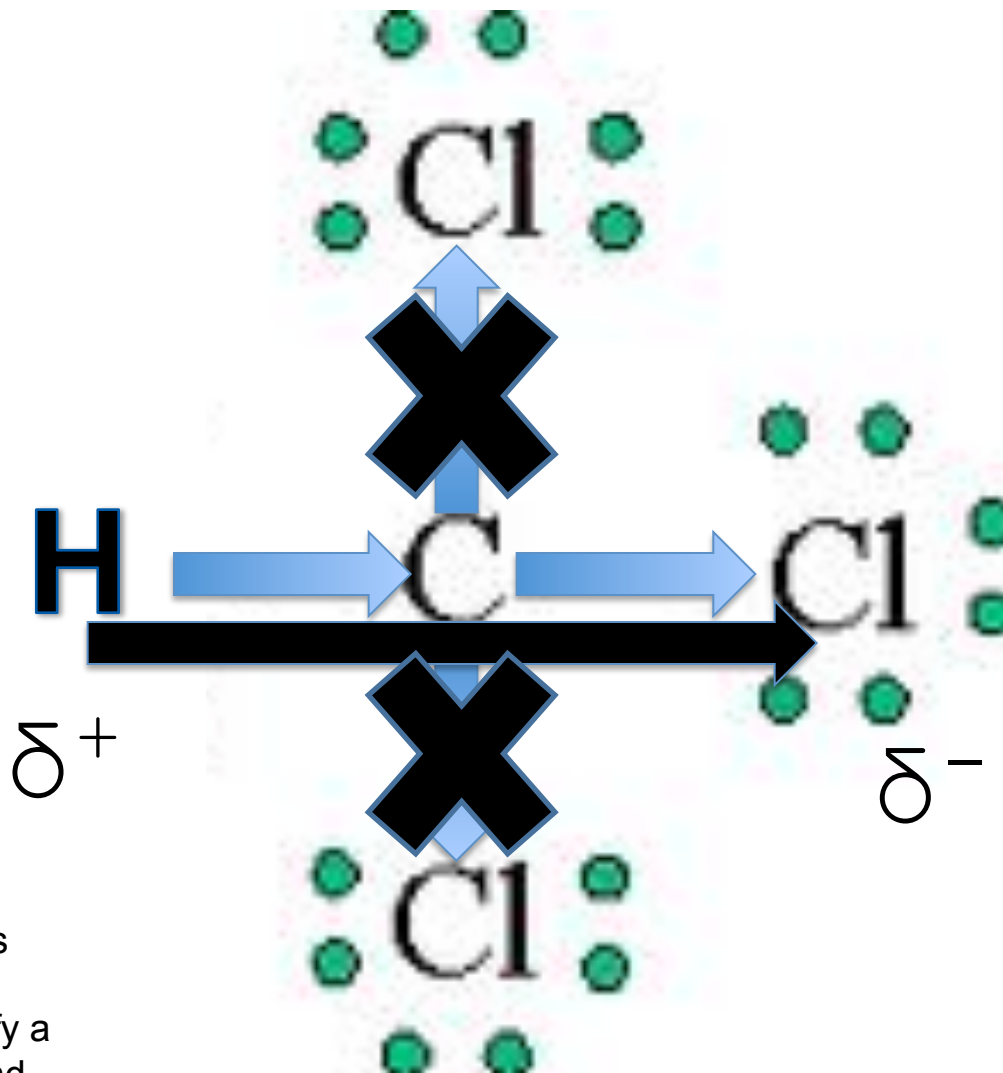


Carbon is more electronegative than

Pulls electrons away from the hydrogen and carbon

Non-Symmetrical Compounds

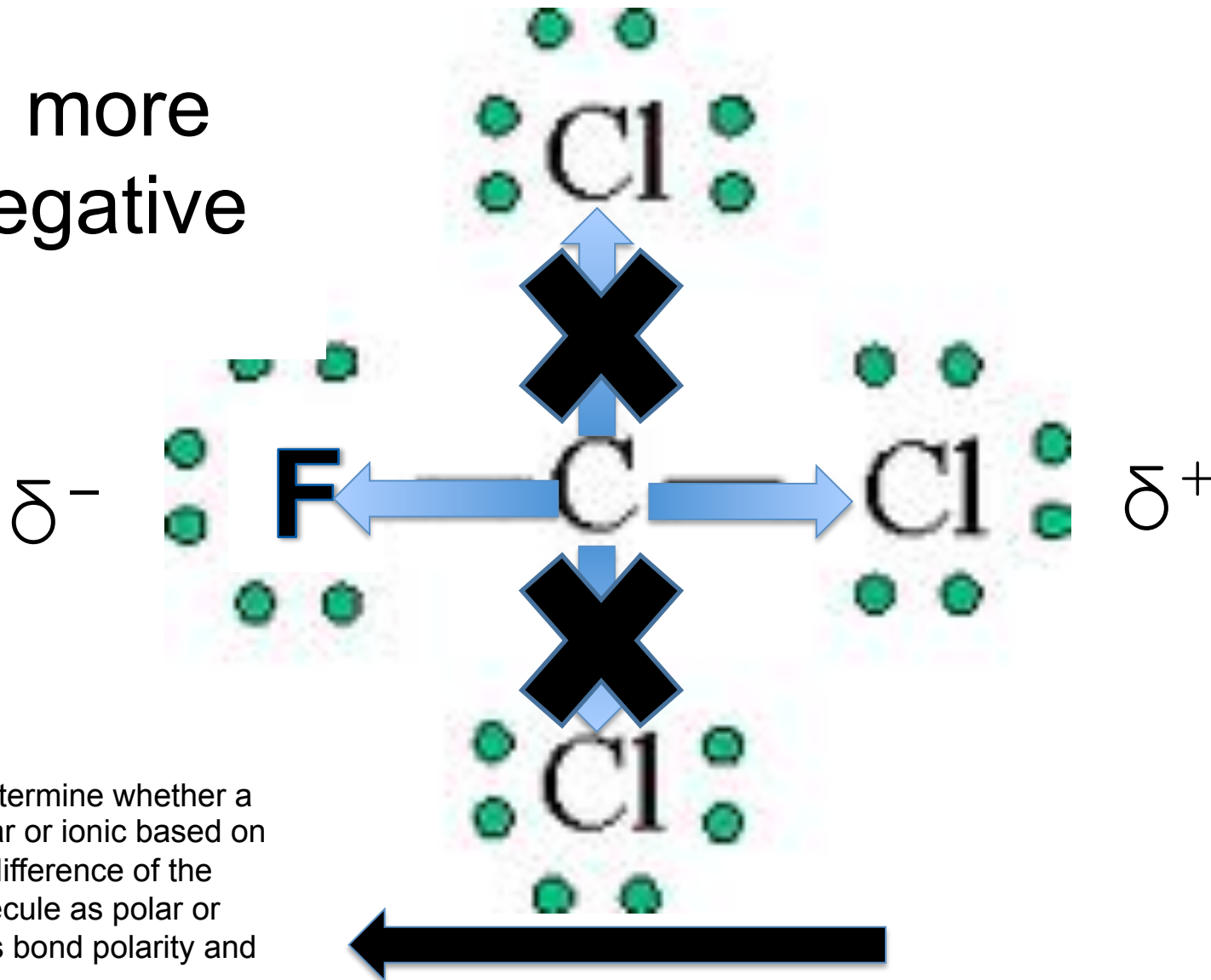
Dipole** is a molecule with two poles.



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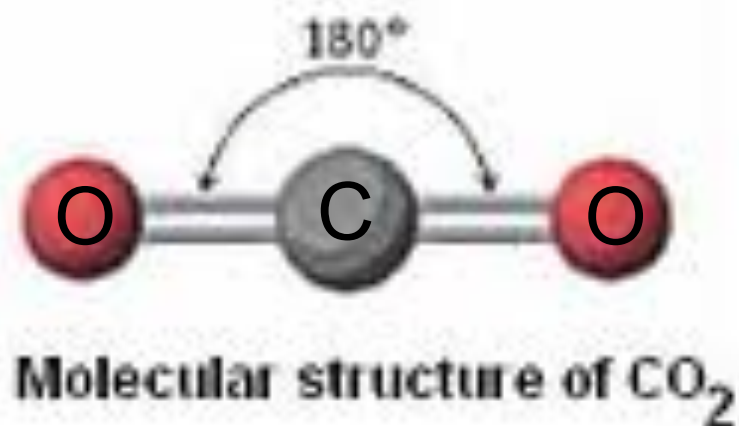
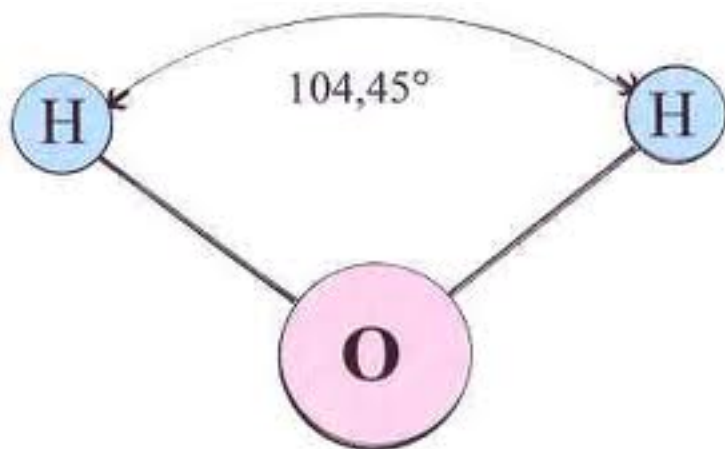
Non-Symmetrical Compounds

Which is more electronegative Cl or F?



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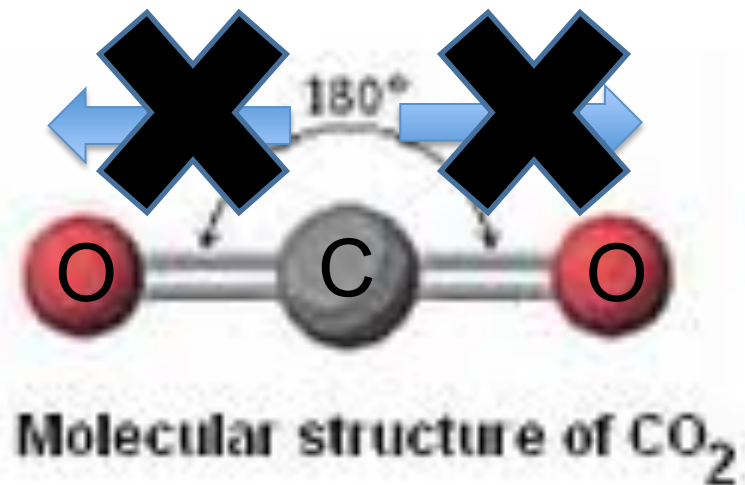
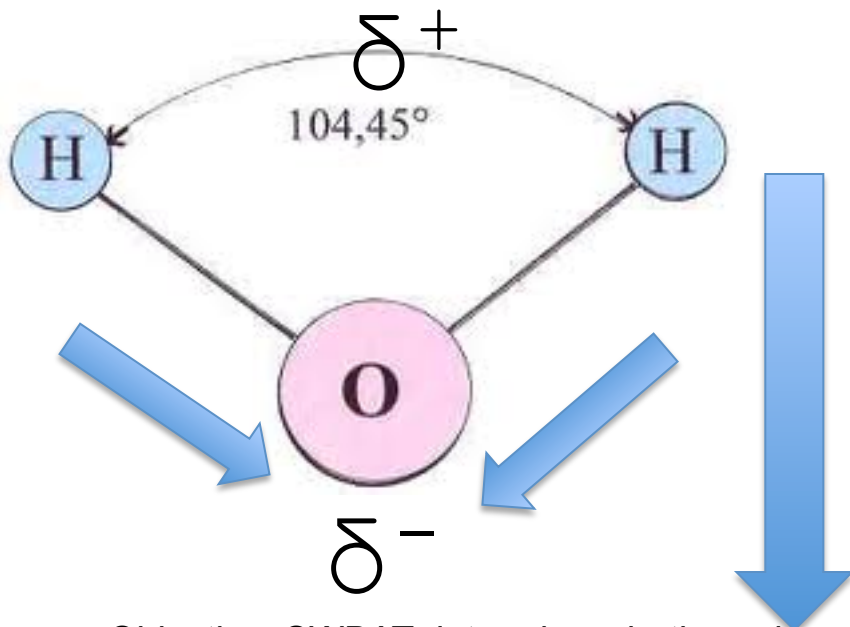
- What geometry did CO_2 and H_2O have?



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Water vs. Carbon Dioxide

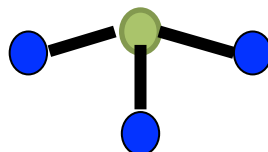
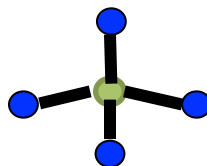
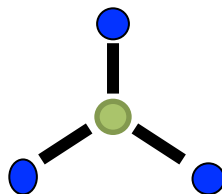
- **Linear** molecules can be symmetrical if they have the same atom on either side
- **Bent** molecules are never symmetrical!
 - More Negative Near Oxygen



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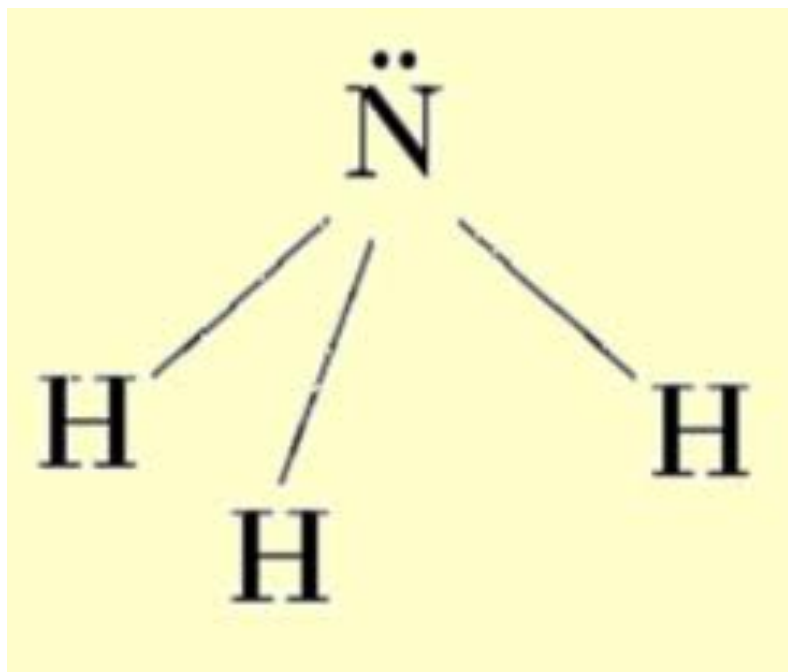
Which can be symmetrical?

- **Linear**
 - Sometimes
- **Bent**
 - Never
- **Trigonal Planar**
 - Sometimes
- **Tetrahedral**
 - Sometimes
- **Trigonal Pyramidal**
 - Never



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Trigonal Pyramidal Shape



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Practice

- Give an example of a molecule that would be polar and one that would be non-polar for each geometry listed below:
 - **Linear**
 - **Trigonal Planar**
 - **Tetrahedral**
- Be prepared to share with the class a drawing of the molecular structure and the overall dipole direction.

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Independent Practice

- Go through the Polar Practice and determine if the overall molecule is polar or non-polar.
- If it is polar, use another color to draw the arrow of the overall dipole and label the positive and negative pole of the molecule.
- If you finish this early, finish the multiple choice homework!

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Exit Ticket

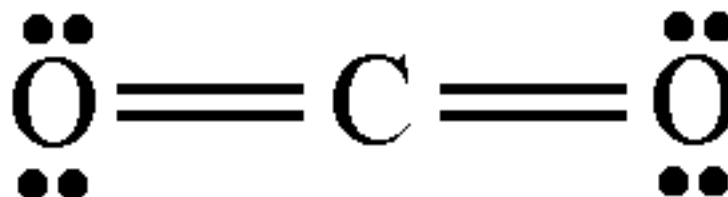
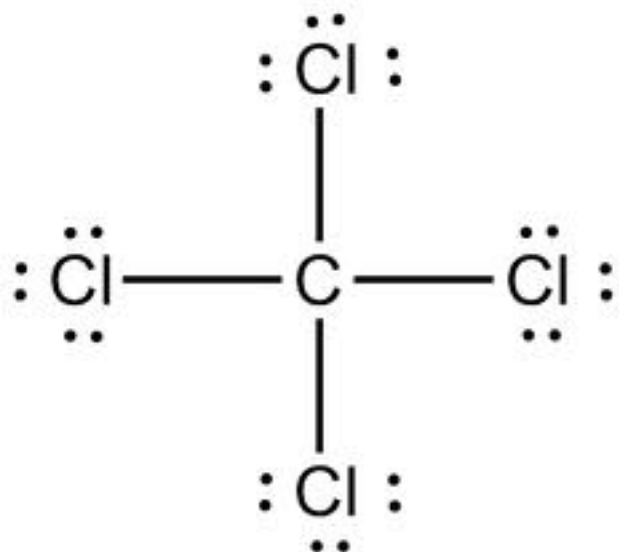
Complete your exit ticket and place it in the bin!

Objective: SWBAT determine whether a bond is polar, nonpolar or ionic based on the electronegativity difference of the atoms, identify a molecule as polar or nonpolar based on its bond polarity and symmetry

Exit Ticket

- How can a bond in a molecule be polar while the overall molecule is non-polar?

(Use this example to explain: CCl_4 or CO_2)



HOMEWORK

Make a study sheet for your Unit 5 Exam!

Update glossary with all vocabulary words!

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