

Date: _____

Why Shape Matters to Matter - Compound Polarity

Recall : **Electronegativity** - The ability of an atom to attract an electron to itself while bonding. In general, as you move left to right across a period on the table electronegativity

increases. (can you explain why?the exam is near!!!)

Within a single bond we can determine the electronegativity difference between the atoms

involved and determine if the bond is

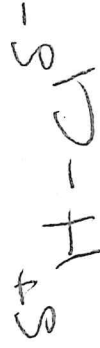
- nonpolar covalent - Has an electronegativity difference of less than 0.4

Ex. H_2



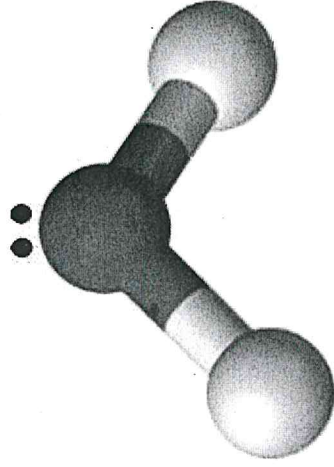
- polar covalent - Has an electronegativity difference of less than 1.7 but greater than 0.4

Ex. HCl .



- ionic - Has an electronegativity difference of greater than 1.7

Ex. $NaCl$



Rules to Determining Polarity

Polarity	Type/Shape of molecule	Reason	Vector Visual
Non-Polar	-All binary molecules (Linear) with an electronegativity difference below 0.3 -Tetrahedral molecules with the same elements surrounding the central atom	The pull-on electrons are of equal magnitude in opposite direction	
Polar	-All binary molecules (Linear) with an electronegativity above 0.3 - Tetrahedral molecules with different elements surrounding the central atom	The pull-on electrons are in opposite direction but NOT of equal magnitude	
Polar	-Bent and Trigonal Pyramidal molecules	The pull of electron is in opposite directions but NOT in opposite direction	
Polar	-Molecules the contain function groups	Functional groups provide a polar part to the molecule	

VECTORS
 CANCEL
 WHEN
 IN
 OPPOSITE
 DIRECTIONS
 = NON
 POLAR
 IF
 NOT
 = POLAR

In General - Symmetrical molecule are Non-Polar

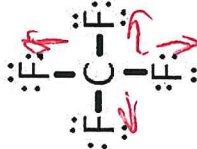
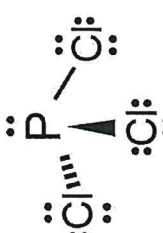
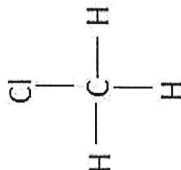
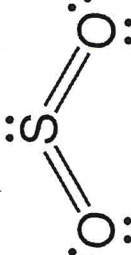
While it can be important to know if an individual bond is polar or not, it of often more important to decide if an **entire molecule** is polar or not. To determine this we need to consider a molecules shape as well as electronegativity differences within it's bonds.

This year we will be looking at four molecular shapes (there are more that will come up in grade 12)

Please use the model kits to construct the following molecules (Black = Carbon, White = Hydrogen, Red = Oxygen). Recall your knowledge of Lewis Structures from unit 1 and draw the molecule

Molecule	Visual	Shape	Another Example	Polar or Non-Polar
Hydrogen Gas		LINEAR		Non-Polar
Hydrogen Chloride		LINEAR		POLAR
Carbon dioxide		LINEAR		Non-Polar
Methane (carbon tetrahydride)		tetrahedral		Non-Polar
Water		Bent		POLAR
Ammonia (nitrogen trihydride)		trigonal pyramidal		POLAR

More Examples:

Molecule	Shape	Rational and Polarity determination
Carbon tetrafluoride 	tetrahedral	The pull on the electrons is of <u>equal magnitude</u> and in <u>opposite directions</u> therefore the molecule is <u>non-polar</u> .
Phosphorus trichloride 	trigonal pyramidal	The pull on the electrons is of <u>equal magnitude</u> , but <u>Not</u> in opposite direction, therefore the molecule is <u>polar</u> .
Chloromethane 	tetrahedral	The pull on the electrons is <u>Not</u> of equal magnitude in opposite directions therefore the molecule is <u>polar</u> .
Sulfur dioxide 	Bent	The pull in the electrons is of <u>equal magnitude</u> , but <u>not</u> in opposite directions, therefore the molecule is <u>polar</u> .