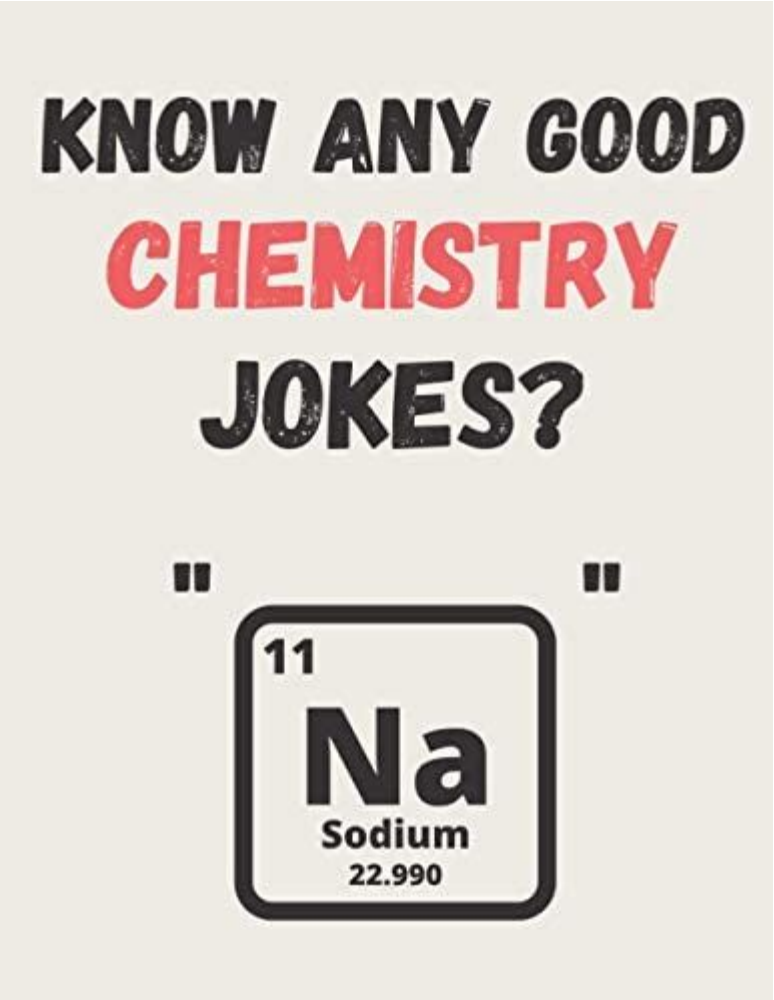
Unit 3 Slides

Lewis Dot Structures and Polarity

Welcome back!

Complete the 10/18 bellwork on formative

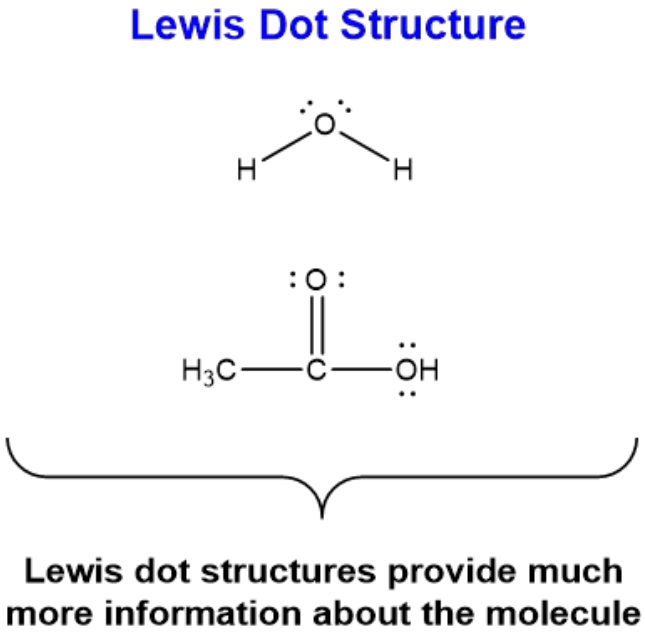


PBO: SWBAT use Lewis dot structures and electronegativity differences IOT predict the polarities of simple molecules (linear, bent, trigonal planar, trigonal pyramidal, tetrahedral)

Big picture: We will be investigating and learning about the shape of molecules

Step 1-Make the Lewis dot Structure for the **molecule**

- Which electrons are shown on Lewis dot structures?



Rules for making Lewis dot structures for **molecules**

1. Determine the number of valence electrons
2. Draw your central atom
3. Connect other atoms with a single bond (2 electrons)
4. Add remaining valence electrons to outer atoms in lone pairs
5. Check to see if all atoms have a full valence shell. Too few, make a double or triple bond. If additional electrons remain, place them on the central atom as lone pairs

Example: Carbon Tetrafluoride

1. Total valence electrons:
    a. Carbon: 4
    b. Fluorine: 7 x 4= 28
    c. Total: 32

Example: CF_4

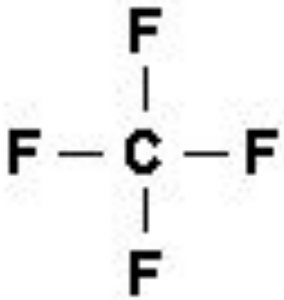
2. Central atom
    a. C

The central atom is the atom with the lowest subscript. If all the atoms have the same subscript, it is normally the least electronegative atom.

**Hydrogen does not like to be the central atom as it can ONLY form one bond

Example: CF_4

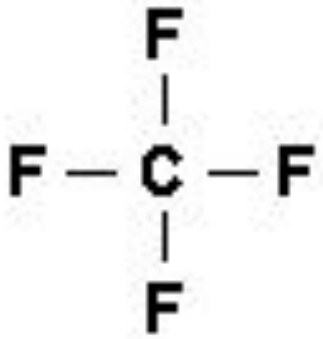
3. Connect central atom to all other atoms



Example: CF_4

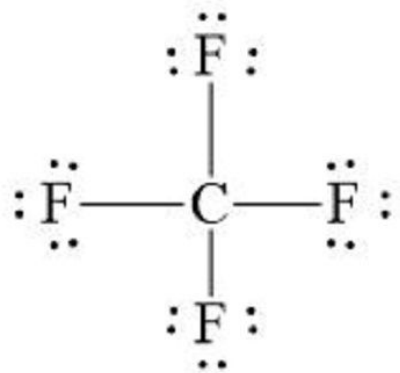
4. Place remaining electrons around outer atoms in **lone pairs**

a. Remaining electrons: 32- 8= 24



Example: CF_4

5. Check to see if all valence shells are full



Let’s work through NF_3 together

Whiteboard Practice

SCl_2

Whiteboard Practice

CI_4

Whiteboard Practice

PF_3

Whiteboard Practice

$CHCl_3$

Whiteboard Practice

PCl_5

Complete the Quizizz as your exit ticket

Complete your bellwork on goformative

Definitions

- Central atom: the atom in the middle of a Lewis dot structure. This will be the atom with the lowest subscript
- Lone pairs: 2 unbonded electrons. Represented with 2 dots
- Single bond: 2 shared electrons. Represented with a line

Example: HI

Double and triple bonds

Double bonds involve the sharing of _____ electrons

Triple bonds involve the sharing of _____ electrons

Lewis dot structure with double bonds: oxygen

Lewis dot structure with triple bonds: nitrogen

Write the order of the questions on a separate sheet of paper from your notes

Draw the Lewis structures that are on the chart paper

Bellwork on a whiteboard draw:

1. CS_2
2. H_2O

MAKE SURE YOU HAVE THE TWO SHEETS THAT ARE AT THE FRONT

The number of bonds and lone pairs on a central atom affects the shape of the molecule

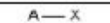
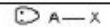
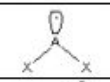
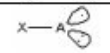
VSEPR

Valence Shell Electron Pair Repulsion- the molecular shape is affected by the repulsion of electrons

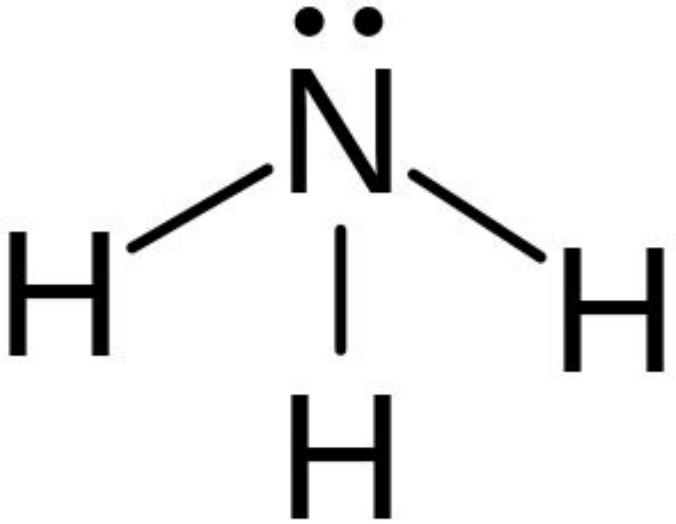
VSEPR Theory (Molecular Shapes)

A = the central atom, X = an atom bonded to A, E = a lone pair on A

Note: There are lone pairs on X or other atoms, but we don't care. We are interested in only the electron densities or domains around atom A.

Total Domains	Generic Formula	Picture	Bonded Atoms	Lone Pairs	Molecular Shape	Electron Geometry	Example	Hybridi -zation	Bond Angles
1	AX		1	0	Linear	Linear	H_2	s	180
2	AX_2		2	0	Linear	Linear	CO_2	sp	180
	AXE		1	1	Linear	Linear	CN^-		
3	AX_3		3	0	Trigonal planar	Trigonal planar	$AlBr_3$	sp^2	120
	AX_2E		2	1	Bent	Trigonal planar	$SnCl_2$		
	AXE_2		1	2	Linear	Trigonal planar	O_2		
4	AX_4		4	0	Tetrahedral	Tetrahedral	$SiCl_4$	sp^3	109.5
	AX_3E		3	1	Trigonal pyramid	Tetrahedral	PH_3		
	AX_2E_2		2	2	Bent	Tetrahedral	$SeBr_2$		
	AXE_3		1	3	Linear	Tetrahedral	Cl_2		

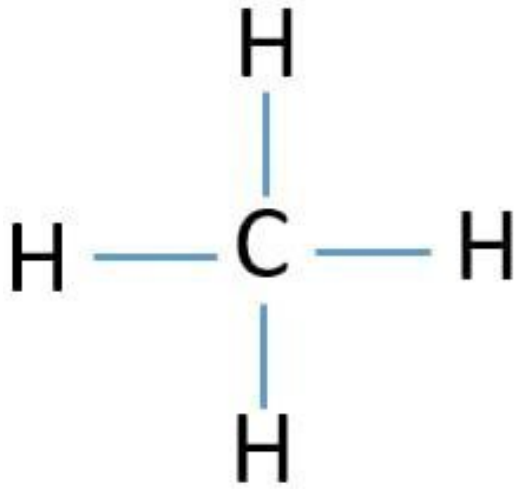
Example: NH_3



What is the molecular geometry of this molecule

1. Linear
2. Bent
3. Trigonal planar
4. Trigonal pyramidal
5. Tetrahedral

What is the molecular geometry of this molecule



1. Linear
2. Bent
3. Trigonal planar
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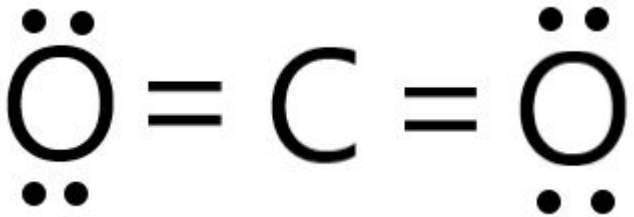
5. Tetrahedral

What is the molecular geometry of this molecule

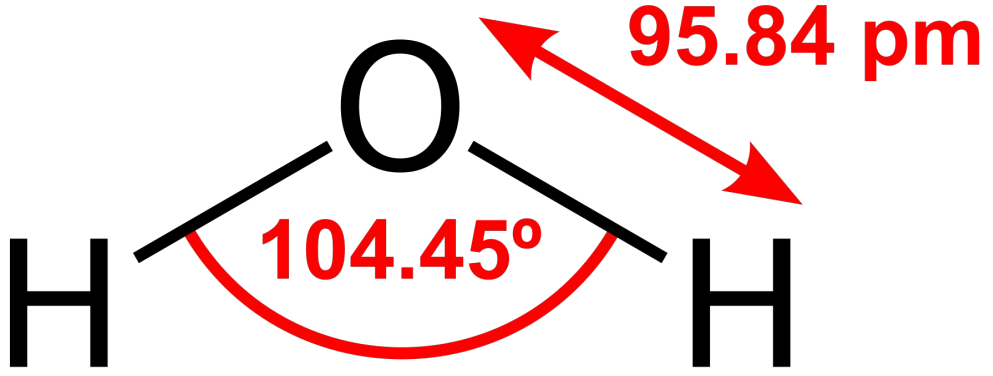


1. Linear
2. Bent
3. Trigonal planar
4. Trigonal pyramidal
5. Tetrahedral

Double and triple bonds DO NOT count as additional electron domains

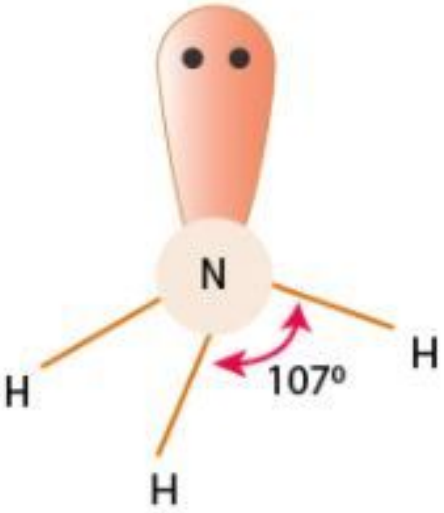
Determine the bond angles for water (H_2O)

1. Make the Lewis dot structure
2. Use the chart to determine the shape and bond angles

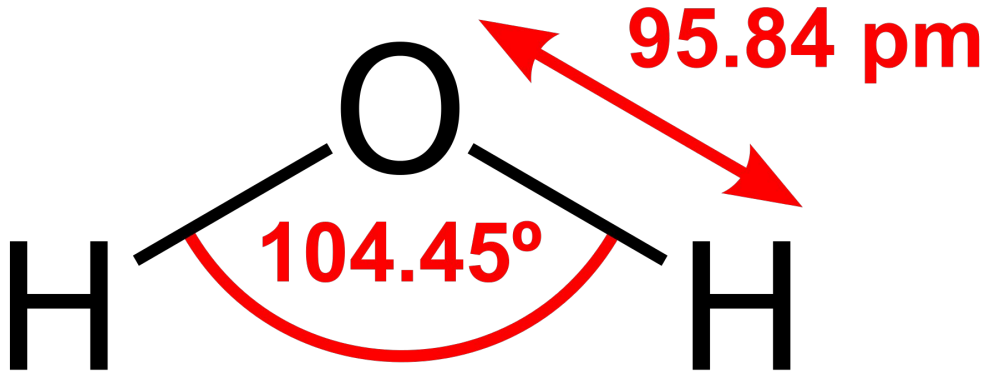


Make a prediction:

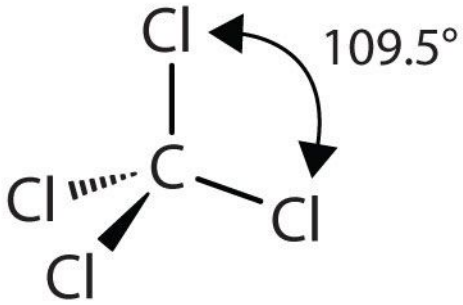
Why is the bond angle of water less than what’s on the chart?



Pyramidal shape



Lone pairs on central atom decrease bond angles



Let's make some models!!

Finished early?

- Make more models for chem money
- Work on your homework (due Monday)
- Work on something for a different class

1. Make the Lewis dot structure for each compound
2. Use clay to make a model for each compound
    a. You must attach every electron domain to your model (both lone pairs and bonds)
3. In order to get full credit for today you must have your teacher sign off on 5 models

Polarity

Complete your bellwork

Phenomena: Fatbergs

Agenda

SWBAT use Lewis dot structures and electronegativity differences IOT predict the polarities of simple molecules (linear, bent, trigonal planar, trigonal pyramidal, tetrahedral).

- 2 lab stations
- 2 explain stations
- Notes
- Practice problems
- Exit ticket

Miscibility

The property of two substances to mix and form homogeneous mixtures.

Station 1

-Do not mix methanol

-Do not add all of the oil or hydrogen peroxide

-If your station runs out of anything ask me

5th period groups

Group 1

- Amaya
- Kiya
- Jeremiah
- Kelby
- *Kassy*

Group 2

- Kelp
- *Aron*
- Valentin
- Quinlan
- Bryce

Group 3

- Jackson
- Vincent
- Luna
- Aimee

Group 4

- Nic
- *Maddie*
- Kyndal
- Morgaan
- *Jewel*

7th period groups

Group 1

- Alijah
- Jordan
- *Gabe*

Group 2

- Deacan
- *Stella*
- Tania

Group 3

- Kaylin
- Morgan
- Kylie
- Tisaiah

Group 4

- Noah
- Leila
- Hadeel

Notes

Polarity Notes

-Both individual __**bonds**_ and whole ___**molecules**_____ can be classified as polar or nonpolar.

-Atoms with similar ___**electronegativities**____ form ___**nonpolar**_____ covalent bonds that __**evenly**___ share electrons.

-_**Polar**__ bonds form between atoms with a significant __**difference**____ in electronegativity.

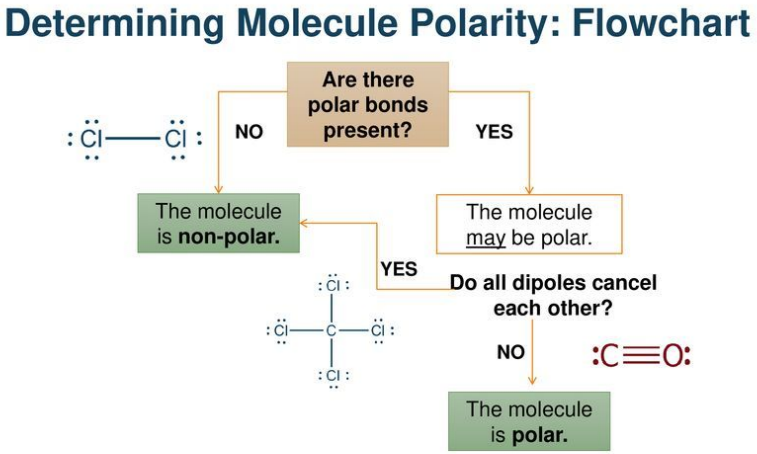
-A __**dipole**__ is the separation of charge. Partial positive on one end and partial negative on the other (_**pole**_)

-When a molecule contains multiple dipoles, they can __**cancel out**____ or __**add**__ to form a net dipole.

-Polar molecules contain ___**polar bonds**____ and are not __**symmetrical**__ resulting in a _**dipole**__.

Polarity example problem- carbon tetrahydride

1. Lewis dot structure
2. Polar or nonpolar bonds
3. Symmetry
4. Determine if compound is polar or nonpolar



Exit ticket

1. Why didn't the oil mix with water?
2. Draw a lewis dot structure for SCl_2 and state if it's polar or not.

Polarity day 2

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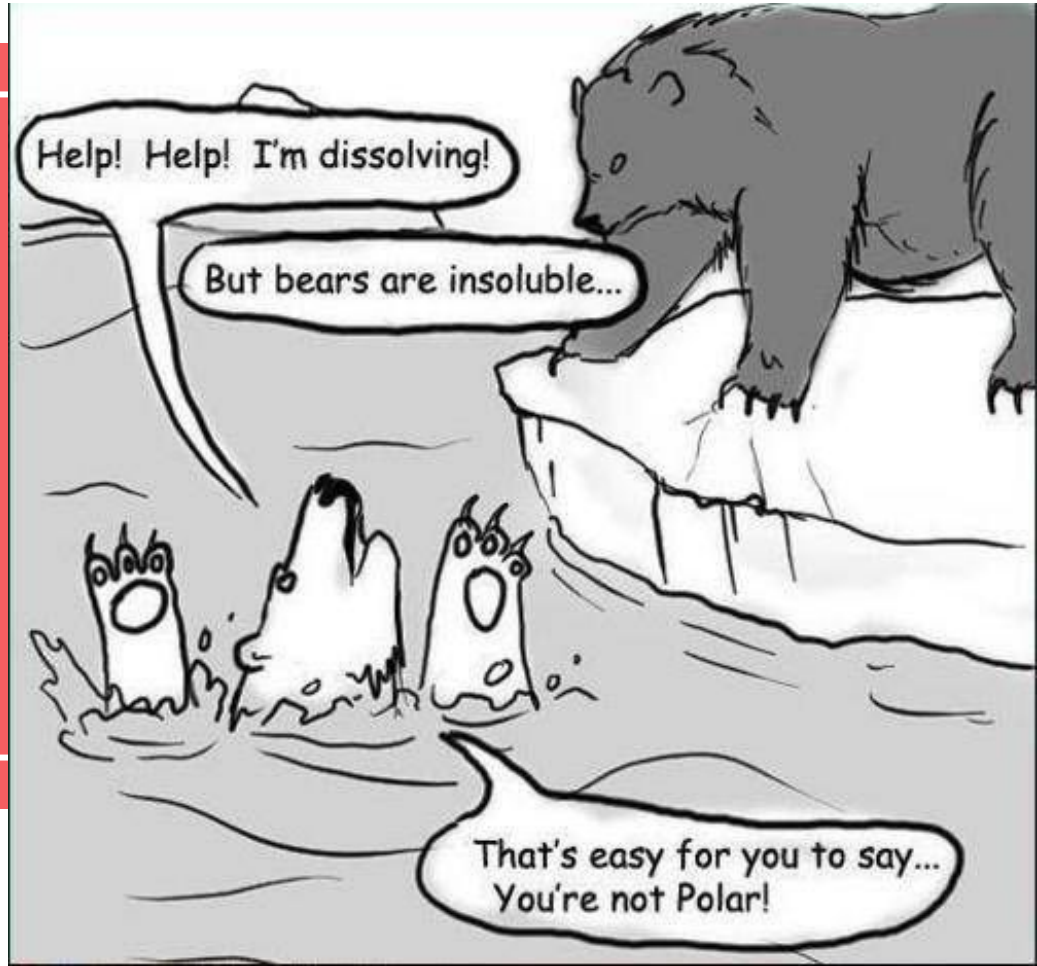

Help! Help! I'm dissolving!
But bears are insoluble...
That's easy for you to say...
You're not Polar!

In a nonpolar covalent bond, electrons gather around

- the atom with the least EN.
- the atom with the greatest EN.
- each atom equally.

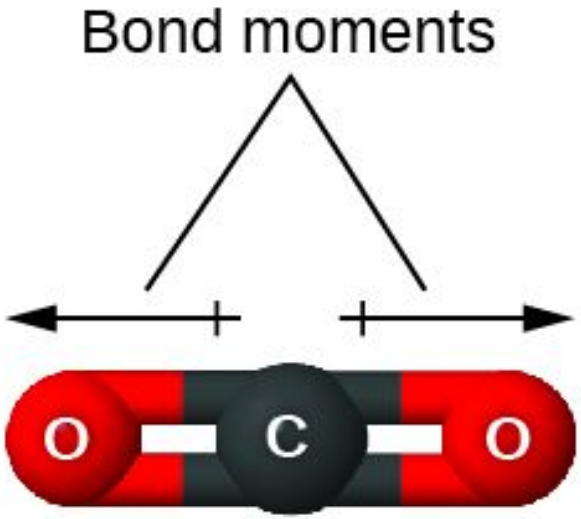
In a polar covalent bond, electrons gather around

- the atom with the greatest EN.
- the atom with the least EN.
- each atom equally.

With your group, read the polarity article

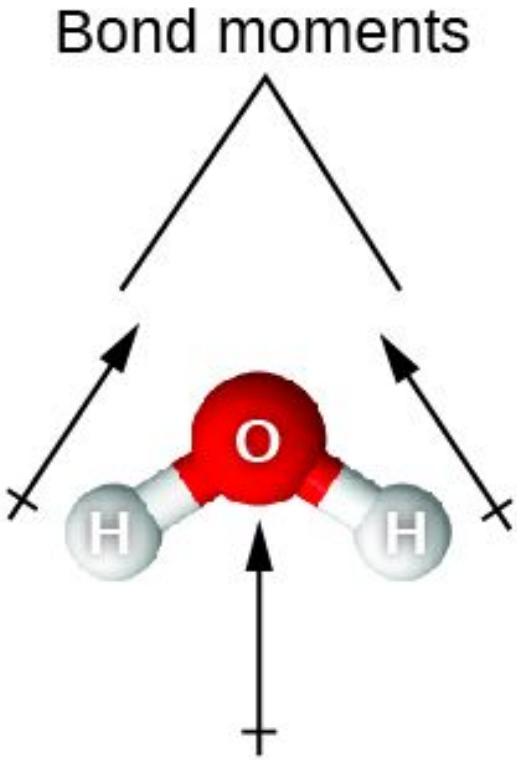
- What is needed for a molecule to be polar?

- Which molecular shapes tend to be symmetric?



Overall dipole moment = 0

(a)

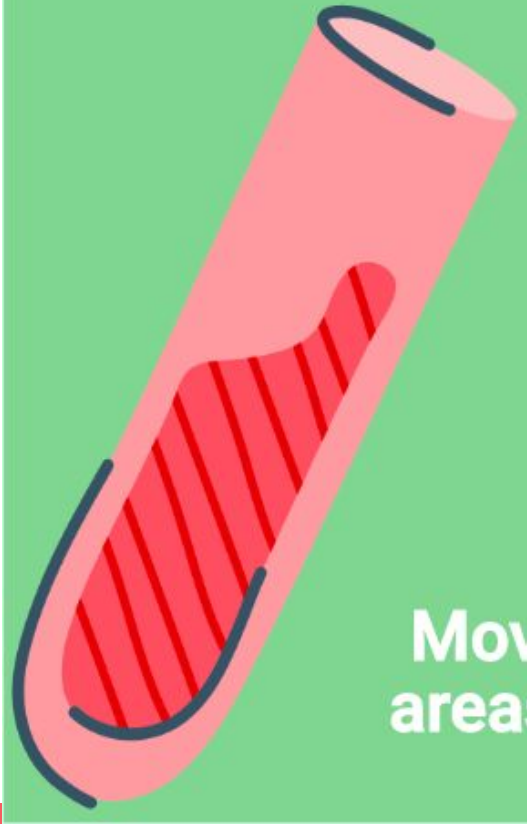


Overall dipole moment

(b)

$+\delta$

$-\delta$



C - N

Move the symbols to the correct areas for the chemical compound above.

On your white board determine if the following molecules are polar or nonpolar

Cl_2CO

NH_3

H_2

HI

IBr

CO_2

BF_3

Work on the practice problems with your group

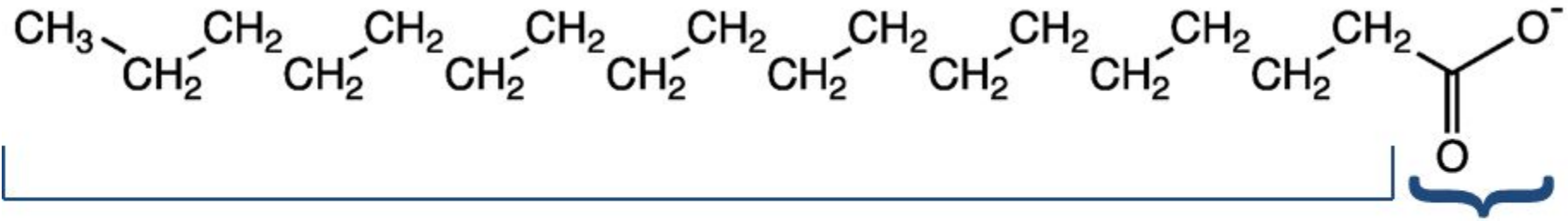
Solubility

- Like dissolves like
- Polar molecules mix with other polar molecules
- Look back at the lab stations, based off the observations are both water and oil polar?

Which of the following molecules would mix with water?

1. CH_4
2. HCl
3. Cl_2
4. N_2

Turn and talk: Based on the observations what do you think the polarity of soap is?



non-polar tail

polar head