

Unit 5

NAME

Class Work

1/13/14

SPARK

## 5.12 Intermolecular Forces

1. Draw the Lewis Dot Structure for water using the correct molecular geometry (e.g. linear, bent, tetrahedral, etc.).
2. Is  $\text{H}_2\text{O}$  a polar or non-polar molecule? If it is polar, label each of the poles positive or negative.
3. How can we bend a stream of water without touching it?

## Objective

SWBAT explain how the polarity of molecules affect how they interact with other molecules

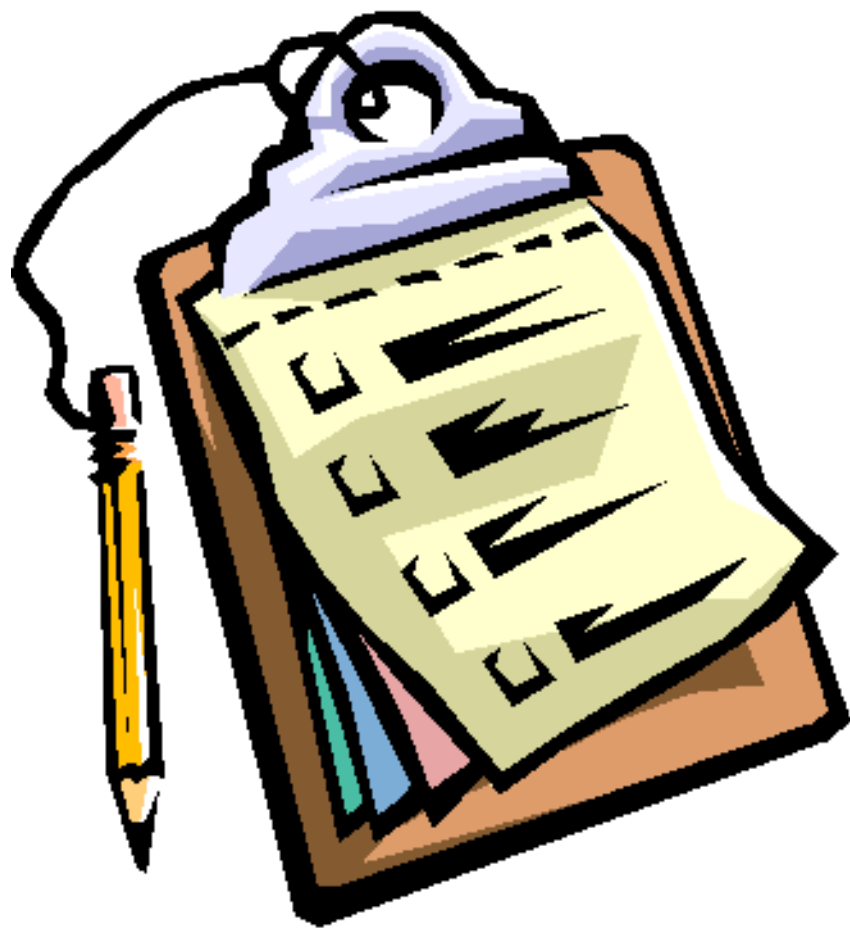
# WATER DEMO!

- Think-Write-Pair-Share

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Agenda:

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



Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Looking back... looking forward

- We've already learned about bonds, also known as INTRAmolecular forces.
- Today we're going to look at INTERmolecular forces which are forces that cause some molecules to stick together!

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

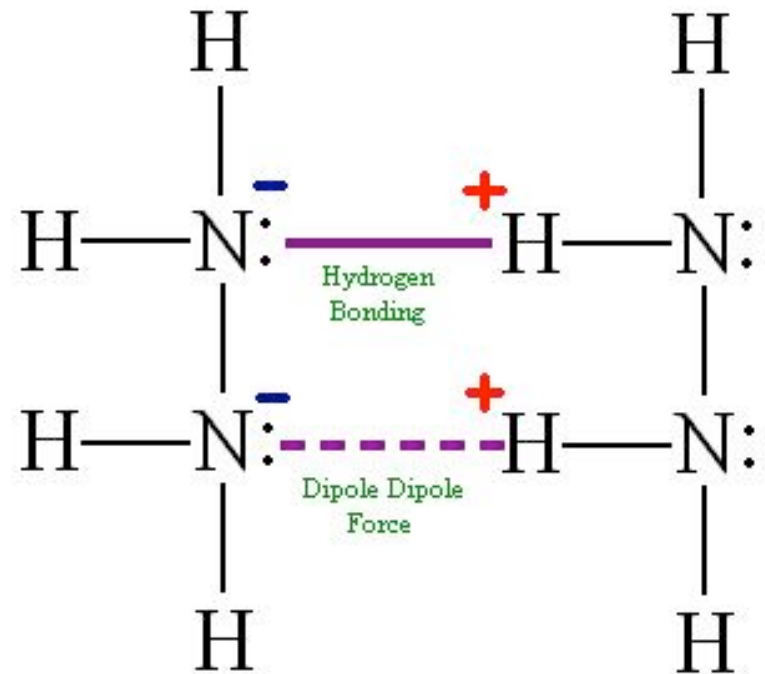
# Forces of Molecules

- Intermolecular forces (IMF) are the forces of attraction that hold molecules together
- Quick check:

Opposite charges will?

(1) Attract

(2) Repel



Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Strength of Forces

- Intermolecular forces are weaker than bonds

Ionic bonds > Covalent bonds > Intermolecular Forces

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

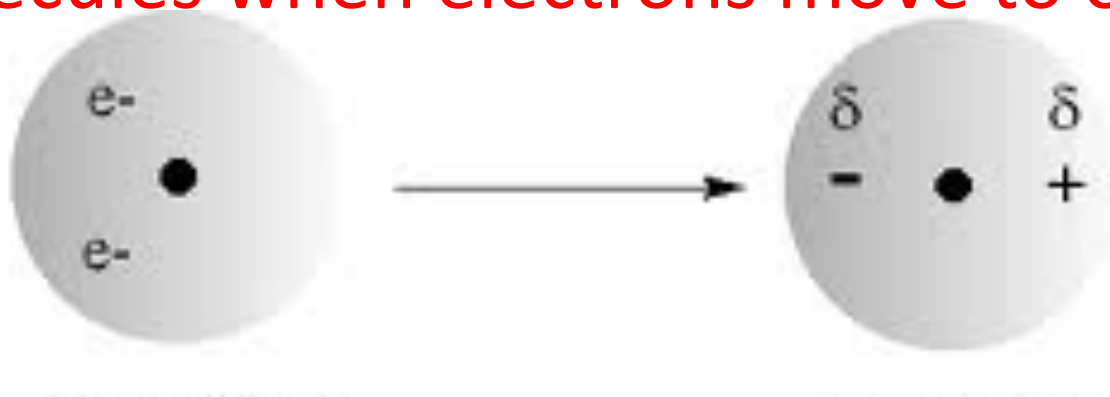
# CFU - Quick Write

- How do we determine if a molecule is polar or nonpolar?

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# London Dispersion Forces\*\* (also known as Van Der Waals)

- Between two nonpolar molecules
- Temporary dipoles are formed in non-polar molecules when electrons move to one side

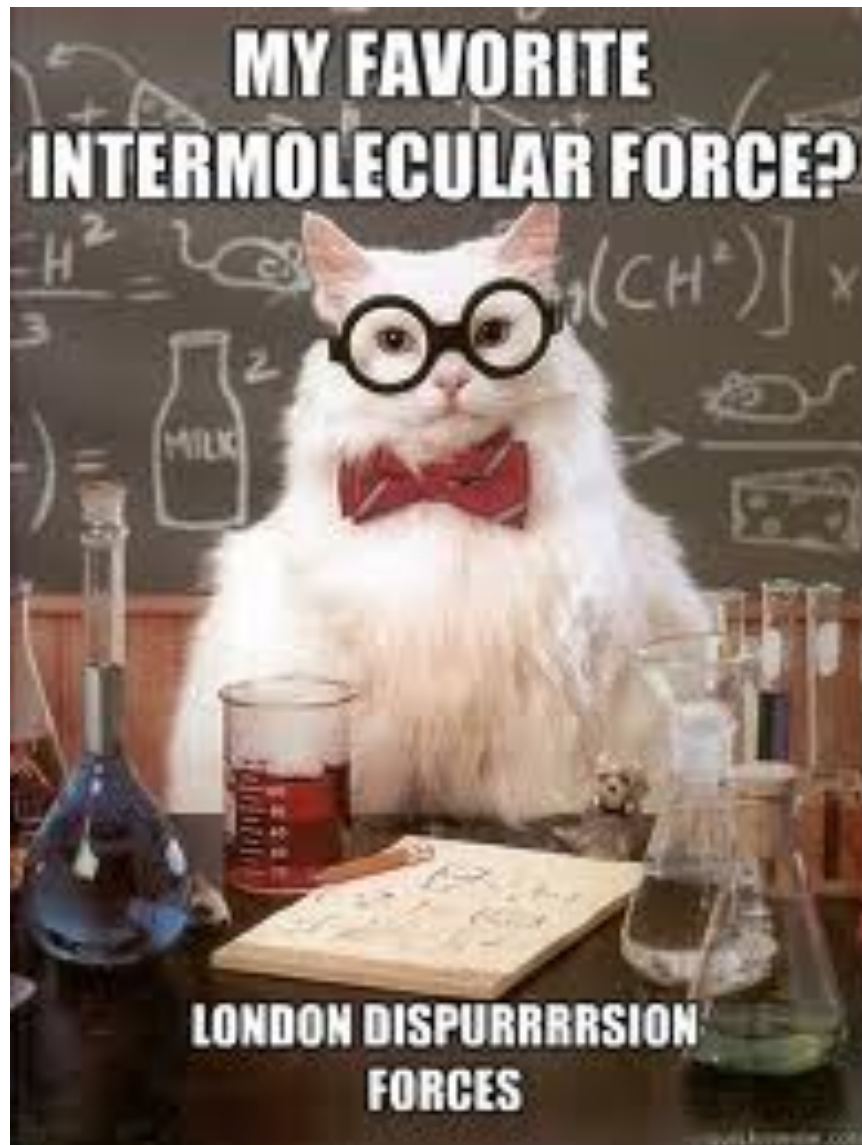


- Example:  $I_2$



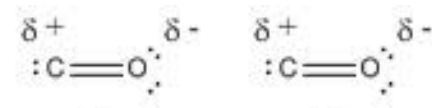
Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules  
London dispersion force ( $I_2$  bond)



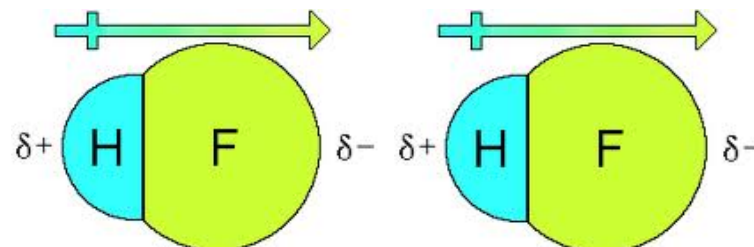
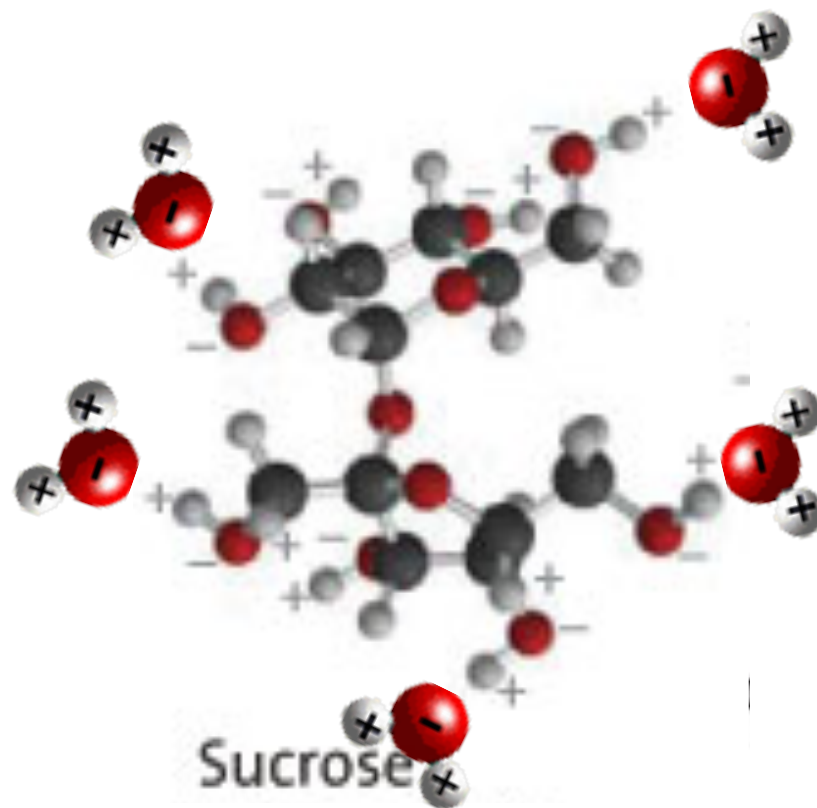


Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Dipole-Dipole Forces\*\*



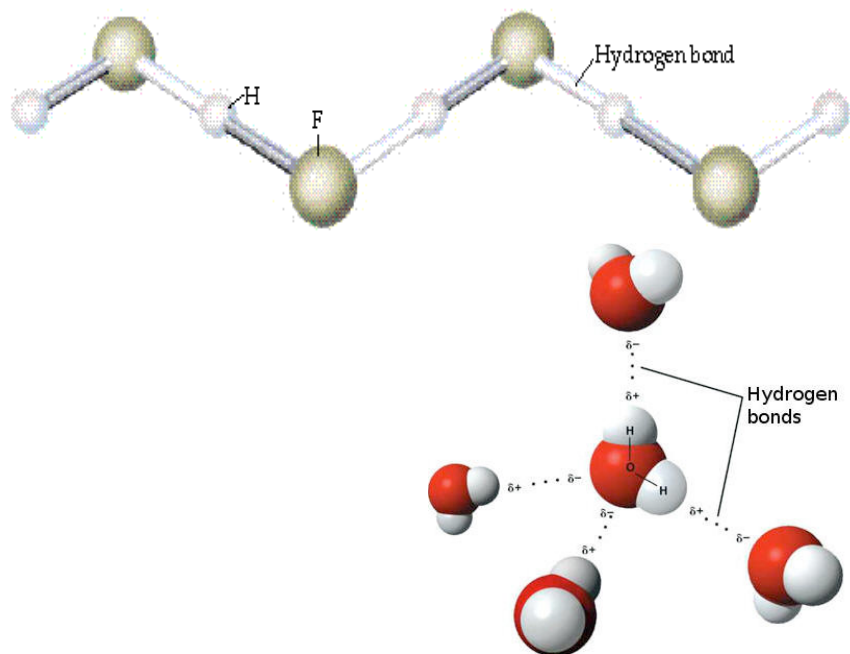
- Between polar molecules
- The partial negative side of one molecule is attracted to the partial positive side of another molecule.



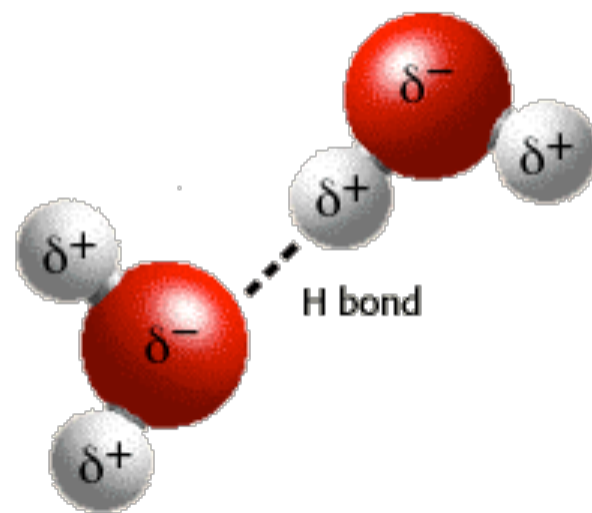
Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Hydrogen Bonding\*\*

- Occurs when H is bonded to FON
- How to remember: **Hydrogen bonding is FON**

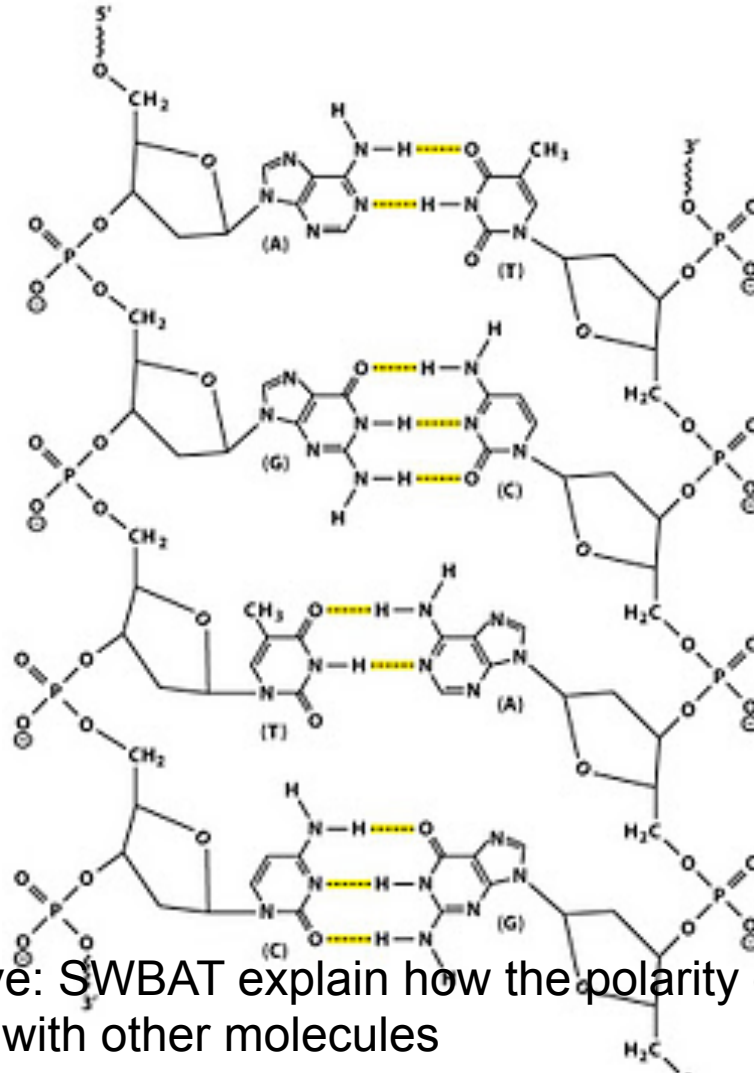


Hydrogen bonding  
between water molecules



Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Did you talk about hydrogen bonding in Living Environment?



Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Quick animation!

- <http://www.wisc-online.com/Objects/ViewObject.aspx?ID=GCH6804>

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Practice

Objective: SWBAT  
explain how the polarity  
of molecules affect how  
they interact with other  
molecules

- Complete the table below:

Molecule	Polar or Nonpolar?	Types of IMFs present
HF		
C <sub>2</sub> H <sub>6</sub>		
HI		
CH <sub>4</sub>		
H <sub>2</sub> O		
O <sub>2</sub>		
PCl <sub>3</sub>		
If you finish the above early, predict which of the three IMF is the strongest.		

# Sample Regents Question!

- In which liquid is hydrogen bonding the most significant force of attraction?
  1. HF
  2. HCl
  3. HBr
  4. HI

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Strength of Intermolecular Forces

- London < Dipole-dipole < Hydrogen bonding

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules



# Why do we care?

- What do you think having stronger forces can do to a molecule??

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Intermolecular Forces - Trends

Stronger Forces =

- Higher mp / bp

Weaker Forces =

- Lower mp / bp

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Regents Question – Stop and Check!

**Data Table**

Component of Natural Gas	Boiling Point at Standard Pressure (°C)
butane	-0.5
ethane	-88.6
methane	-161.6
propane	-42.1

- List the four components of natural gas in order of increasing strength of intermolecular forces.

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Why do oil and water not mix?

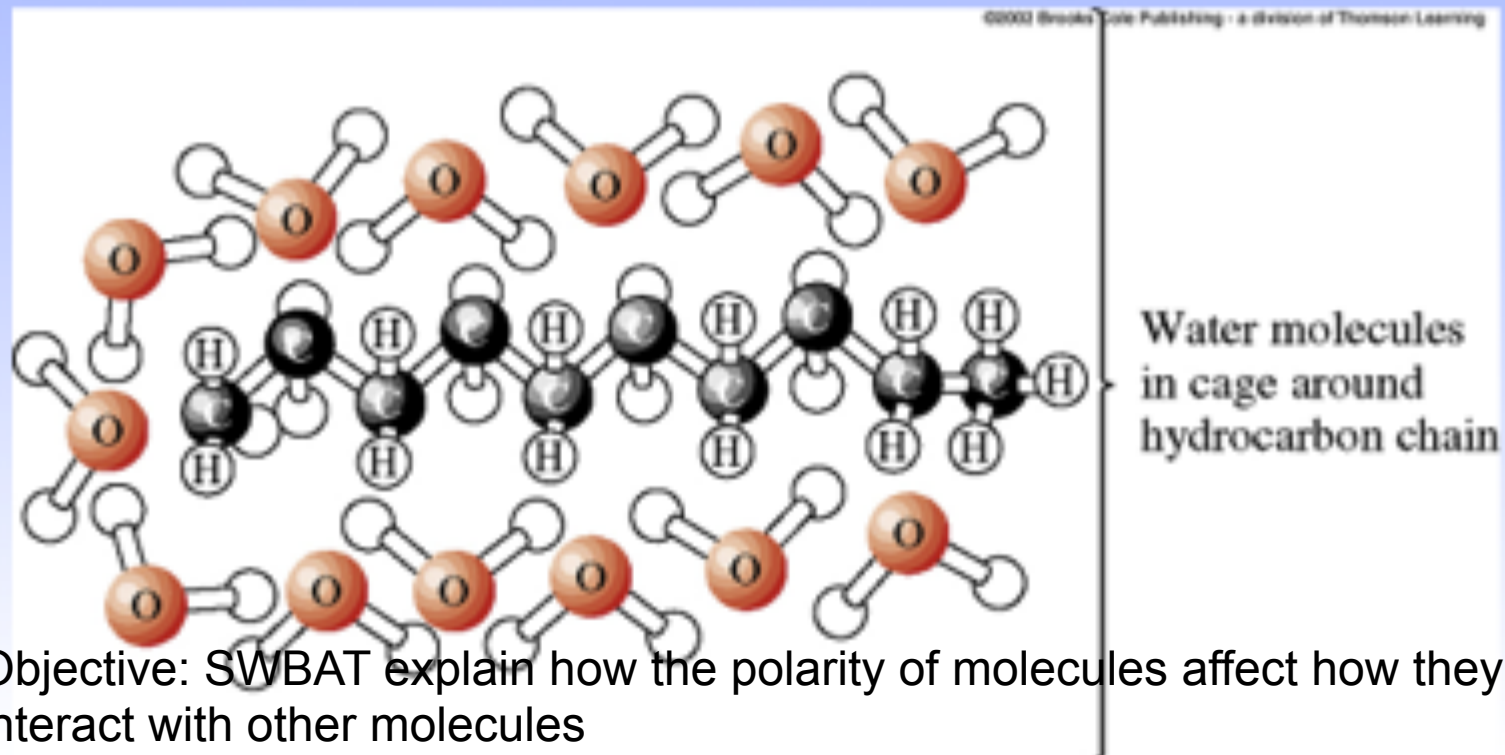
- What type of molecule is oil?

Oil is a hydrocarbon – composed of C and H molecules.

Nonpolar

What type of molecule is water?

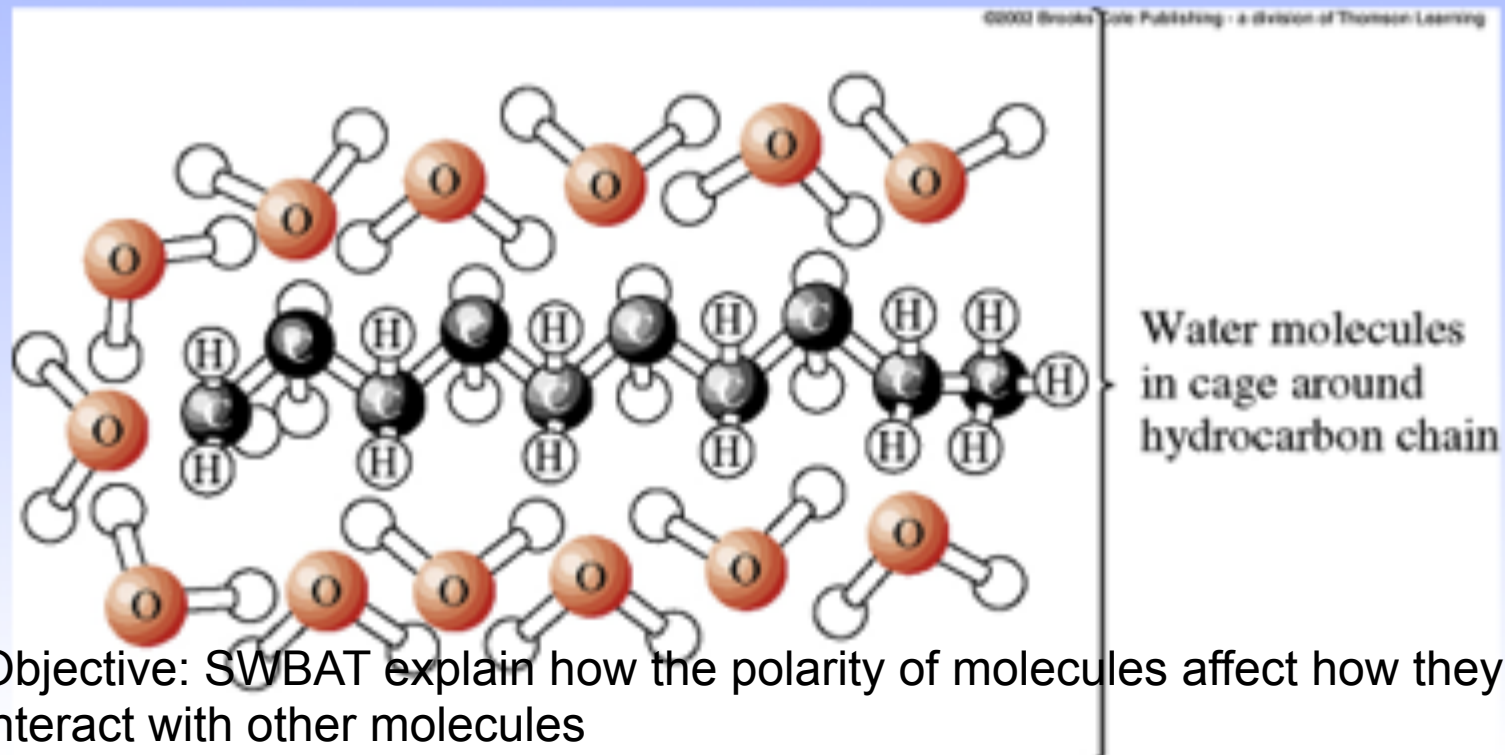
Polar



Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Why do oil and water not mix?

- Water molecules are attracted to each other through hydrogen bonding and push all the oil molecules together.
- Oil molecules will be attracted to each other through London dispersion forces.



# Exit Ticket

- Complete your 5.12 Exit Ticket!

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# Preview

Soap seems to clean almost  
everything!

WHY???????

It's all about CHEMISTRY

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules

# HOMEWORK

Complete page 193, questions #1-5 in your textbook!

Objective: SWBAT explain how the polarity of molecules affect how they interact with other molecules