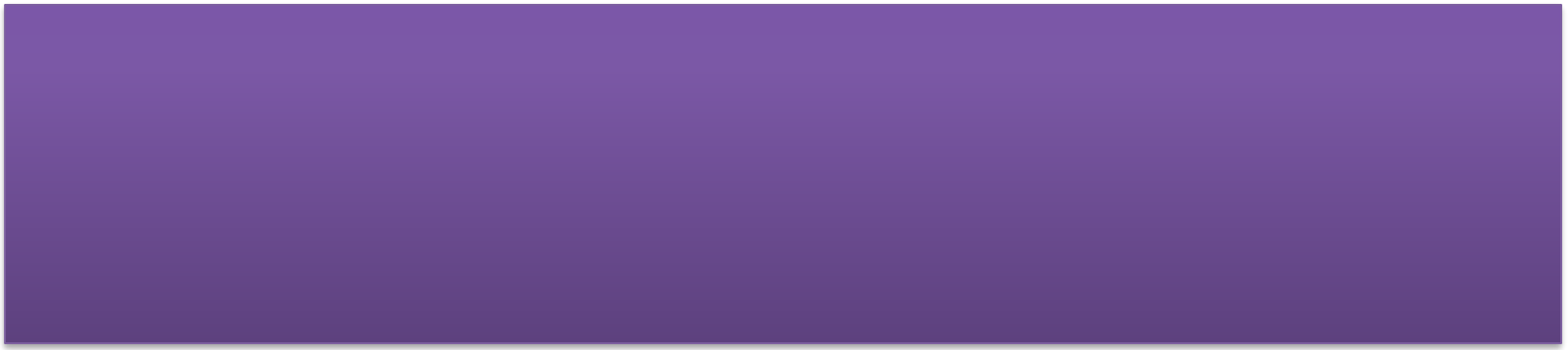
Types of IMFs

Get KCQ and Target set up!

INTER molecular forces (forces between neighboring molecules)



INTER molecular forces (forces between neighboring molecules)

London Dispersion < Dipole-dipole < Hydrogen bonding

WEAKEST

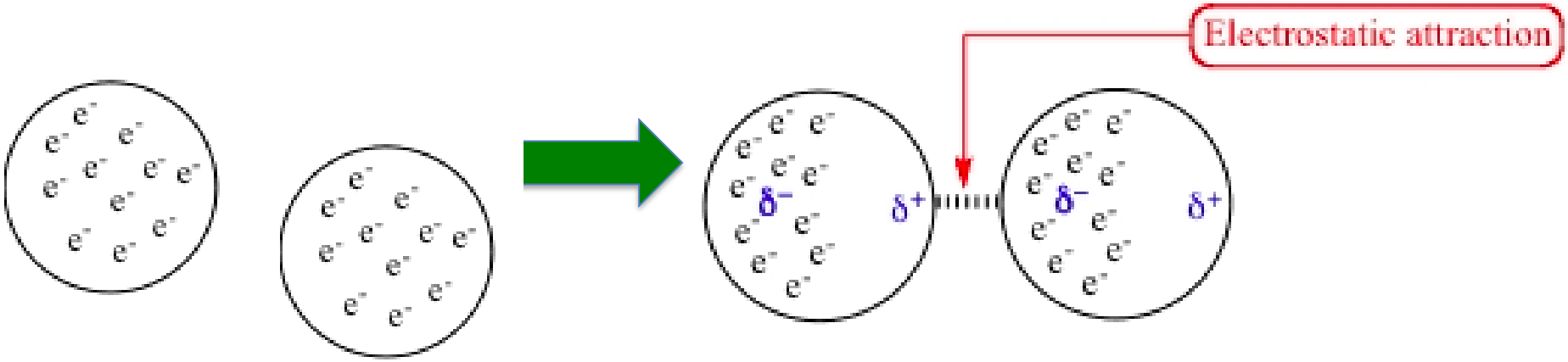
STRONGEST

"Van der Waals Forces" are London Dispersion Forces and Dipole-Dipole Forces added together

London Dispersion Forces

VERY WEAK and TEMPORARY!!!!

Caused by **<u>temporary</u> unequal** electron distribution that makes weak and <u>temporary dipoles. Also called "instantaneous dipole"</u>



Example I_2

London Dispersion Forces Continued…

EVERYTHING HAS LONDON DISPERSION FORCES BECAUSE EVERYTHING HAS ELECTRONS!

Bigger molecules will have more LDFs – more places to get temporary unequal electrons

C_8H_{18} will have more LDFs than C_3H_8

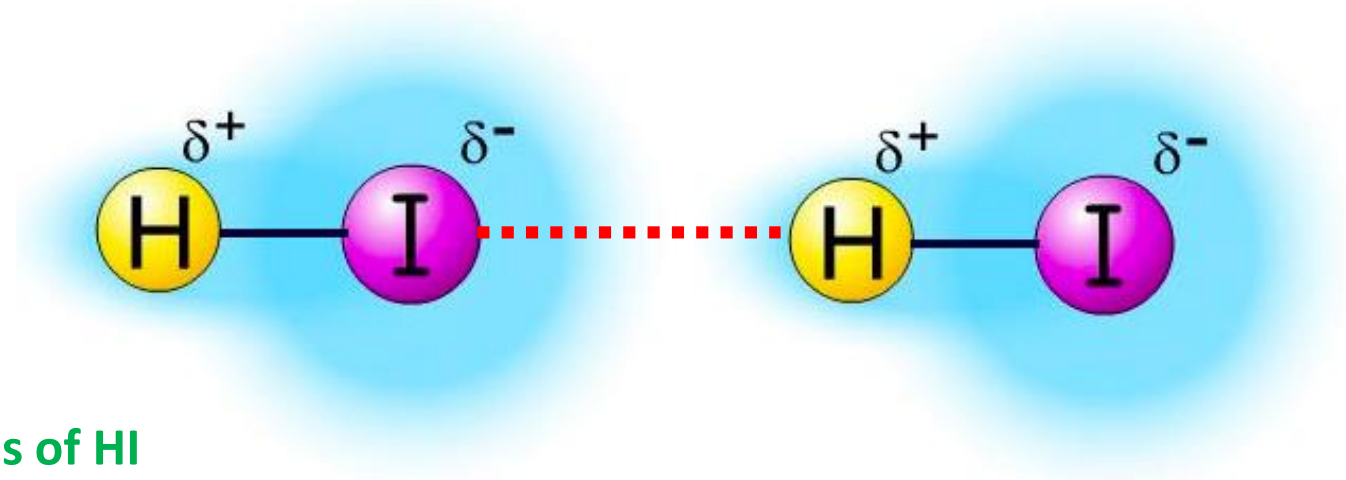
Dipole - Dipole

ONLY OCCURS IN POLAR MOLECULES

Partially negative portion of one polar molecule

attracted to

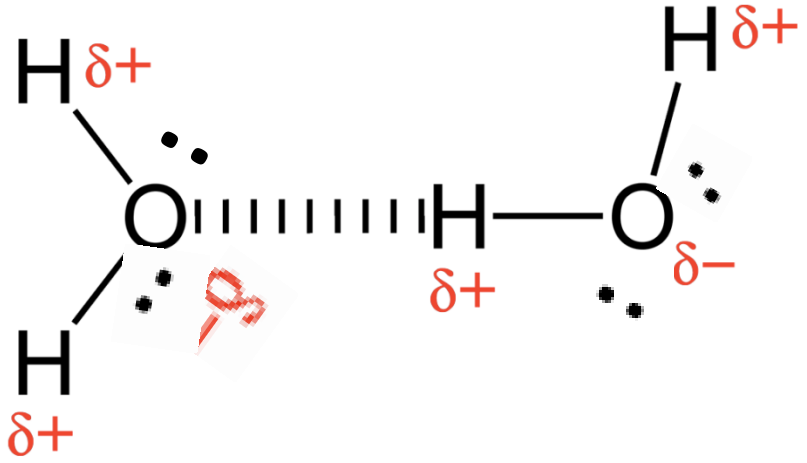
Partially positive portion of the second polar molecule



Example:
2 molecules of HI

Hydrogen Bonding

A TYPE OF DIPOLE-DIPOLE!
(Strongest Kind of IMF!)



Must have:

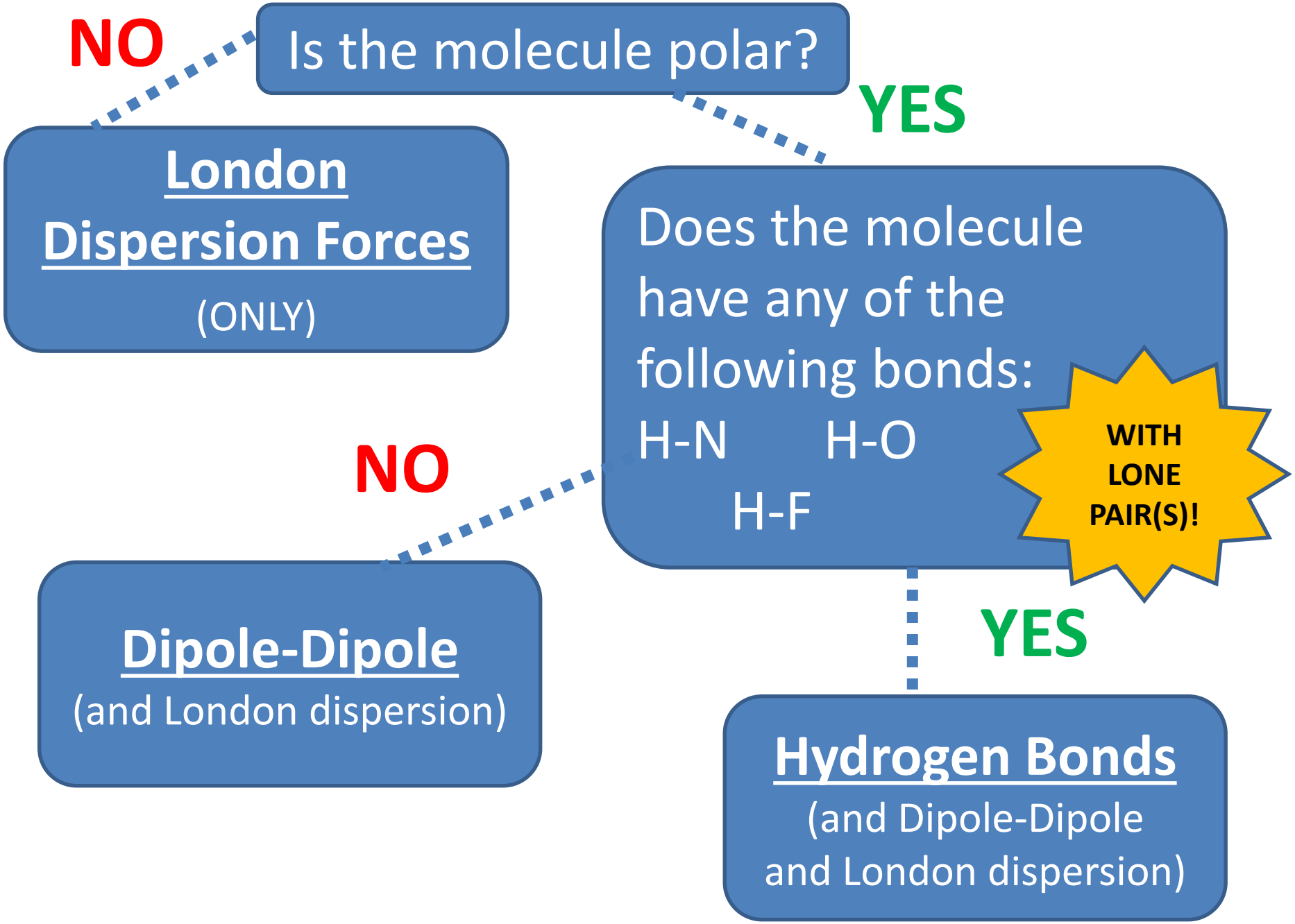
"H-NOF:"

ATTRACTION BETWEEN:

the partially negative part of a *lone pair* on an N, O, or F, atom

Hydrogen end of an O-H, N-H, or F-H bond

− +


Is the molecule polar?
NO
YES
London Dispersion Forces
(ONLY)
Does the molecule have any of the following bonds:
H-N H-O
H-F
WITH LONE PAIR(S)!
NO
YES
Dipole-Dipole
(and London dispersion)
Hydrogen Bonds
(and Dipole-Dipole and London dispersion)

Molecule	Dominant IMF	Written Justification
C_2H_6		
CH_3OH		
PF_3		
NH_3		
H_2CO		
CH_3F		

Molecule	Dominant IMF	Written Justification
C_2H_6		
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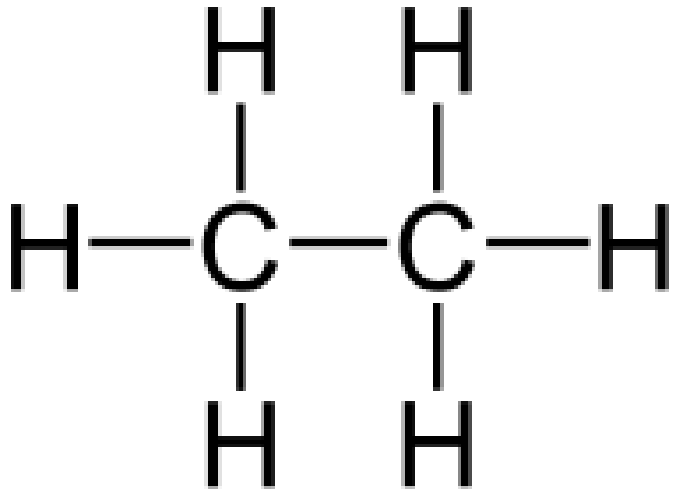
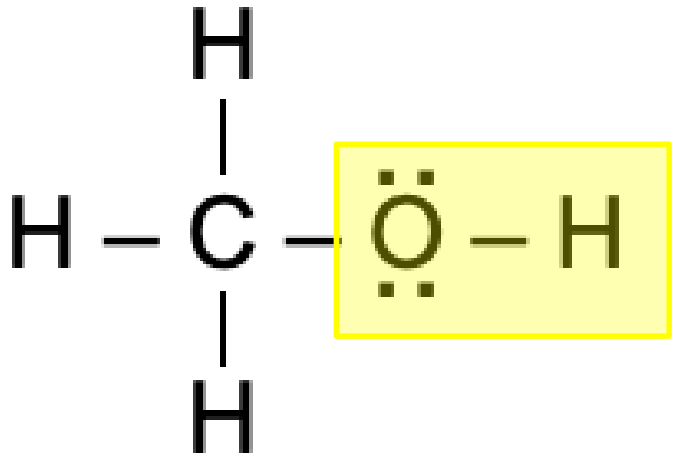


Non-polar

Only option is London Dispersion Forces!

Molecule	Dominant IMF	Written Justification
C_2H_6		
CH_3OH		
PF_3		
NH_3		
H_2CO		
CH_3F		

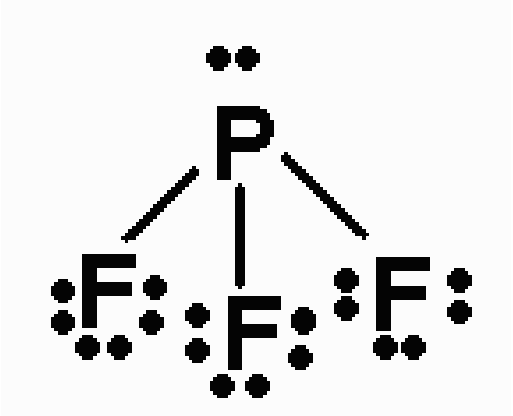


Polar

Has “H-NOF Lone Pair”

So it is an H-Bond

Molecule	Dominant IMF	Written Justification
C_2H_6		
CH_3OH		
PF_3		
NH_3		
H_2CO		
CH_3F		



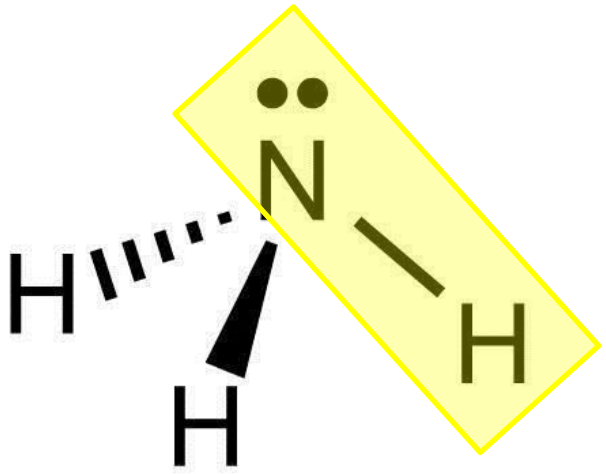
Remember that lone pairs on the center atom bend the molecule!

Polar

NO “H-NOF Lone Pair”

So it is Dipole-Dipole

Molecule	Dominant IMF	Written Justification
C_2H_6		
CH_3OH		
PF_3		
NH_3		
H_2CO		
CH_3F		



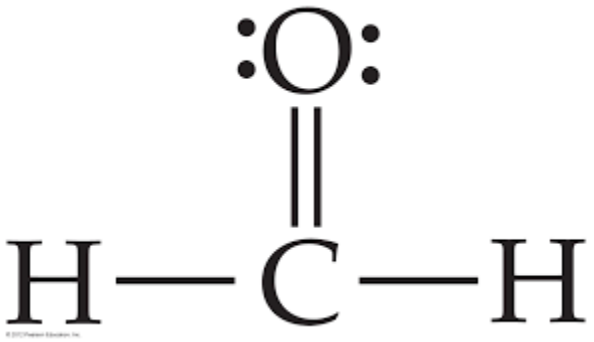
Remember that lone pairs on the center atom bend the molecule!

Polar

Has “H-NOF Lone Pair”

So it is an H-Bond!

Molecule	Dominant IMF	Written Justification
C_2H_6		
CH_3OH		
PF_3		
NH_3		
H_2CO		
CH_3F		



Careful! The formula was "chunked" to try and give you a hint!

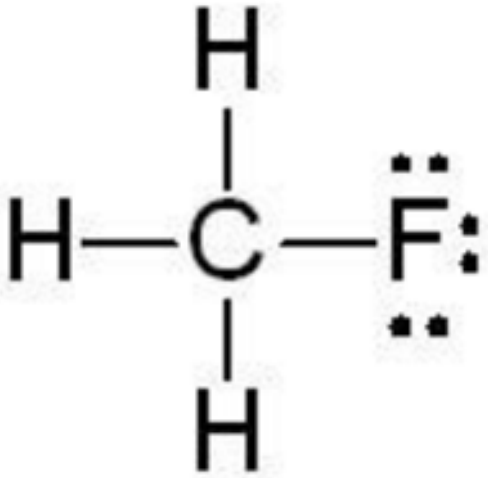
Polar

NO "H-NOF Lone Pair"

The H is not connected to the oxygen!

So it is Dipole-Dipole!

Molecule	Dominant IMF	Written Justification
C_2H_6		
CH_3OH		
PF_3		
NH_3		
H_2CO		
CH_3F		



Polar

NO “H-NOF Lone Pair”

The F is not connected to the oxygen!

So it is Dipole-Dipole!

Crash Course – Liquids

https://youtu.be/BqQJPCdmIp8

YouTube Link to Presentation

https://youtu.be/NzUSb6QFaBk