

Higher: Bonding and Structure

Bonding Continuum

Covalent bonding

Covalent bonding ...

Diagram:

Pure covalent bonding

Covalent bonding in which there is _____ difference in
_____ between the atoms in the bond. Electrons are
shared _____ between the atoms.

Diagram:

Polar covalent bonding

Covalent bonding in which there is a _____ difference in _____ between the atoms in the bond. Electrons are found _____ to the _____ atom in the bond.

Diagram:

Ionic bonding

Electrostatic attraction between _____ ions. The difference in _____ is so _____ that electrons are fully _____ from the _____ atom to the _____ atom.

	Ionic bonding	Polar covalent	Pure covalent bond
Elements			
Electronegativity difference			
Electron location			



Which of these is most ionic?

A - CaCl_2

B - CaBr_2

C - CaF_2

Polar covalent bonds vs polar covalent molecules

A molecule can have polar covalent bonds but this does not necessarily mean the molecule itself is polar.

Polar molecules:

- E.g.
-

Non-polar molecules:

- E.g.

OR

- E.g.
-



Sort these molecules into polar and non-polar

- Silicon tetrafluoride
- Phosphorus chloride
- Sulfur hydride
- Carbon monoxide

Intermolecular Forces

Intramolecular forces:

Intermolecular forces:

There are three types of intermolecular forces, also called _____
_____ forces:

-
-
-

London dispersion forces

London dispersion forces ...

Diagram:

Permanent dipole-permanent dipole interactions

Permanent dipole-permanent dipole interactions ...

Diagram:

Hydrogen bonding

Hydrogen bonding ...

Diagram:

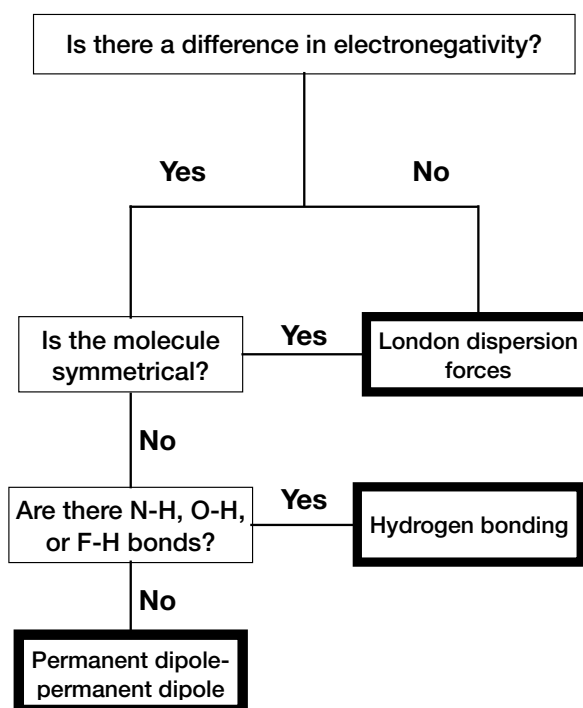


Strength of intermolecular forces:

_____ > _____ > _____

Which type of intermolecular force is it?

- A) *Hydrogen chloride*
- B) *Carbon dioxide*
- C) *Carbon monoxide*
- D) *Silicon tetrachloride*
- E) *Nitrogen hydride*
- F) *Ethanol*



Properties due to bonding

Properties of molecular substances can be explained and predicted by looking at the intermolecular forces present. When comparing different substances it is important to compare substances with similar number of electrons to eliminate the effect of London Dispersion Forces (unless this is the only force present).

Melting and boiling points

When a substance is heated to melt or boil ...

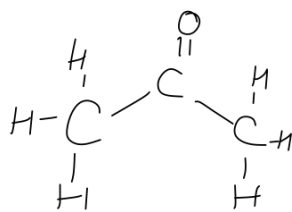
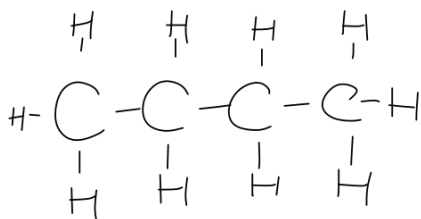
London dispersion forces and the Noble gases:

Noble gas	Melting point
Helium	
Neon	
Argon	
Krypton	

Hydrogen bonding and anomalies:

Group 6 hydride	Boiling point
Oxygen	
Sulfur	
Selenium	
Tellurium	

Comparing compounds (boiling points):



Butane =

propanone =



Explain why iodine monochloride has a higher melting point than bromine.

Viscosity

Viscosity is ...



A marble is dropped into a tube of ethanol and another is dropped into a tube of propanone. Explain what would happen.

Solubility/miscibility

Soluble:

Insoluble:

Miscibility:

Substances that are _____ (_____, _____
_____) are soluble in _____ solvents such as

Substances that are _____ are soluble in
_____ solvents such as _____



Explain why carbon tetrachloride is less soluble in water than carbon trichloride.