

Molecular Forces

Intramolecular Forces

- * Intramolecular forces are those forces between the atoms found inside a single molecule.

Electronegativity

- * Electronegativity: describes the relative ability of an atom to attract electrons
- * We can determine the nature of a bond based on EN (electronegativity difference).

Using EN to determine bond type



Example

*NBr₃

Examples

* Determine the bond types of:

HCl

CrO

Br₂

H₂O

Covalent bonds

- * Covalent bonds are characterized by the sharing of electrons between two or more atoms
- * Between nonmetals and two atoms of the same element, or elements close to each other on the periodic table
- * Two atoms with similar electronegativity will not exchange an electron from their outermost shell

Ionic Compounds

- * Ionic bonding occurs when there is a large difference in electronegativity
- * This leads to the loss of an electron from the less electronegative atom and the gain of that electron by the more electronegative atom, resulting in two ions.
- * These oppositely charged ions feel an attraction to each other, and this electrostatic attraction constitutes an ionic bond.
- * Ionic bonding occurs between a nonmetal and a metal

Intermolecular Forces

- * Intermolecular forces are those forces between molecules. These forces determine the boiling point of substances and state.

Intermolecular Forces

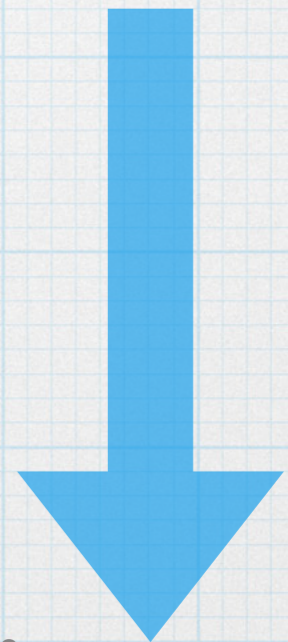
* Three types of force can operate between molecular/covalent molecules:

* Dispersion Forces or London Forces

* Dipole-dipole interactions

* Hydrogen bonds

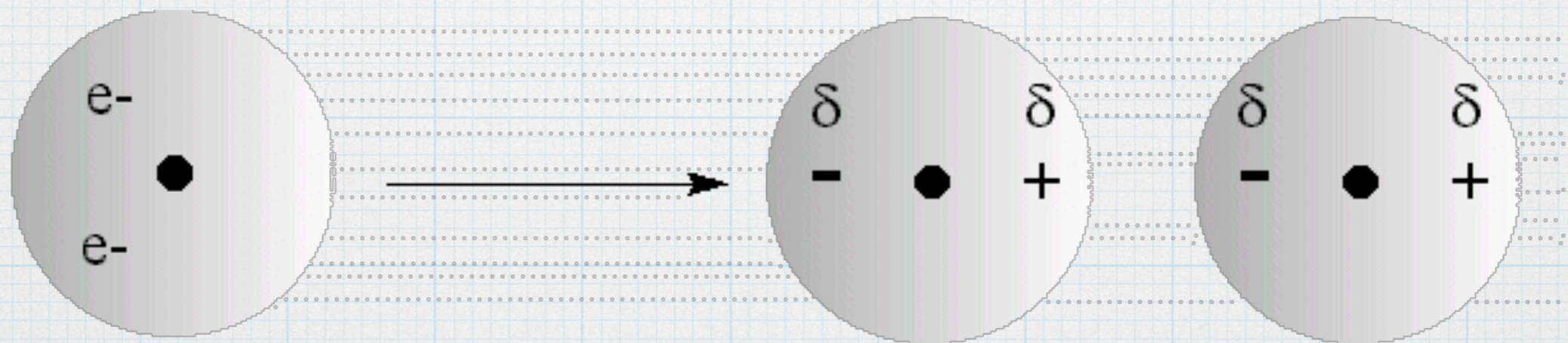
Weakest



Strongest

Dispersion Forces/ London Forces

- * Very weak forces of attraction between molecules resulting from momentary dipoles occurring due to uneven electron distributions



Instantaneous
uneven distribution
of electrons in He atom

Instantaneous
dipole

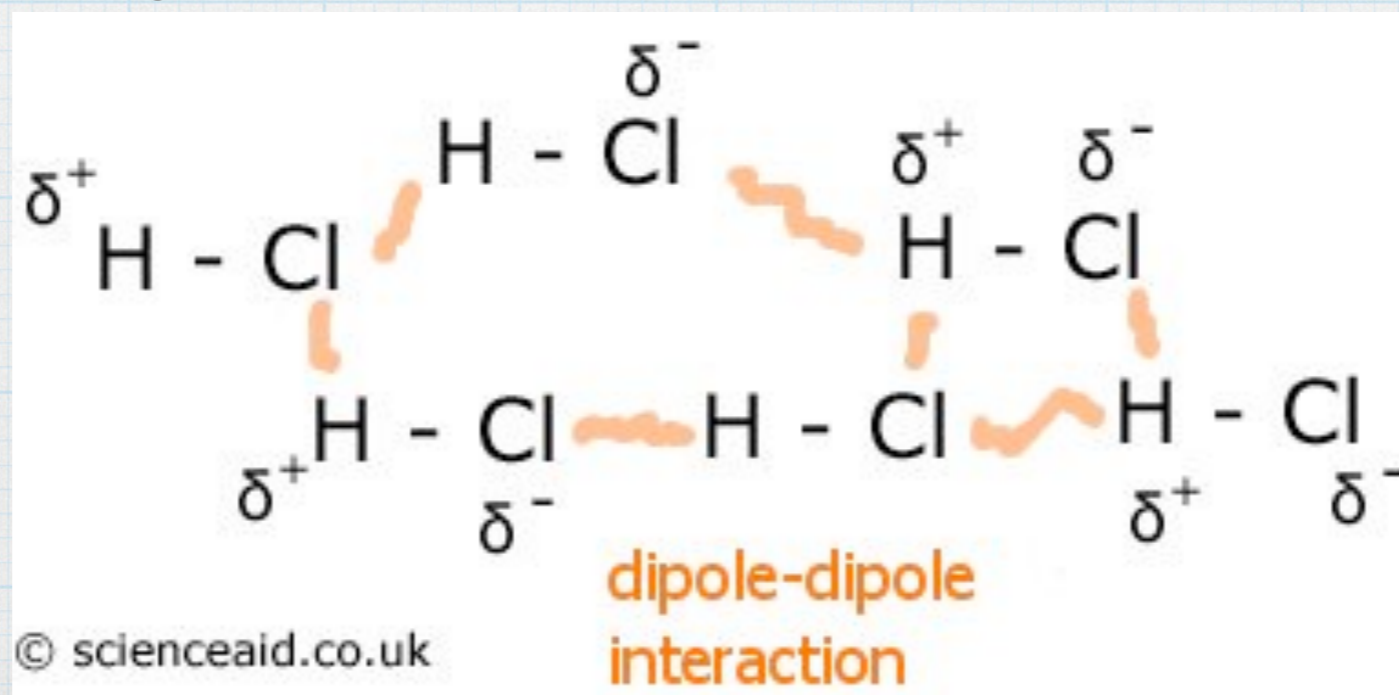
Induced dipole
on neighboring
He atom.
Resultant attractive
force

Dispersion Forces/ London Forces

- * The more electrons that are present in the molecule, the stronger the dispersion forces will be.
- * Dispersion forces are the only type of intermolecular force operating between non-polar molecules

Dipole-dipole Interactions

- * The partial positive charge on one molecule attracted to the partial negative charge on another molecule.
- * Occur between molecules that have permanent net dipoles (polar molecules)



Hydrogen bonds

- * Occur between molecules that have a permanent net dipole resulting from hydrogen being covalently bonded to either fluorine, oxygen or nitrogen.

