

PHYSICAL BONDING

A T A G L A N C E

- *PHYSICAL BONDS ARE WEAK*
- *LITTLE ENERGY IS NEEDED TO OVERCOME THEM*
- *BASIC ATTRACTION IS THE VAN DER WAALS' FORCE WHICH MAY BE AUGMENTED BY ONE OF THE OTHERS*

Electronegativity

The ability of an atom to attract the pair of electrons in a covalent bond to itself.

Pauling Scale

- A scale for measuring electronegativity
- Values increase across periods
- Values decrease down groups
- Fluorine has the highest value

H									
	Li	Be	B	C	N	O	F		
	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
	Na	Mg	Al	Si	P	S	Cl		
	0.9	1.2	1.5	1.8	2.1	2.5	3.0		
	K						Br		
							2.8		

Polar bond

- **Different atoms = different electronegativities**
- One atom will pull the electrons closer to its end
- It will be slightly more negative than average, δ^-
- Other end is less negative (more positive) δ^+
- A dipole is induced and the bond is said to be polar
- The greater the difference in electronegativity, the greater the polarity of the bond.

VAN DER WAALS' FORCES

- WEAK INTERMOLECULAR ATTRACTIONS BETWEEN MOLECULES
- BIGGER SURFACE AREA MOLECULES HAVE GREATER ATTRACTIONS
- A GREATER ATTRACTION = MORE ENERGY TO SEPARATE = HIGHER BOILING POINT

e.g. CH₄ -161°C C₂H₆ -88°C C₃H₈ -42°C

DIPOLE-DIPOLE INTERACTION

- AN ADDITIONAL INTERMOLECULAR FORCE OF ATTRACTION (ACTS ON TOP OF THE VAN DER WAALS' FORCES)
- OCCURS WHEN MOLECULES HAVE POLAR BONDS
- DIFFERENCE IN ELECTRONEGATIVITY CREATES A DIPOLE
- DIPOLES ATTRACT EACH OTHER
- MORE ENERGY NEEDED TO SEPARATE MOLECULES
- GET HIGHER BOILING POINTS FOR A GIVEN MOLECULAR MASS

HYDROGEN BONDING

- A SPECIAL (STRONGER) FORM OF DIPOLE-DIPOLE INTERACTION
- ONLY OCCURS BETWEEN H-F H-O and H-N bonds
- **F, O, N** - **3 MOST ELECTRONEGATIVE ELEMENTS** and are **SMALL**
- **HYDROGEN IS A SMALL ATOM**
 - BOND BETWEEN H and F, N or O is VERY POLAR
 - SMALL ATOMS MEAN HIGH CHARGE DENSITY FOR δ^+ and δ^-
- PRODUCES EVEN GREATER FORCES OF ATTRACTION
- MOLECULES HAVE EVEN HIGHER BOILING POINTS FOR THEIR MASS

e.g WATER H₂O and HYDROGEN FLUORIDE HF