Chemical Energetics

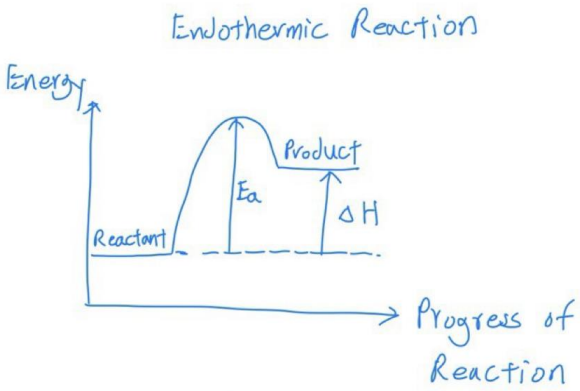
Endothermic	Exothermic
Absorb Thermal Heat	Release Thermal Heat
Lowers Temperature	Increases Temperature
Think about Bond Breaking	Think about Bond Forming
Examples: Melting, Boiling, Dissolving, Thermal Decomposition, Photosynthesis	Examples: Condensation, Freezing, Combustion, Neutralisation

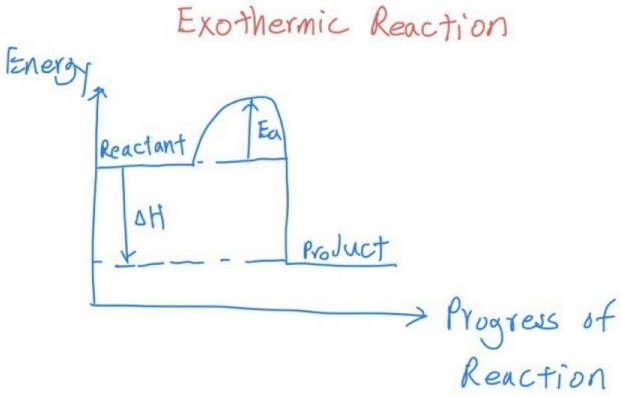
Bond Energy – Amount of energy absorbed to break 1 mole of a chemical bond

Activation Energy (E_a) – Minimum amount of energy that colliding particles must possess to react with each other

H: Enthalpy - the total chemical energy of a substance

ΔH: **Enthalpy Change** - Energy Change -> kJ mol^{-1} or J mol^{-1}

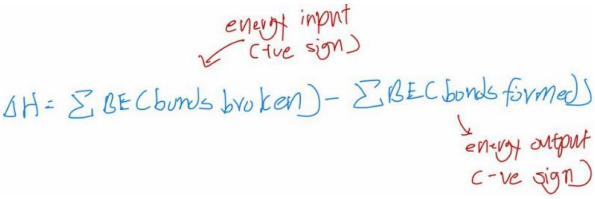




Relationship of bond energy to ΔH

Bond breaking -> absorbs energy -> endothermic

Bond forming -> releases energy -> exothermic



Steps to calculate ΔH with Bond Energy

1. Draw the FULL Structural Formula of all species in the Chemical Equation – see all the bonds. E.g. CO_2, H_2O
2. Calculate the Total energy of bonds broken.
3. Calculate the Total energy of bonds formed.
4. Calculate ΔH

Example Question:

The complete combustion of hydrogen is represented by the following equation.

$2H_2 + O_2 \rightarrow 2H_2O$

Use the bond energies given in the table below to calculate the energy released on burning 1 mole of hydrogen.

bond	bond energy / kJ mol^{-1}
H–H	436
O=O	496
O–H	460