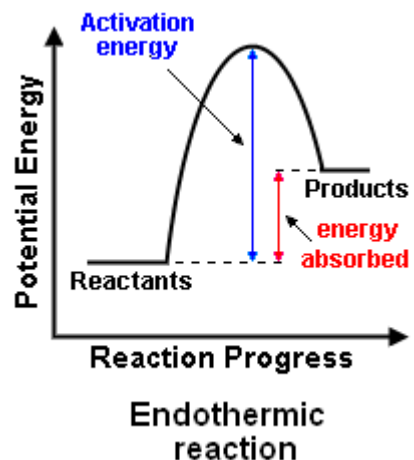


C5 Knowledge Organiser – 4.5.1 – Energy changes



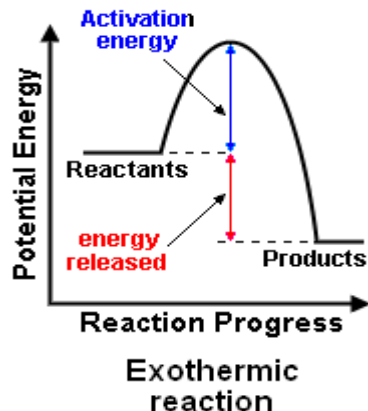
Endothermic reactions 1

- Takes in energy from the surroundings
- **Temperature of the surroundings decreases**
- Examples:
- Thermal decomposition
- Citric acid + Sodium hydrogencarbonate
- Sports injury packs



Exothermic reactions 2

- Transfers energy to the surroundings
- **Temperature of the surroundings increases**
- Examples:
- Combustion
- Oxidation reactions
- Neutralisation reactions
- Hand warmers

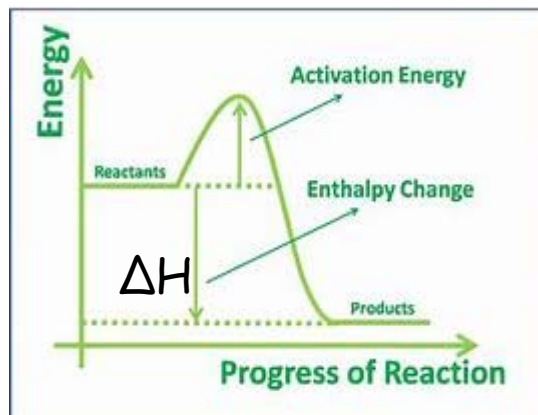


Reaction profiles 3

Activation energy – The minimum amount of energy that particles require to react

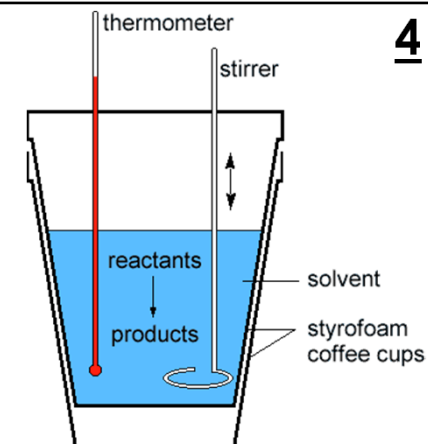
ΔH – Overall energy change

+ ΔH = **Endothermic**
 - ΔH = **Exothermic**



Required practical 4

- Styrofoam cup reduces energy transfer
- **Independent – Reactants**
- **Dependent – Temperature change**
- **Improvements** – add a lid to reduce energy loss
- Add a stirrer to ensure reactants fully mixed



Bond enthalpy calculations (HT only) 5

Example: Calculate the enthalpy change when water is formed from H_2 and O_2 .

STEP 1 Bonds Broken

$$2 \times (H-H) = 2 \times 436 = 872$$

$$1 \times (O=O) = 498$$

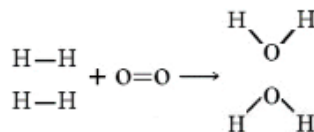
$$\text{Total} = 872 + 498 = 1370$$

STEP 2 Bonds Made

$$4 \times (O-H) = 4 \times 464 = 1856$$

STEP 3

$$\begin{aligned} \text{Enthalpy change} &= \text{bonds broken} - \text{bonds made} \\ &= 1370 - 1856 = -486 \end{aligned}$$



Bond	Bond Enthalpy
H-H	436
H-O	464
O=O	498

Chemical and Fuel cells (Chemistry only) 6

