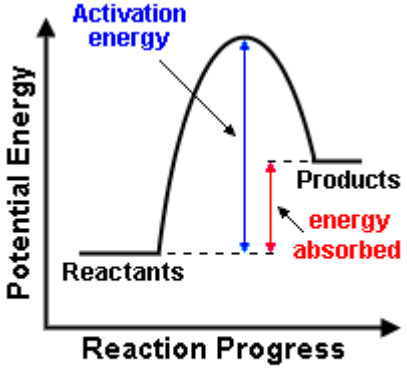
C4 Knowledge Organiser – 5.4.1-3 – Chemical Changes

Endothermic reactions 1

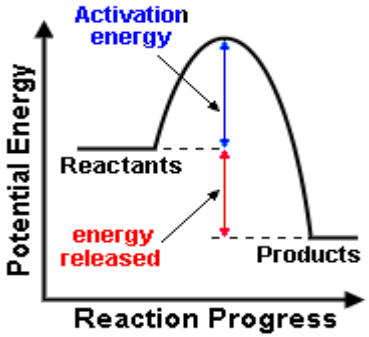
- Takes in energy from the surroundings
- **Temperature of the surroundings decreases**
- Examples:
- Thermal decomposition
- Citric acid + Sodium hydrogencarbonate
- Sports injury packs



Endothermic reaction

Exothermic reactions 2

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



Exothermic reaction

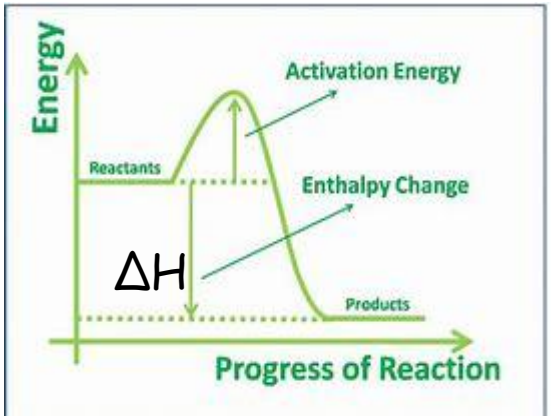
Reaction profiles 3

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

ΔH – Overall energy change

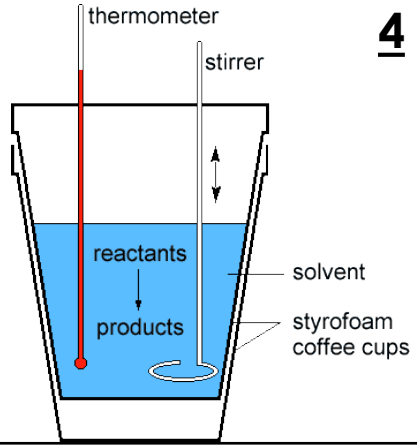
+ ΔH = Endothermic

- ΔH = Exothermic



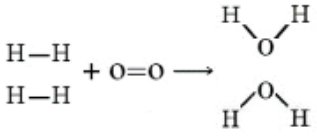
Required practical 4

- 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 x (H-H) = 2 x 436 = 872

1 x (O=O) = 498

Total = 872 + 498 = 1370

STEP 2 Bonds Made

4 x (O-H) = 4 x 464 = 1856

STEP 3

Enthalpy change = bonds broken – bonds made

= 1370 – 1856 = -486

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

Chemical and Fuel cells (Chemistry only) 6