Exothermic and Endothermic Reactions Bond Energies

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If the products of a reaction store more energy than the original reactants then overall energy has been taken in.
If the products store less then energy was transferred to the surroundings

Exothermic

- energy us transferred to the surroundings - we see a rise in temperature
- Burning (or combustion as we call it)
- Neutralisation reactions
- Many oxidation reactions - eg sodium on water

Endothermic

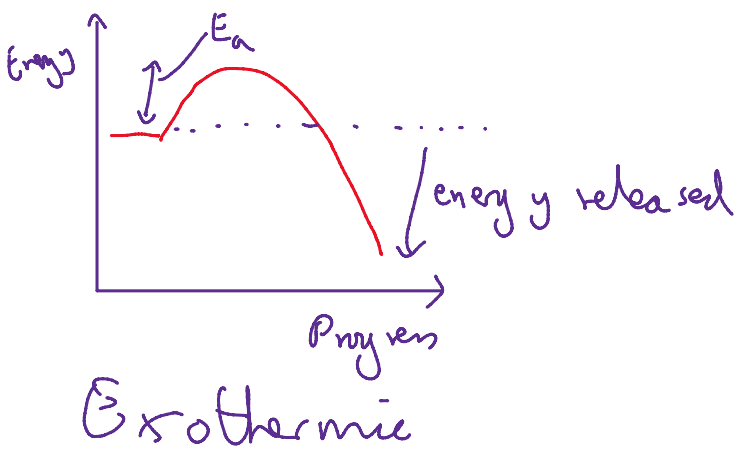
- Energy is taken in - a fall in temperature
- Much less common
- Citric acid and sodium hydroxide
- Thermal decomposition - heat something, it breaks down

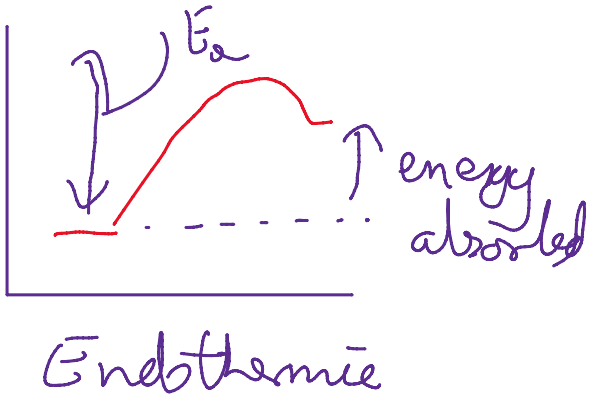
$$CaCO_3 (+ heat) \rightarrow CO_2 + CaO$$

You can easily measure how much energy has gone in/given out by measuring temperature before and after the reaction. Heat loss to the surroundings is a problem, so insulate. You could look at the effect of concentration of acid in an acid + alkali neutralisation reaction.

Reaction Profiles

Show relative energies of reactants and products. The difference in height shows the energy given (per mole) in the reaction.
The initial rise is the 'activation energy' - the energy needed to start the reaction. Ea
The Ea is the minimum enbergy the reactants need to collide with each other and react





Bond Energies

Old bonds are broken, new ones made

Breaking bonds needs energy - its endothermic - energy taken in
Making bonds releases energy - its exothermic - energy released

Bond energies are given per mol

eg H-H : 436 kJ/mol Cl-Cl : 242 kJ/mol

HCl 431 kJ/mol

$H_2 + Cl_2 \rightarrow 2\,HCl$

436 242 2 × 431

678 → 862

$\therefore \Delta G = -184\ kJ/mol$