ENERGY CHANGE

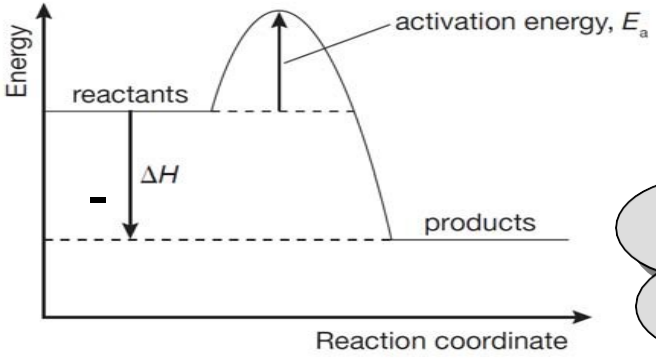
Enthalpy – symbol H – means "heat energy".
ΔH = change in enthalpy
ΔH = H(products) – H(reactants)
Overall ΔH depends on the size of each of these.

EXOTHERMIC REACTIONS

- **Give out heat**
- **Have a -ΔH**

E.g. combustion, neutralisation, Mg + hydrochloric acid, respiration & physical (state) changes e.g. G → L & L → S

If the reaction is done in a test tube it feels hot.



ENTHALPY & MOLES

$C(s) + O_2(s) \rightarrow CO_2(s)$: $\Delta H = -393\ kJ\ mol^{-1}$

This means 393 kJ of energy are released when 1 mol of solid C is burnt in I mol of O_2 gas to form 1 mol of carbon dioxide gas.

If 2 mol of C were burnt the enthalpy change would be 2 x -393 = -786 kJ **ΔH = -786 kJ** OR
The energy released would be 786 kJ

ENDOTHERMIC REACTIONS

- **Absorb heat**
- **Have a +ΔH**

E.g. dissolving ammonium chloride in water, photosynthesis & physical (state) changes S → L & L → G

If the reaction is done in a test tube it feels cold

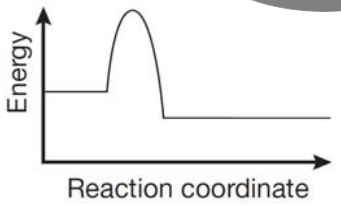
CHEMICAL REACTIONS

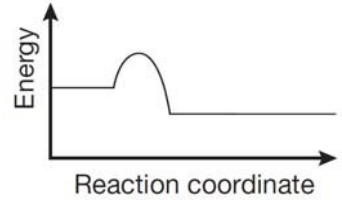
❶ BOND BREAKING: always endothermic +ΔH e.g. X-Y → X· and ·Y
❷ BOND MAKING: always exothermic -ΔH A· + ·B → A-B

Activation energy, *E*a, is the amount of energy required to break bonds in a chemical reaction. The height is a measure of the activation energy.

If Ea is high
- Low proportion of molecules have energy > (or equal) to Ea & reaction is slow

If Ea is low
- High proportion of molecules have energy > (or equal) to Ea & reaction is fast





There is no relationship between the size of ΔH and the size of Ea