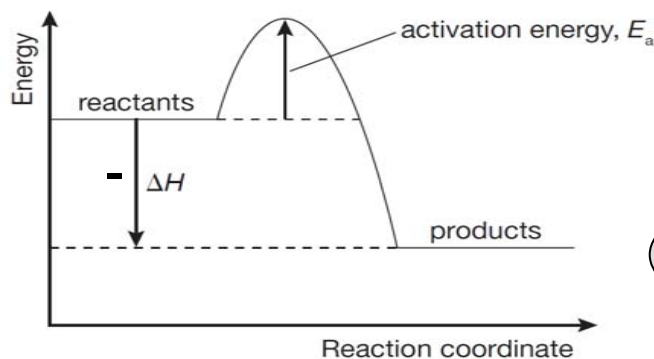


EXOTHERMIC REACTIONS

- Give out heat
- Have a $-\Delta H$

Eg combustion, neutralisation, Mg + hydrochloric acid, respiration & physical (state) changes eg $G \rightarrow L$ & $L \rightarrow S$

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



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 E_a is high

- Low proportion of molecules have energy $>$ (or equal) to E_a & reaction is slow

If E_a is low

- High proportion of molecules have energy $>$ (or equal) to E_a & reaction is fast

Enthalpy – symbol H – means “heat energy”.

ΔH = change in enthalpy

$\Delta H = H(\text{products}) - H(\text{reactants})$

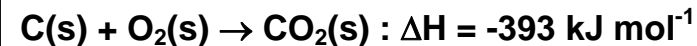
Overall ΔH depends on the size of each of these.

ENERGY CHANGE

CHEMICAL REACTIONS

- 1 BOND BREAKING : always endothermic $+\Delta H$ eg $X-Y \rightarrow X\cdot$ and $\cdot Y$
- 2 BOND MAKING: always exothermic $-\Delta H$ $A\cdot + \cdot B \rightarrow A-B$

ENTHALPY & MOLES



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

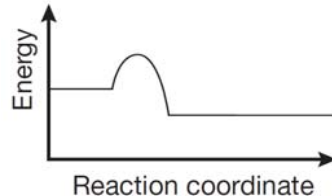
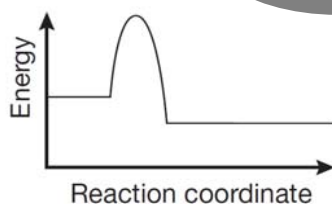
If 2 mol of C were burnt the enthalpy change would be $2 \times -393 = -786 \text{ kJ}$ $\Delta H = -786 \text{ kJ}$
OR
The energy released would be 786 kJ

ENDOTHERMIC REACTIONS

- Absorb heat
- Have a $+\Delta H$

Eg dissolving ammonium chloride in water, photosynthesis & physical (state) changes $S \rightarrow L$ & $L \rightarrow G$

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



There is no relation between the size of ΔH and the size of E_a

