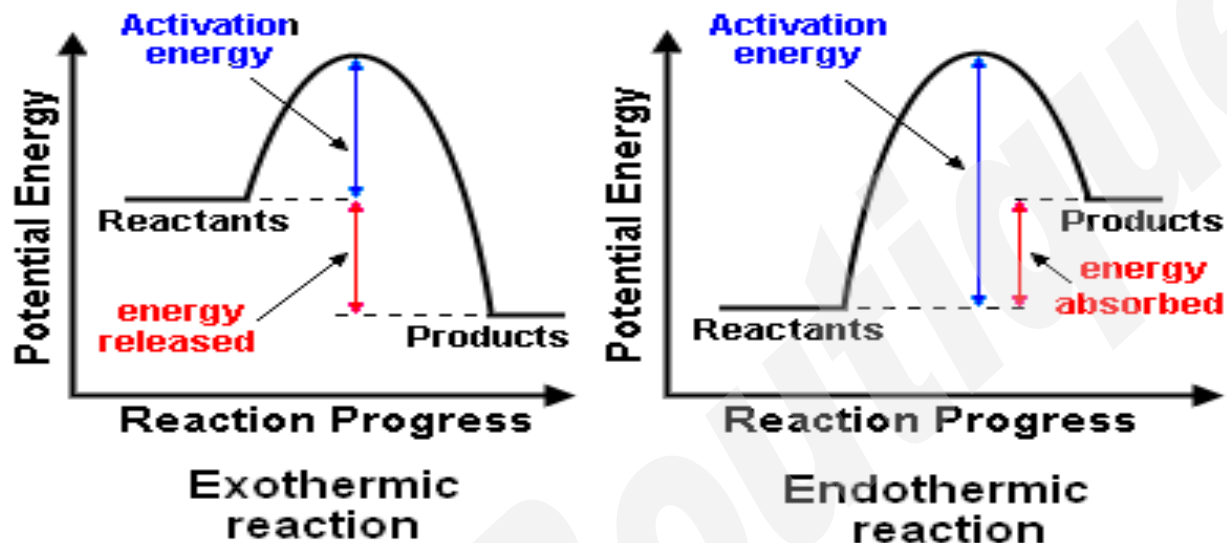


Chemical Energetic

(IGCSE Chemistry Syllabus 2016-2018)

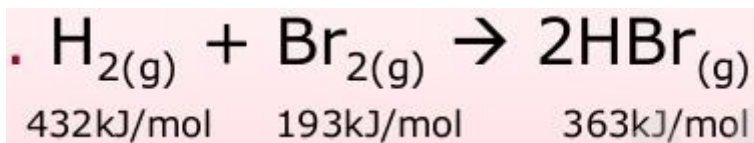
Energetic of a Reaction



Exothermic reaction	Endothermic reaction
Release heat energy into surrounding	Absorb heat energy from the surrounding
Bond forming	Bond breaking
$\Delta H = -ve$	$\Delta H = +ve$
Examples: <ul style="list-style-type: none"> - Combustion - Neutralisation - Condensation - Freezing - Hydration - Respiration 	Examples: <ul style="list-style-type: none"> - Thermal decomposition - Melting - Boiling - Photosynthesis

Bond Energy

- The amount of energy consumed or liberated when a bond is broken or formed in kJ/mol
 $\Delta H = \text{bond breaking} + \text{bond forming}$
- If overall heat energy is negative, reaction is exothermic
- If overall heat energy is positive, reaction is endothermic
- Example:



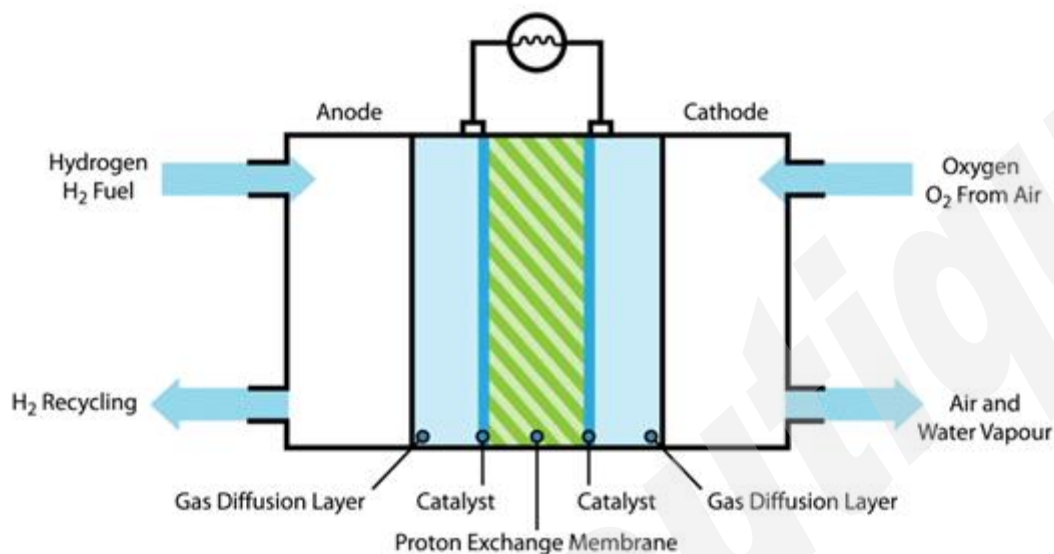
$$\Delta H^\circ = (432\text{kJ/mol} + 193\text{ kJ/mol}) - (2 \times 363\text{kJ/mol})$$

$$\Delta H^\circ = -101\text{kJ/mol}$$

$$\therefore \Delta H^\circ \text{ is } -101\text{kJ/mol}$$

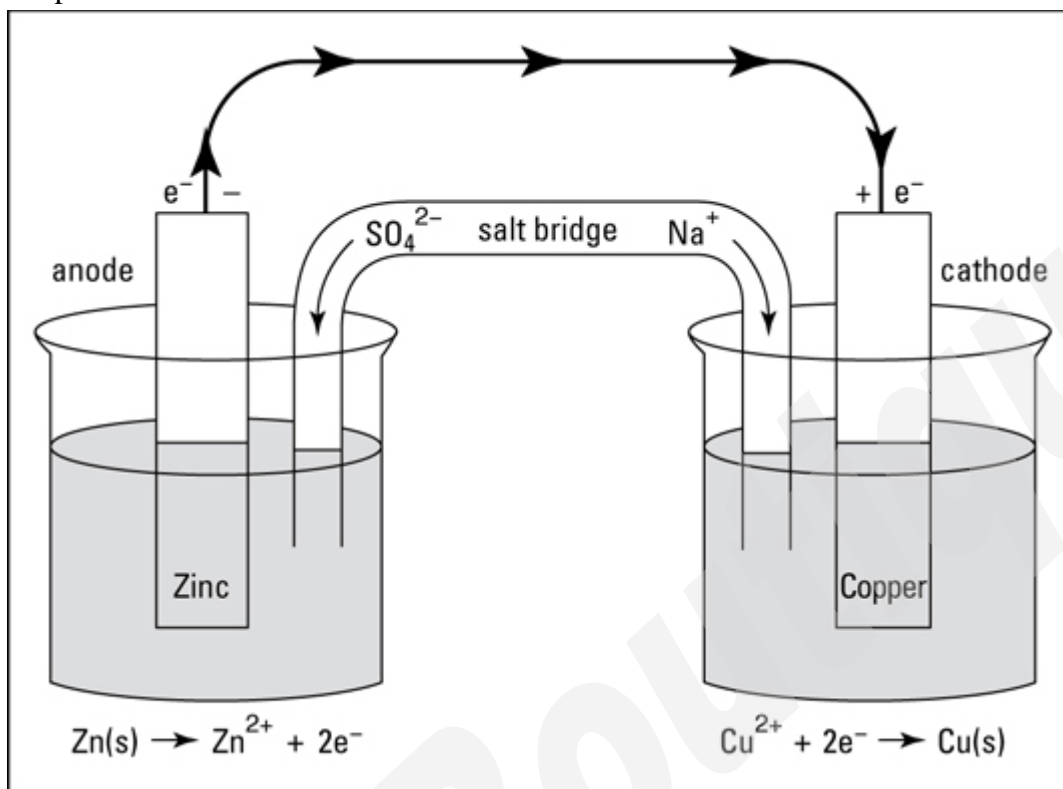
Energy Transfer

- Hydrogen Fuel Cell



- Hydrogen burns explosively with oxygen, it is used in rockets
- **Advantages:** Produces a lot of energy, less pollutant, renewable fuel
- **Disadvantages:** Difficult to transport as it is a gas at room temperature, form explosive mixture with air – very dangerous

○ Simple cells



- A cell is a device which **converts chemical energy into electrical energy** and is composed of **two metals** of **different reactivity** connected by an external circuit and an electrolyte
- Anode (terminal negative): more reactive metal
- Cathode (terminal positive): less reactive metal
- The greater the difference in reactivity of the two metals, the greater the voltage will be
- E.g. Zinc & Copper
- ✓ Zinc is more reactive than Copper
- ✓ Anode: $\text{Zn (s)} \rightarrow \text{Zn}^{2+} (\text{aq}) + \text{e}^{-}$
- ✓ Cathode: $\text{Cu}^{2+} (\text{aq}) + \text{e}^{-} \rightarrow \text{Cu (s)}$
- The electrons flow from anode to cathode

- Radioactive Isotopes
 - Uranium-235 can be used in nuclear power stations to produce electricity
 - The radioactive isotope is bombarded by neutrons resulting in a lot of heat being produced
 - Small amount of radioactive fuel produces large amount of heat
 - **Advantages:** lot of energy is produced from small amount of fuel, no carbon dioxide produced
 - **Disadvantages:** radioactive waste produced and non-renewable

ChemBoutique