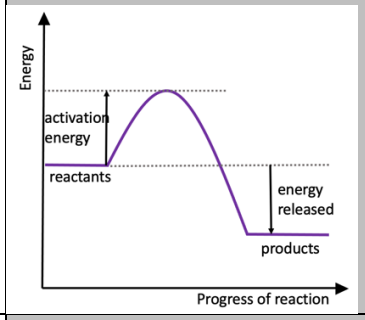
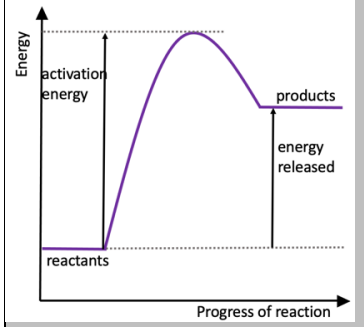
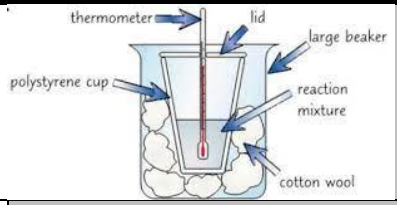
1 – Endothermic and Exothermic Reactions

Conservation of Energy	Energy is **conserved** in chemical **reactions**. The amount of **energy** in the **universe** at the **end** of a chemical reaction is the **same** as **before** it takes place.
Exothermic reaction	A **reaction** which **transfers energy** to the **surroundings.** It causes **increase in temperature** of surroundings.
Examples	**Combustion**, **neutralisation**, **oxidation** and **respiration**. Everyday uses include **hand warmers** and **self-heating cans**.
Endothermic reactions	A **reaction** where **energy is taken in** from the **surroundings**. It causes a **decrease in temperature** of the surroundings.
Examples	**Thermal decomposition** and **photosynthesis**. Everyday uses include **sports injury packs**.

2 – Reaction profiles

Exothermic reactions		-Energy level **decreases** because energy is **given out** to **surroundings**. -**Products** are at a **lower** energy than the **reactants**. -The **difference** in **height** represents the **overall energy change**. -**Initial rise** represents the **activation energy**.
Endothermic reactions		-Energy level **increases** because energy is **taken in** from the **surroundings**. -**Products** are at a **higher** energy than the **reactants**. -The **difference** in **height** represents the **overall energy change**. -**Initial rise** represents the **activation energy**.
Activation energy	The **minimum** amount of **energy** that **particles** must have to **react**.	

3 – Temperature changes

Equipment		-**Polystyrene** cup and **cotton wool** for **insulation** to **prevent** energy loss. -**Lid** to reduce energy loss by **evaporation**.
Variables	This equipment could be used to investigate effect of **concentration**, **mass** or **volume** of **reactants** on **temperature change**.	

4 – Bond energies (HT)

Bond breaking	**Bond breaking** is **endothermic** as **energy** must be **supplied** to **break bonds**.
Bond forming	**Bond forming** is **exothermic** as **energy** is **released** when **new bonds** are **formed**.
Bond energy example calculation	Using the **bond energies** given, calculate the **energy change** for the reaction between H_2 and Cl_2 forming HCl: H – H + Cl – Cl → H – Cl H – H: +436 kJ/mol Cl – Cl: +242 kJ/mol H – Cl H – Cl: +431 kJ/mol *1. Find the **energy required** to **break** the original bonds:* (1 x H – H) + (1 x Cl – Cl) = 436 + 242 = 678 kJ/mol *2. Find the **energy released** by **forming** the new bonds:* 2 x H – Cl = 2 x 431 kJ/mol = 862 kJ/mol *3. Find the **overall energy change** for the reaction:* **Overall energy change** = **breaking bonds** – **forming bonds** 678 kJ/mol – 862 = -184 kJ/mol

GCSE Science

Chemistry C5 – Energy Changes