

- 1. Exothermic and Endothermic Reactions
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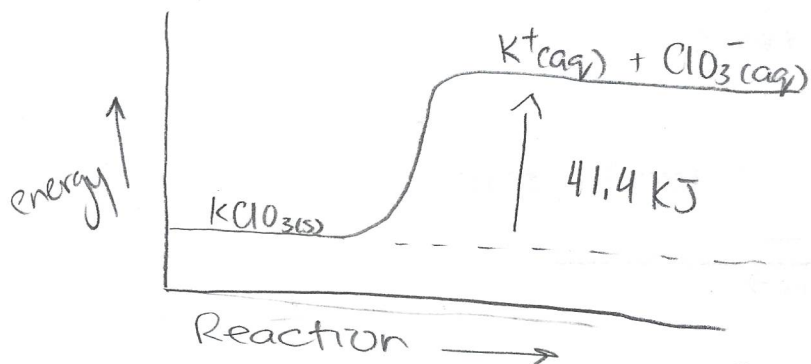
Exothermic and Endothermic Reactions

Molecules are held together by chemical bonds.

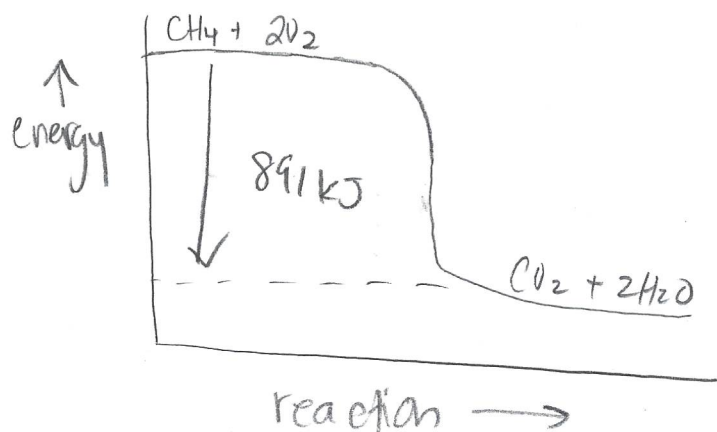
- In order to break a bond, energy must be added to the bond.
- When bonds form, energy is released.

Classifying Reactions

- Can classify reactions based on their energy changes - whether they take in or release energy (usually as heat)
- If a reaction absorbs energy it is called: endothermic (heat enters)
- Example: $KClO_3(s) + 41.4 \text{ kJ} \rightarrow K^+(aq) + ClO_3^-(aq)$
- Graphically represented as:



- If a reaction produces energy it is called: exothermic (heat exits)
- Example: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + 891 \text{ kJ}$
- Graphically represented as:

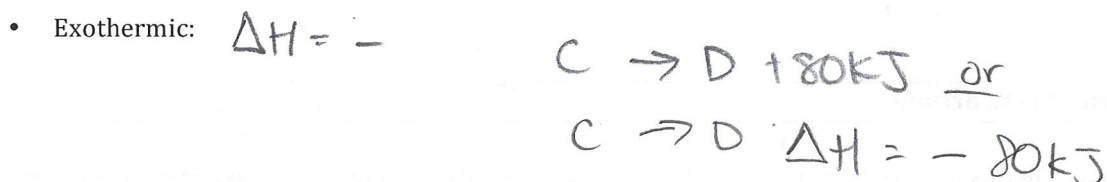
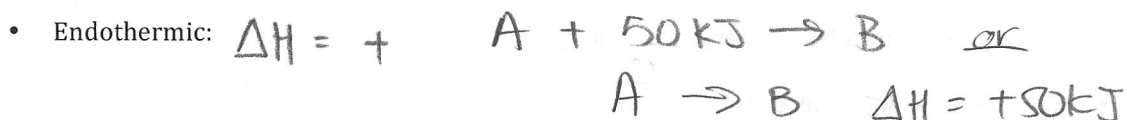


Enthalpy (Heat Energy):

- The heat contained in the system
- Symbol: H
- The change in heat (enthalpy) during a reaction is: ΔH

$$\Delta H = H_{\text{products}} - H_{\text{reactants}}$$

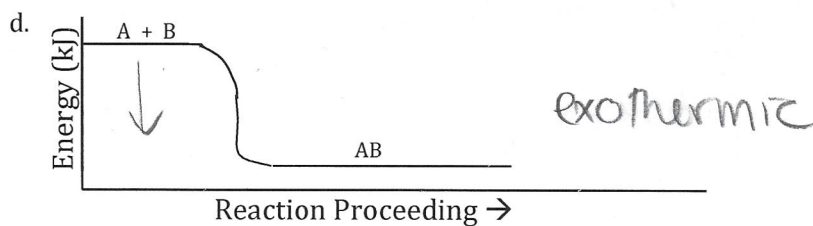
- Exothermic and endothermic reactions can be shown in two ways:



Practice:

Determine whether the following are exothermic or endothermic reactions:

- $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl} + 432\text{ kJ}$ Exothermic
- $12\text{CO}_2 + 11\text{H}_2\text{O} \rightarrow \text{C}_{12}\text{H}_{22}\text{O}_{11} + 12\text{O}_2 \quad \Delta H = 5638\text{ kJ}$ endothermic
- $\text{H}_2\text{O}_{(s)} \rightarrow \text{H}_2\text{O}_{(l)}$ endothermic



- $\text{C} + \text{D} \rightarrow \text{CD} \quad \Delta H = -65.7\text{ kJ}$ exothermic
- $\text{E} + \text{F} + 437\text{ kJ} \rightarrow \text{G} + \text{H}$ Endothermic
- $\text{H}_2\text{O}_{(g)} \rightarrow \text{H}_2\text{O}_{(l)}$ exothermic