

Energy and Chemical Change

Name: _____

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EXOTHERMIC REACTION: A reaction that release energy.

ENDOTHERMIC REACTION: A reaction that absorbs energy from the environment.

ENTHALPY: The total amount of chemical potential energy in a chemical system.

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

When the energy of the products is larger than that of the reactants, the ΔH will be positive. This indicates that the system absorbs energy from the environment. It is then an endothermic reaction.

ENDOTHERMIC REACTION: $\Delta H > 0$

When the energy of the reactants is larger than that of the products, the ΔH will be negative. This indicates that the reaction releases energy into the environment. It is then an exothermic reaction.

EXOTHERMIC REACTION: $\Delta H < 0$

BINDING ENERGY: The energy absorbed when bindings break or release when new bindings form.

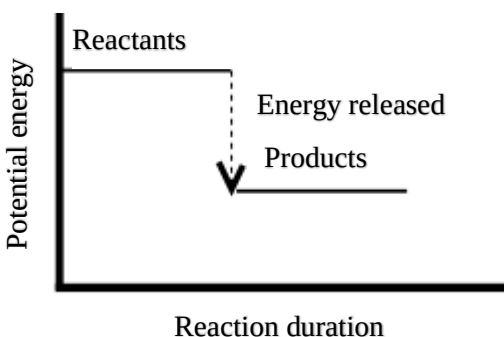
EXAMPLES OF EXOTHERMIC REACTIONS:

1. Burning of fuels
2. Cell respiration
3. Neutralization
4. Hydration

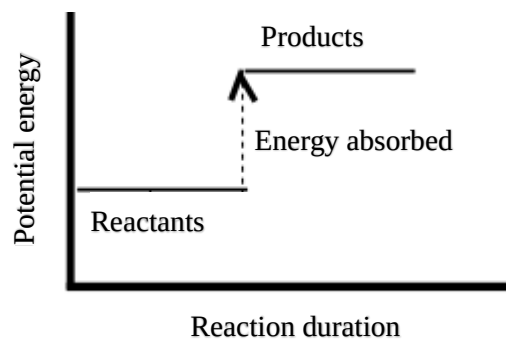
EXAMPLES OF ENDOTHERMIC REACTIONS:

1. Photosynthesis
2. Electrolysis
3. Thermal decomposition
4. Reaction between steam and coal to prepare $\text{H}_{2(g)}$

EXOTHERMIC REACTION



ENDOTHERMIC REACTION



ACTIVATION ENERGY (E_A)

It is the **minimum** energy needed to let a chemical reaction **take place**.

Activated complex is a temporary, high energy, unstable transitional condition between reactants and products.

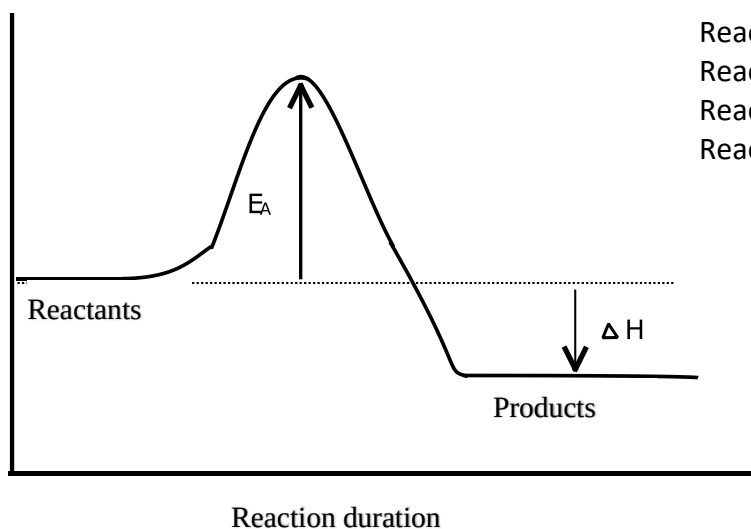
CATALYSTS

A catalyst is a substance that changes/increases the tempo of a reaction without undergoing its own permanent change.

What work is done by a catalyst?

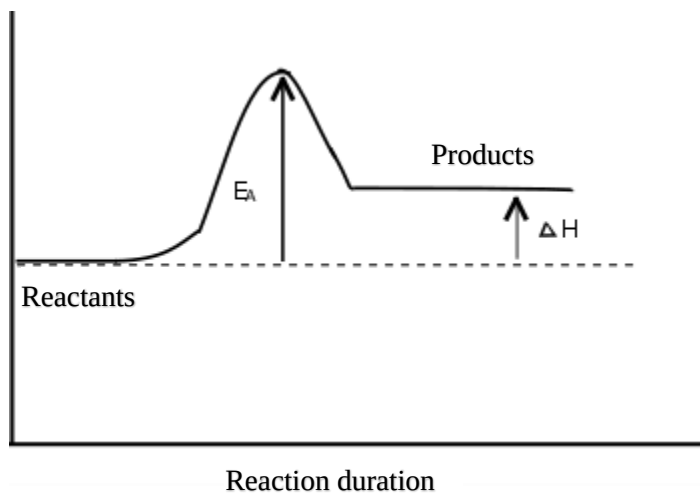
- It lowers the activation energy of the reaction
- ΔH remains the same, because the energies of the products and the reactants do not change.

EXOTHERMIC REACTION



Reactants + energy $\rightarrow$ products
 Reactants $\rightarrow$ products $\Delta H < 0$
 Reactants $\rightarrow$ products $\Delta H = -30 \text{ kJ} \cdot \text{mol}^{-1}$
 Reactants $\rightarrow$ products $+30 \text{ kJ} \cdot \text{mol}^{-1}$

ENDOTHERMIC REACTION



Reactants + energy $\rightarrow$ products

Reactants $\rightarrow$ products $\Delta H > 0$

Reactants $\rightarrow$ products $\Delta H = 30 \text{ kJ} \cdot \text{mol}^{-1}$

Reactants + $30 \text{ kJ} \cdot \text{mol}^{-1} \rightarrow$ products