

Unit 5: Thermochemistry

Reaction Energy Diagrams

Thermochemistry

- **thermochemistry**: studies the relationships between chemical reactions and energy changes involving heat



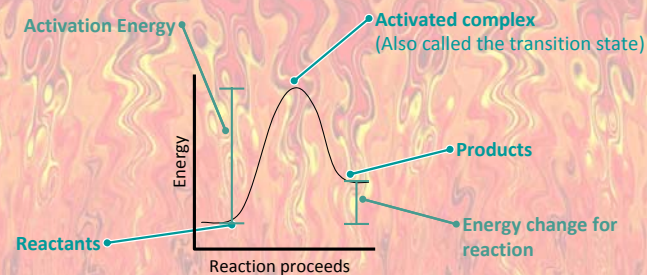
Thermochemistry

Heat and temperature are NOT the same thing!

- **Heat**: *transfer/flow* of energy due to a temperature difference (from high to low)
- **Temperature**: a measure of the random motions of molecules (*average kinetic energy*)

Reaction Energy Diagram

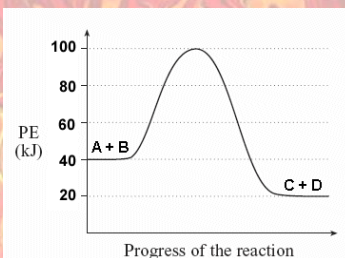
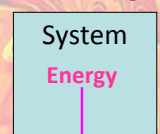
Reaction energy diagrams show the energy changes throughout the reaction



Exothermic Reactions

Exothermic:
energy **EXITS** the system

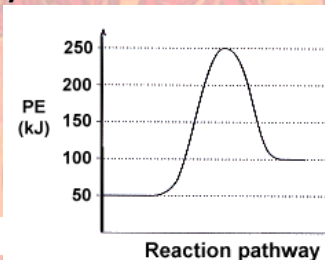
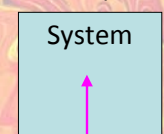
$\Delta E < 0$ (neg.)



Endothermic Reactions

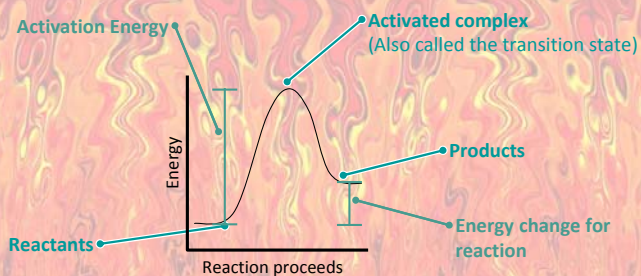
Endothermic:
energy **ENTERS** the system

$\Delta E > 0$ (pos.)



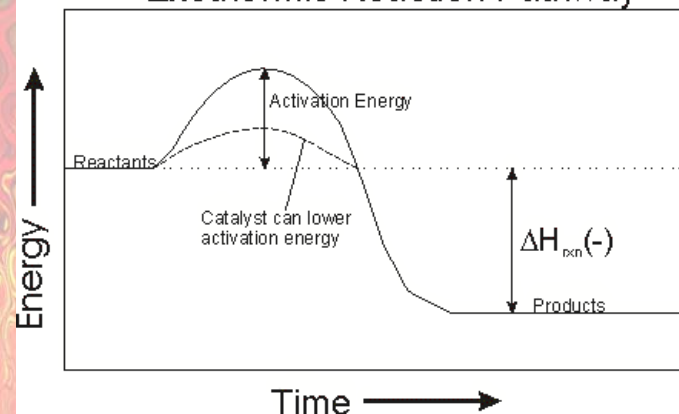
Catalysts

Catalysts create a lower energy reaction pathway



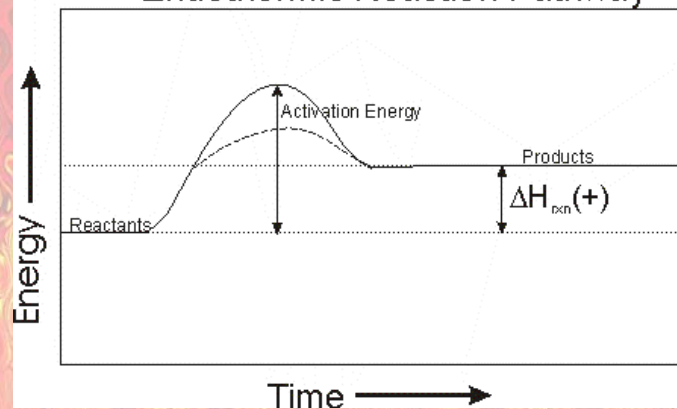
Enthalpy

Exothermic Reaction Pathway



Enthalpy Cont.

Endothermic Reaction Pathway



Reaction Rates

- Notice that in both reaction diagrams (endo and exo) that higher energy speeds up the reaction (needed for the activation energy).



•Above diagram from World of Chemistry p. 538

- Reactions happen when bonds are broken and atoms recombine to form new molecules
- More collisions and higher-energy collisions increase the chance that a bond can be broken – leading to a faster reaction
- Catalysts work differently – by creating a lower energy reaction pathway