

CC15: Groups, rates and heat changes

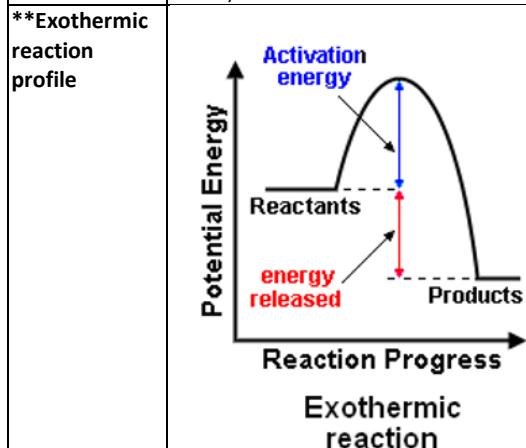
Lesson sequence

- Exothermic and endothermic reactions
- Explaining energy changes

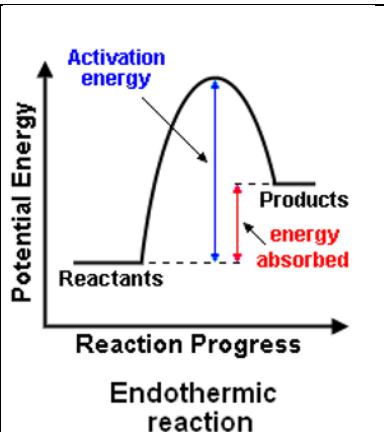
1. Endothermic and exothermic reactions

***Exothermic reaction** A reaction that transfers energy to the surroundings (gets hotter, temperature up).

***Endothermic reaction** A reaction that absorbs energy from the surroundings (gets colder, temperature down)



**Endothermic reaction profile



**Measuring energy changes

- Sit a polystyrene beaker inside a glass beaker (insulation)
- Measure the starting temperature of the reactants.
- Mix the reactants in the polystyrene beaker
- Cover with lid fitted with a thermometer
- Monitor and record the peak temperature change.

** Most common problem

Heat escaping. Solution is more insulation.

2. Explaining energy changes

**Chemical bonds in reactions	During chemical reactions, old chemical bonds are broken and new ones are formed.
**Breaking bonds	Endothermic. Breaking bonds absorbs energy, breaking stronger bonds absorbs more energy.
**Making bonds	Exothermic. Making bonds releases energy, making stronger bonds releases more energy.
**Energy changes and bond formation	The energy change in a reaction is the difference between the energy required to break the old bonds and the energy released by making the new ones.
**Exothermic reactions and bonds	Exothermic reactions break weaker bonds and make stronger ones.
**Endothermic reactions and bonds	Endothermic reactions break stronger bonds and make weaker ones.
***Bond strength	The energy required to break one mole of a particular covalent bond in kJ/mol.
***Calculating energy changes from bond strengths	Add up the total strength of old bonds broken and subtract the total strength of new bonds made. A negative answer is exothermic.