

Endothermic and Exothermic processes

Endothermic Reaction

- Chemical reaction that requires the addition of heat energy to proceed.
- The reaction absorbs heat from its surroundings
- Cools the surroundings
- Takes in heat for reaction to occur (feels cold to the touch because it is taking away your heat). This causes a decrease in temperature.

Exothermic Reaction

Releases heat

Heat the surroundings (rise the temp. of the surrounding)

Example:

Exothermic processes

Making ice cubes

Formation of snow in clouds

Condensation of rain from water vapor

A candle flame

Endothermic processes

Melting ice cubes

Evaporation of water

Conversion of frost to water vapor

Forming a cation from an atom in gas phase

Melting solid salts

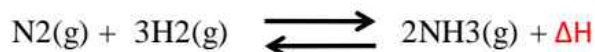
Any combustion reaction

Le Chatelier's Principle

- Le Chatelier's principle is an observation about chemical equilibria of reactions.
- It states that changes in the temperature, pressure, volume, or concentration of a system will result in predictable and opposing changes in the system in order to achieve a new equilibrium state.
- This Principle is important, because it allows us to shift an equilibrium to the side that we would like to favor.

For example: the Haber Process produces ammonia reversibly.

- Le Chatelier principle is the Haber-Bosch process for the synthesis of ammonia, in which a balance between low temperature and high pressure must be found.
- The forward reaction (the production of ammonia) is exothermic.



Le Chatelier's Principle

STRESS	SHIFT	WHY?
increase concentration of a substance	away from substance	extra concentration needs to be used up
decrease concentration of a substance	towards substance	need to produce more of substance to make up for what was removed
increase pressure of system	towards <i>fewer</i> moles of gas	<u>for gas</u> : pressure increase = volume decrease
decrease pressure of system	towards <i>more</i> moles of gas	<u>for gas</u> : pressure decrease = volume increase
increase temperature of system	away from heat/ energy <i>exothermic</i> reaction is favored	extra heat/ energy must be used up
decrease temperature of system	towards heat/ energy <i>exothermic</i> reaction is favored	more heat/ energy needs to be produced to make up for the loss
add a catalyst	NO SHIFT	The rates of both the forward and reverse reactions are increased by the same amount.