

Energy of Reactions

$\Delta H+$ is endothermic

$\Delta H-$ is exothermic

AE is activation energy

PE is energy stored in bonds
when bonds form, energy is released

KINETICS AND EQUILIBRIUM

The Law of
Conservation
of Energy...

Know it?

Potential Energy Diagrams show the flow of energy through a reaction. Reactants have the POTENTIAL to react, some more than others (helium balloons for kids are fun, methane balloons are scary). All reactions require activation energy to react. All reactions pay some energy back. If they pay back a little, and the products have more energy than the reactants did, the reaction is endothermic. If the products have less energy than the reactants did, the reaction is exothermic. The difference between the potential of the reactants and the potential of the products is called the HEAT OF REACTION, or ΔH .

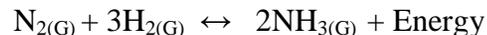
LeChatleier's Principle

A chemical system at equilibrium will stay at equilibrium. If a stress is applied to a dynamic equilibrium, the system will shift (forward or reverse) to relieve that stress, and create a new dynamic equilibrium.

Chemical stresses include increasing or decreasing the heat, pressure, the concentrations of reactants or the products. Pressure ONLY affects gases, not solids or liquids or aqueous solutions.

Catalysts move systems to new equilibrium quicker, but do not favor forward or reverse.

EXAMPLE



← Add Heat

Remove Heat →

Add Pressure →

← Remove Pressure

Add N_2 →

← Remove N_2

← Add NH_3

Remove NH_3 →

Add H_2 →

← Remove H_2

no effect X Add a catalyst X no effect

Collision Theory

Anything that increases the
rate and strength of collisions
increases the rate of reaction

INCREASE

Temperature, Surface Area,
or the
Concentration of the Solutions,
makes the reaction rate ↑

Most reactions only go “forward” →

← Some reactions can go in “reverse”

Some reactions are dynamic equilibriums,
they go both ways ↔

Catalysts increase the rate of reactions, or lower the time it takes to start reactions, by being able to lower the activation energy, or they provide an alternate pathway forward for the reaction. They do not affect the collisions of particles.

ENTROPY is the measure of chaos in a chemical system. In our class it's easy.

Low entropy to high is SOLID → LIQUID → GAS. Gases move fast + randomly, solids are stuck in place, liquids are medium entropy.

When comparing different compounds at the same temp + pressure, the big molecules with more bonds have less entropy, small molecules have more entropy.

Learn to draw exothermic + endothermic potential energy diagrams (draw on back). Always label the reactants R, products P, activation energy AE, activated complex AC, the change of energy ΔH , and the affect of a catalyst (shown with a dotted line inside the bell curve).

Exothermic reactions
have energy written
with the products.

Endothermic reactions
have energy written
with the reactants.

Heats of Reaction
is Table I.

If you reverse an
arrow, then reverse
the sign for
 ΔH too.