Thermochemistry – study of energy changes in chemical reactions

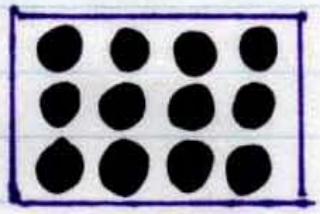
Kinetic molecular theory –

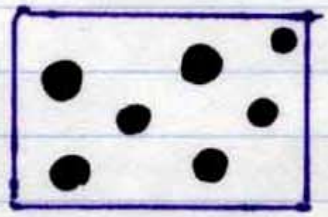
Kinetic energy = energy of motion

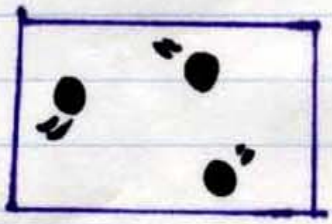
A) increases in temperature cause an increase in the kinetic energy of molecules
B) leads to an increase in the number of collisions
C) increases the reaction rate.
   * molecules must collide in order to react

Phases of Matter

Entropy - degree of disorder
* Nature spontaneously goes to a state of disord

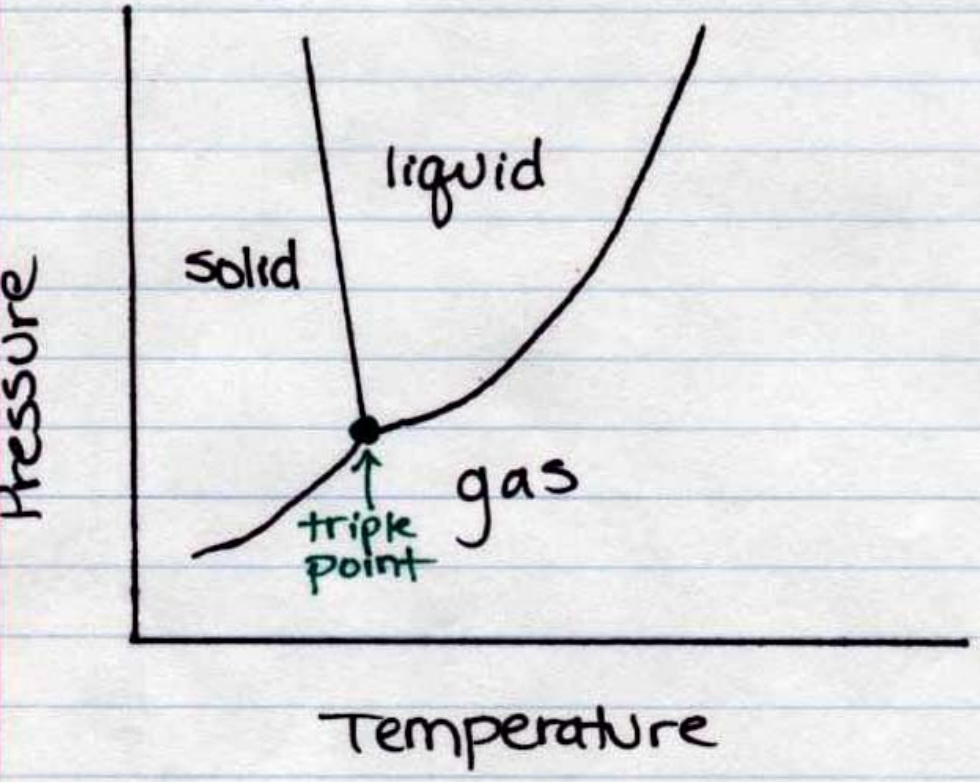
solid  low entropy, atoms vibrating

liquid  medium entropy, more motion

gas  high entropy, atoms moving rapid

Phase Diagram

shows how pressure + temperature can cause changes in phase of matter



Triple point - solid, liquid, + gas coexist in equilibrium at a certain pressure + temperature

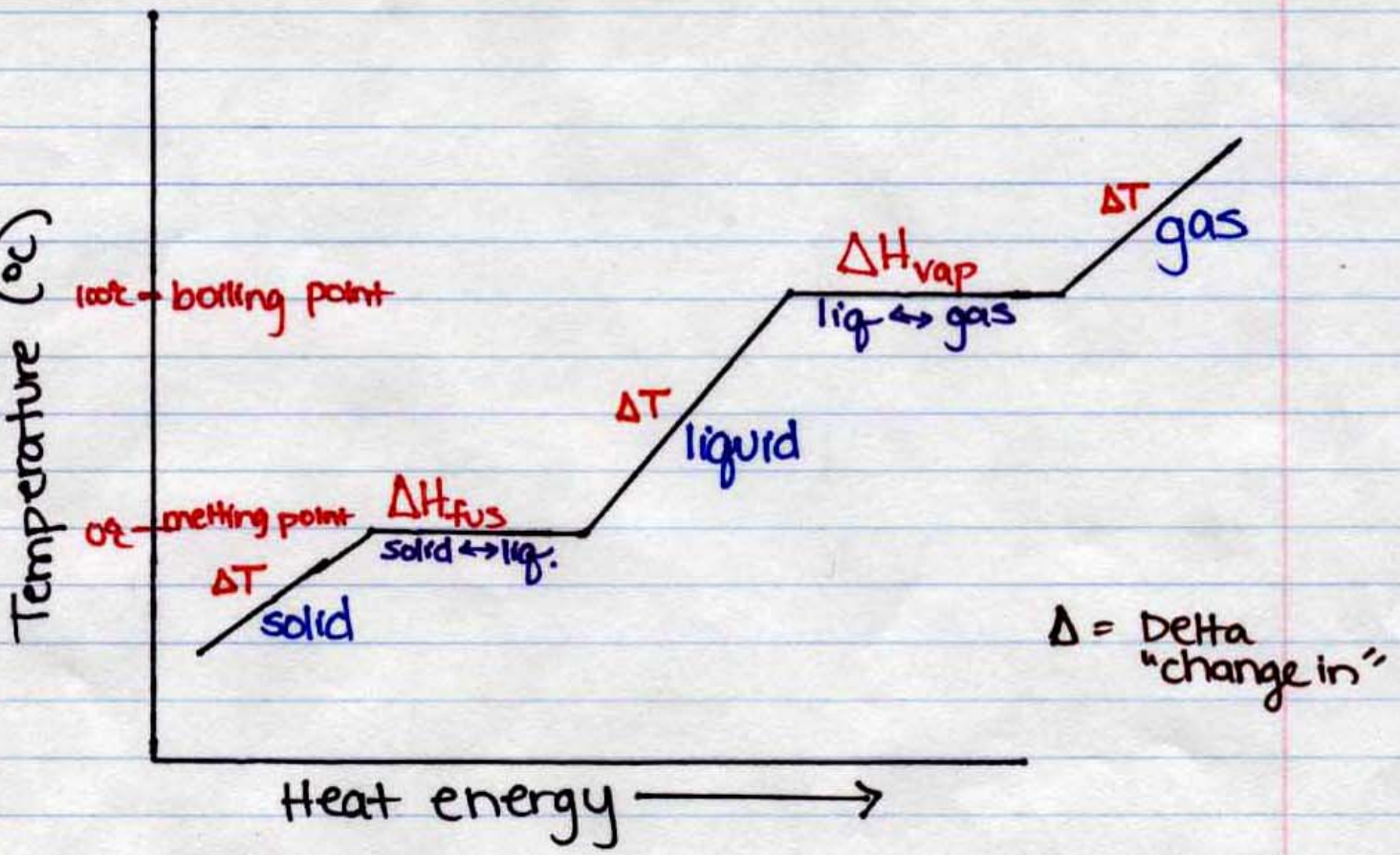
Absolute Zero

* lowest possible temperature
* all molecular motion stops
* 0 Kelvin

Can never be achieved

$K = °C + 273$

Heating Curve of Water



Temperature does NOT change during a phase change

↳ the energy added is being used to change the phase & thus cannot be applied toward increasing the temperature

heat of fusion (ΔH_{fus}) -
energy required to change phase from solid to liquid

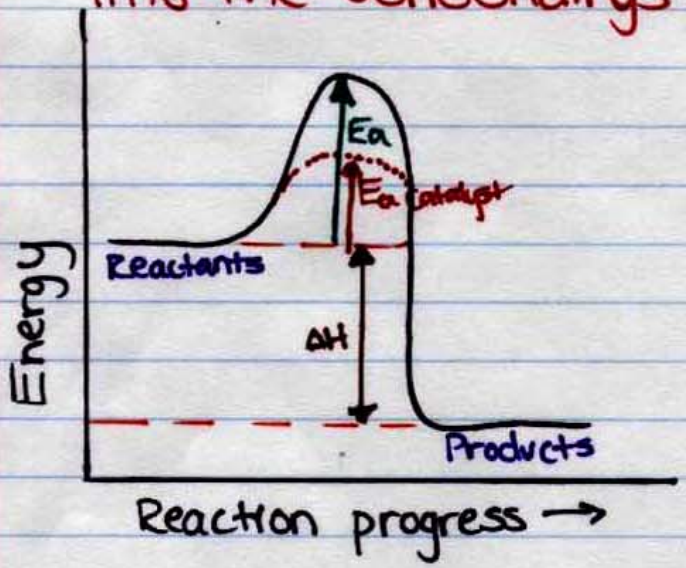
heat of vaporization (ΔH_{vap})
energy required to change phase from liquid to gas

Enthalpy - heat content
- represented by "H"

$\Delta H = H_{products} - H_{reactants}$

Two Types of Reactions

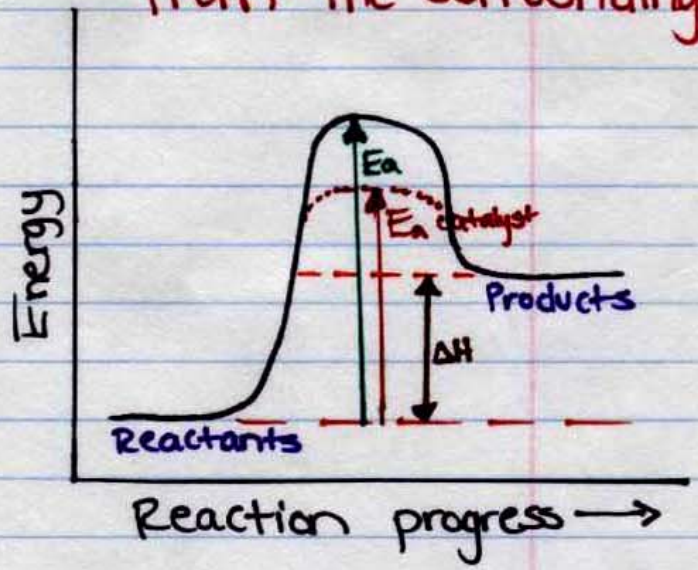
① **Exothermic** - heat is released into the surroundings



reactants → products + heat

$\Delta H = \ominus$

② **Endothermic** - heat is absorbed from the surroundings



heat + reactants → products

$\Delta H = \oplus$

Activation energy (E_a) - energy required to start a reaction
* needed in all reactions
* generally larger in endothermic reactions

Catalyst - speeds up a reaction
- lowers activation energy
- is not used up