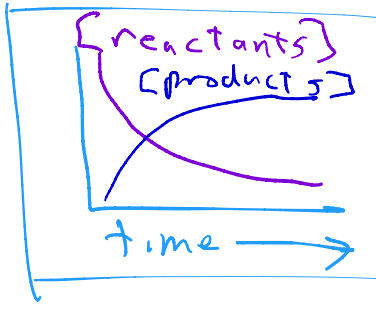
5/6/20

Quiz #2 → Monday 5/11/20

Equilibrium

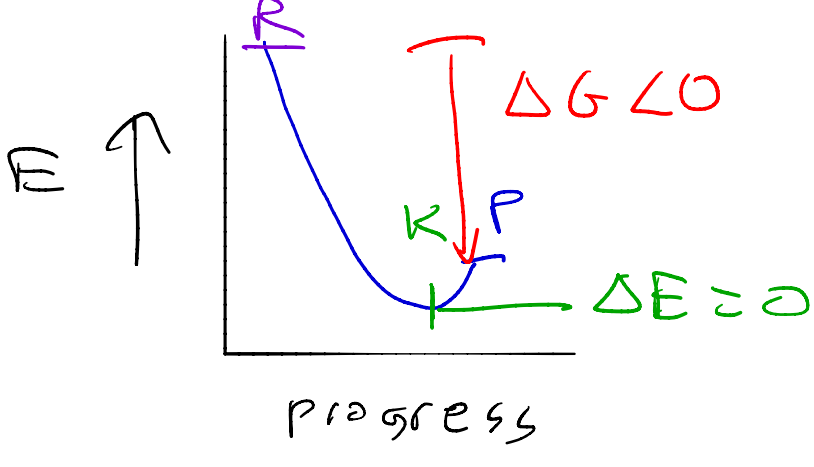
3 definitions

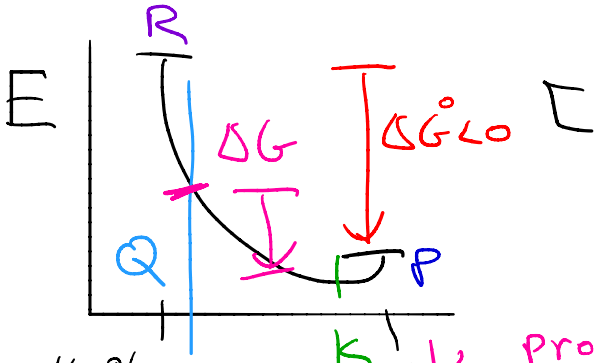
- rate of the forward reaction is equal to the rate of the reverse reaction.
- concentrations of reactants and products are constant

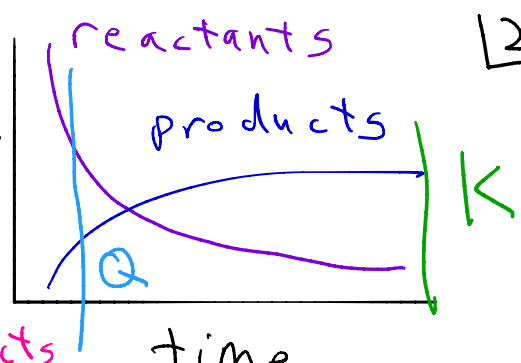


(but not necessarily equal)

- energy in the system is constant







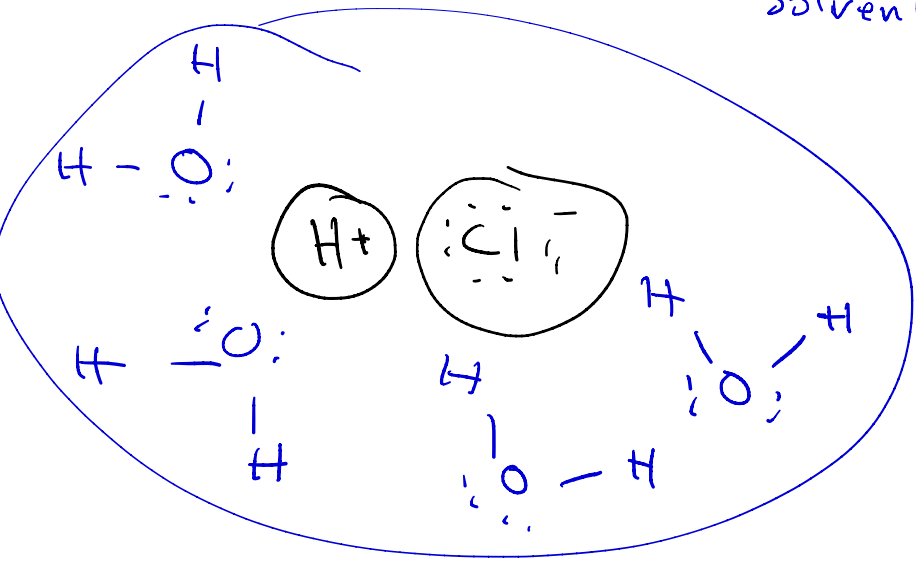
$K = \frac{\text{products}}{\text{reactants}}$

Example 1: The rxn has started but only running a very brief amount of time.

- The forward rxn rate is near its highest, while the reverse rxn rate is at its lowest: $R_f > R_r$
  More products needed to form for the reverse rate to increase
- $Q < K$, so the balance of products and reactants has not been reached, More products needed for Q to increase to K.
- The rxn is not at its lowest energy point, Forming products releases energy.

Ion pairs

Solvent cage



Ion pairs form when a substance dissociates but the ions are "trapped" together by solvent molecules, This can cause the solution to have a behavior that differs from its calculated concentration,

Activity - The effective concentration of a substance in a mixture

→ directly related to energy

In the text, concentrations are directly used.

Standard State (in the text)

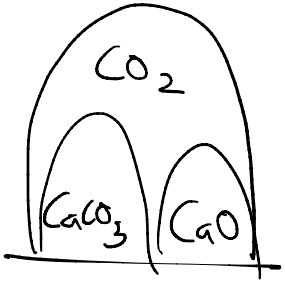
25°C, 1 atm, 1 M

(modern is 1 bar)

$$\text{activity} = \frac{\text{concentration}}{1\ M}$$

⟶ no units

Decomposition of calcium carbonate



$$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$$

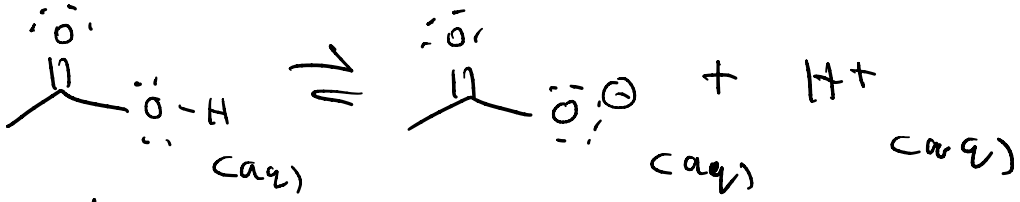
"$K = \dfrac{[CaO][CO_2]}{[CaCO_3]}$"

If a solid is not a solution, how can its concentration be calculated?

⟶ The activity of pure solids and liquids is 1.

$$K = [CO_2]$$

Friday: Kp vs Kc (7.3)



(aq) (aq) (aq)

HA A^- H^+

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

Acid dissociation constant

Acetic acid is a weak acid, meaning it only minimally dissociates. (a little bit)

$K_a = 1.76 \times 10^{-5}$

K_a acid dissociation constant of acetic acid