Essential Question

How can one number describe a reaction mixture?

The Reaction Quotient, Q

- Compares products to reactants
- Can be found at any moment

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

Writing Q_c

$$aA + bB \rightleftharpoons cC + dD$$

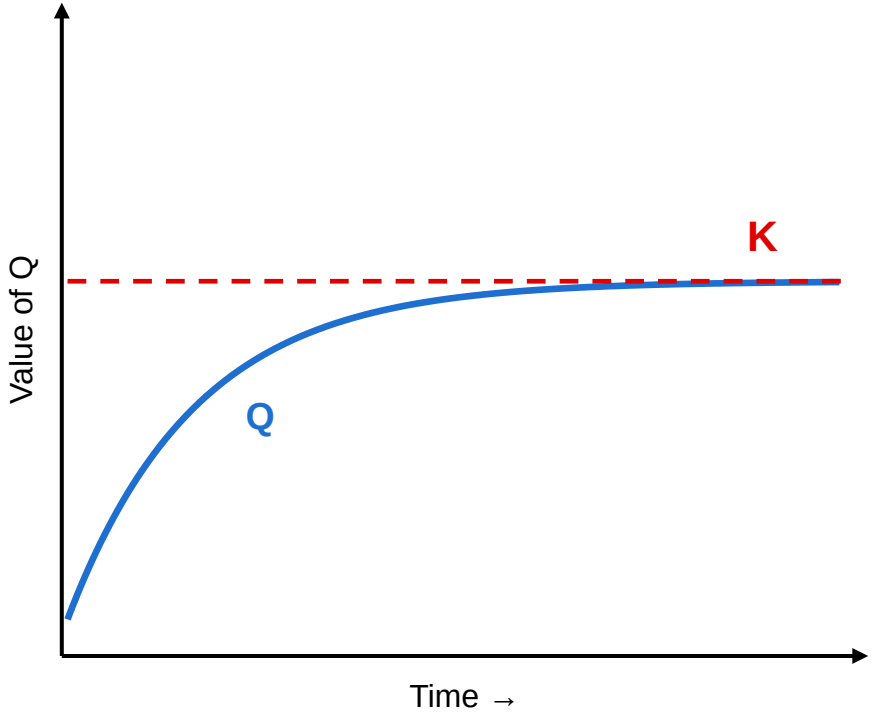
$$Q_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

- [ ] means molarity (M)
- Coefficients become exponents

Reaction Quotient and Equilibrium Constant

Q vs. K

- Q: any moment
- K: at equilibrium only
- At equilibrium, Q = K



Leave Out Solids and Pure Liquids

- Include only (g) and (aq)
- Leave out (s) and (l)

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

$$K_c = [CO_2]$$

K_p for Gases

- Use partial pressures (atm)
- Same pattern as K_c

$$K_p = \frac{(P_C)^c(P_D)^d}{(P_A)^a(P_B)^b}$$

Check: does the question want K_c or K_p?

Example: Writing K_c

Write the K_c expression for:

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

Example: Solids in the Equation

Write the K_c expression for:

$$2NaHCO_3(s) \rightleftharpoons Na_2CO_3(s) + H_2O(g) + CO_2(g)$$

Example: Writing K_p

Write the K_p expression for:

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$

Reaction Quotient and Equilibrium Constant

Big Ideas

- Q compares products to reactants
- At equilibrium, Q = K
- Coefficients become exponents
- Leave out solids and pure liquids

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