

MCAT DUMP SHEET

Chemistry

Gases

Standard temperature and pressure (STP)

$$T = 0^{\circ}\text{C} = 273\text{ K}$$

$$P = 1\text{ atm} = 760\text{ torr} = 760\text{ mm Hg}$$

$$\text{Ideal gas law} = PV = nRT$$

$$\text{Dalton's law of partial pressures} = P_{\text{Total}} = P_1 + P_2 + \dots P_n$$

$$\text{Graham's law} = v_1/v_2 = \sqrt{\frac{MW_2}{MW_1}}$$

Kinetics

$$\text{Rate law} = \text{Rate} = k[A]^a[B]^b$$

$$\text{Arrhenius equation} = k = Ae^{-\frac{E_a}{RT}}$$

Atomic chemistry

Formal charge

$$\text{FC} = \# \text{ valence electrons} - \# \text{ bonds} - \# \text{ lone pair electrons}$$

Electrochemistry

$$F = 96,000\text{ C/mole}$$

$$\Delta G = -nFE_{\text{cell}}$$

Stoichiometry

$$\text{Moles} = \frac{\text{mass}}{\text{molecular weight (MW)}}$$

$$\text{Mole fraction} = X_a = \frac{\text{moles of a}}{\text{total moles}}$$

$$\text{Molarity} = M = \frac{\text{moles}}{\text{L}}$$

$$\text{Molarity} = M = \frac{\text{moles}}{\text{kg}}$$

$$\text{Dilution equation} = M_1 V_1 = M_2 V_2$$

Equilibrium

For the balanced reaction



$$\text{Equilibrium constant} = K_{\text{eq}} = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

Products and reactants at equilibrium

$$\text{Reaction quotient} = Q = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

Thermodynamics

$$T_k = T_c + 273$$

$$q = mc\Delta T$$

$$q = n\Delta H_{\text{fusion/vaporization}}$$

$$\Delta H^{\circ}_{\text{rxn}} = \sum n\Delta H^{\circ}_{\text{f, products}} - \sum n\Delta H^{\circ}_{\text{f, reactants}}$$

Gibbs free energy

$$\Delta G = \Delta H - T\Delta S$$

$$\Delta G^{\circ} = -RT\ln K$$

Acids and bases

$$\text{pH} = -\log[H^+]$$

$$\text{pOH} = -\log[\text{OH}^-]$$

$$\text{pH} + \text{pOH} = 14$$

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

$$\text{p}K_a = -\log K_a$$

$$K_b = \frac{[\text{OH}^-][\text{HB}^+]}{[B]}$$

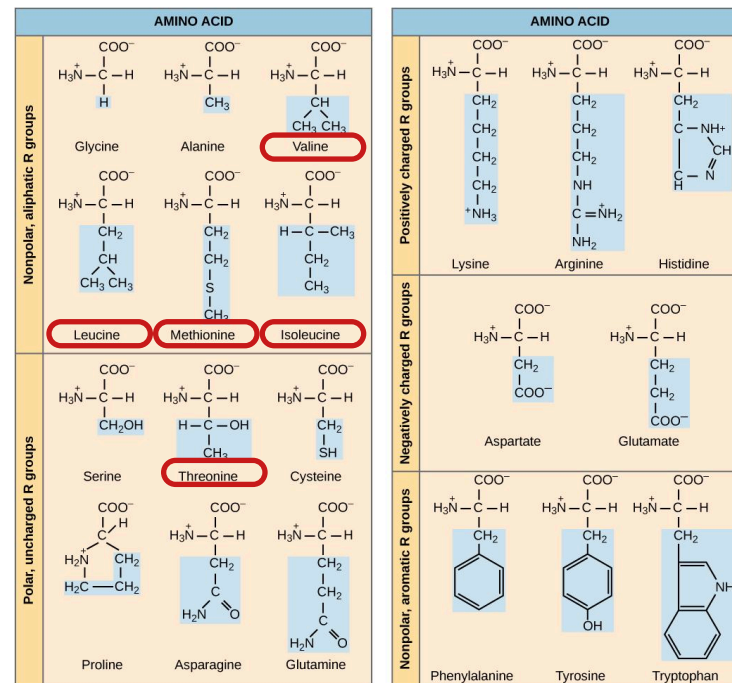
$$\text{p}K_b = -\log K_b$$

$$K_a \times K_b = K_w = 1 \times 10^{-14}$$

$$K_w = [H^+][\text{OH}^-] = 1 \times 10^{-14} \text{ at } 25^{\circ}\text{C}$$

Henderson-Hasselbalch equation

$$\text{pH} = \frac{\text{p}K_a + \log[A^-]}{[HA]}$$



Biology 2e by Clark, Mary Ann; Matthew Douglas, Jung Choi. 2018. OpenStax. Access for free at <https://openstax.org/books/biology-2e/pages/1-introduction>

Structures of the 20 amino acids found in proteins are shown. Each amino acid is composed of an amino group (NH_3^+), a carboxyl group (COO^-), and a side chain (blue). The side chain may be nonpolar, polar, or charged, as well as large or small. It is the variety of amino acid side chains that gives rise to the incredible variation of protein structure and function.

 = indicates one of the 9 essential amino acids