

FRACTIONAL COMPOSITION EQUATIONS (diprotic case):

$$F = [H_2A] + [HA^-] + [A^{2-}]$$

$$\alpha_{H_2A} \equiv \frac{[H_2A]}{F} = \frac{[H^+]^2}{[H^+]^2 + [H^+]K_1 + K_1K_2}$$

$$\alpha_{HA^-} \equiv \frac{[HA^-]}{F} = \frac{K_1[H^+]}{[H^+]^2 + [H^+]K_1 + K_1K_2}$$

$$\alpha_{A^{2-}} \equiv \frac{[A^{2-}]}{F} = \frac{K_1K_2}{[H^+]^2 + [H^+]K_1 + K_1K_2}$$

note: $\alpha_{H_2A} + \alpha_{HA^-} + \alpha_{A^{2-}} = 1$

(see p. 217 for a general set of equations for an acid with n acidic protons)