Chemistry Formula Sheet

Chapter by chapter, topic by topic. Written by the PadhoNa team for quick revision.

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CHAPTER 8

Ionic Equilibrium

Acids, bases and pH

$$\mathrm{pH} = -\log[\mathrm{H}^+], \qquad K_w = [\mathrm{H}^+][\mathrm{OH}^-] = 10^{-14}\ (25^\circ\mathrm{C}), \qquad \mathrm{pH}+\mathrm{pOH} = 14$$

WEAK ACID (OSTWALD)

$$\alpha = \sqrt{\frac{K_a}{C}}, \qquad [\mathrm{H}^+] = \sqrt{K_a C}, \qquad \mathrm{pH} = \tfrac{1}{2}(\mathrm{p}K_a - \log C)$$

$$K_a K_b = K_w \ (\text{conjugate pair})$$

Buffers and salt hydrolysis

HENDERSON

$$\mathrm{pH} = \mathrm{p}K_a + \log\frac{[\text{salt}]}{[\text{acid}]}; \qquad \mathrm{pOH} = \mathrm{p}K_b + \log\frac{[\text{salt}]}{[\text{base}]}$$

WEAK ACID + STRONG BASE SALT

$$\mathrm{pH} = 7 + \tfrac{1}{2}(\mathrm{p}K_a + \log C)$$

STRONG ACID + WEAK BASE SALT

$$\mathrm{pH} = 7 - \tfrac{1}{2}(\mathrm{p}K_b + \log C)$$

WEAK ACID + WEAK BASE SALT

$$\mathrm{pH} = 7 + \tfrac{1}{2}(\mathrm{p}K_a - \mathrm{p}K_b)$$

Solubility product

$$A_xB_y: \quad K_{sp} = x^x y^y\, s^{x+y}$$

$$AB:\ K_{sp}=s^2; \qquad AB_2:\ K_{sp}=4s^3; \qquad AB_3:\ K_{sp}=27s^4$$

PRECIPITATION

$$\text{ionic product} > K_{sp} \Rightarrow \text{precipitate}$$

COMMON ION

$$\text{solubility falls: e.g. } s=\frac{K_{sp}}{[\text{common ion}]} \text{ for } AB$$

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