14a. Acid-Base Equilibria

Definitions

Buffer solution: A buffer solution is a solution which is able to resist pH changes upon the addition of a small amount of acid or base.

NOTE: Buffer solution comprises a **WEAK** acid/base and its salt.

Buffer capacity: A measure of a buffer solution's ability to resist pH change and depends on both the absolute and relative component concentrations.

Effective buffer range: The pH range over which the buffer acts effectively in keeping the pH approximately constant.

- Buffer solution must contain relatively high concentrations of both acid/base and conjugate base/acid i.e. **presence of large reservoir of ions ensures that all ions are removed**.
- The more concentrated the components of a buffer, the greater the buffering capacity (absolute)
- When the component concentrations are similar, the buffer-component ratio changes less and **hence the pH changes less** → buffer has maximum buffering capacity when the component concentrations are equal.
- In the presence of a strong acid, a weak acid is deemed to be undissociated.
- To determine which H will be lost, identify which H is bonded to an electronegative atom.

pH + pOH = 14 @25 degrees C

pH = pKa + lg([conjugate base]/[acid])

pOH = pKb + lg([conjugate acid]/[base])

pK(w) = pH + pOH

pK(w) = 14 @25 degrees C

Ka x Kb = Kw \leftarrow the ionic product of water

- Self-ionisation of water is an endothermic process, hence as temperature increases, value of Kw increases → **pH of water decreases as temperature rises**
- The stronger the acidity of an acid, the weaker the basicity of its conjugate base.
- A salt will undergo hydrolysis if either its anion or cation is a strong(er) conjugate base/acid.

14b. Solubility Equilibria

- Solubility equilibria gives a direct a comparison of the solubility of the two salts **only if the total number of ions produced in the solution is the same** in both cases.
- Precipitation occurs if the ionic product is greater than the Ksp of the sparingly soluble ionic compound.
- Solubility product concept is valid only for saturated solutions in which the total concentration of ions is no more than about 0.01 mol/dm³