SL & HL Answers to Strong & weak acids & bases questions

1. i. Hydrochloric acid is a strong acid and so is completely dissociated into its ions. Ethanoic acid is a weak acid so is only slightly dissociated with fewer ions in solution to conduct electricity.

ii. Both acids have the same amount (in mol) of acid so once hydrogen ions from ethanoic acid are neutralised more of the acid dissociates to restore equilibrium until all have reacted.

2. i. $NH_3(aq) + H_2O(l) \rightleftarrows NH_4^+(aq) + OH^-(aq)$

ii. $K_c = \dfrac{[NH_4^+(aq)][OH^-(aq)]}{[NH_3(aq)]}$ (or at HL it can be expressed as $K_b = \dfrac{[NH_4^+(aq)][OH^-(aq)]}{[NH_3(aq)]}$)

(Note that for reactions taking place in aqueous solution $[H_2O(l)]$ does not appear in the rate expression as the concentration of water remains constant.)

iii. Ammonia would be a poorer conductor as there are less ions present as it is a weak base and only slightly dissociated into its ions whereas sodium hydroxide being a strong base is completely dissociated into its ions.

3. i. $CH_3COOH(aq) + H_2O(l) \rightleftarrows CH_3COO^-(aq) + H^+(aq)$

ii. $K_a = \dfrac{[CH_3COO^-(aq)][H^+(aq)]}{[CH_3COOH(aq)]}$

iii. Although both are weak acids, ethanoic acid is weaker as the value for its equilibrium constant is lower so it is even less dissociated than chloroethanoic acid.

4. Ethanol**, t**he conjugate acid of the ethoxide ion, will be less dissociated than water as it will be a weaker acid than water, the conjugate base of the hydroxide ion, so the equilibrium constant will be smaller. This is because the ethoxide ion is the stronger base so will have the weaker conjugate acid.

5. Sulfuric acid a strong monoprotic acid as it is almost completely dissociated to form the HSO_4^- ion and H^+ but not a strong diprotic acid as HSO_4^- behaves as a weak acid when it forms the SO_4^{2-} ion.

6. i. "*Concentrated*" means a considerable amount (in mol) of acid dissolved in one litre (1 dm^3) of aqueous solution, "*corrosive*" means it is very chemically reactive and "*strong*" means the acid is completely dissociated in aqueous solution.

ii. "*Dilute*" means a small amount (in mol) of alkali dissolved in one litre (1 dm^3) of aqueous solution, and "*weak*" means the alkali is only slightly dissociated in aqueous solution.

iii. Although there will be less of the strong acid dissolved in a dilute solution there may be more ions present than in the concentrated solution of the weak acid as the strong acid is completely dissociated into its ions and hence it will be a better conductor.