SL & HL Questions on Strong & weak acids & bases

1. i. Explain why 25.0 cm^3 of 1.00×10^{-2} mol dm^{-3} hydrochloric acid solution, HCl(aq), has a lower pH value than 25.0 cm^3 of 1.00×10^{-2} mol dm^{-3} ethanoic acid solution, $CH_3COOH(aq)$.

ii. When an acid is neutralized by a base the ionic equation for the reaction taking place is: $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

Explain why both of the above solutions react completely with exactly 25.0 cm^3 of 1.00×10^{-2} mol dm^{-3} sodium hydroxide solution, NaOH(aq).

2. The equilibrium constant for the dissociation of ammonia, NH_3, in water is 1.8×10^{-5}.

i. Write the equation for the dissociation of ammonia in water.

ii. Write the equilibrium expression for the dissociation of ammonia in water.

iii. Describe how the electrical conductivity of an aqueous solution of ammonia differs to an aqueous solution of sodium hydroxide with the same concentration.

3. The equilibrium constant for the dissociation of ethanoic acid, CH_3COOH, in water is 1.8×10^{-5}. The equilibrium constant for the dissociation of chloroethanoic acid, $CH_2ClCOOH$, in water is 1.4×10^{-3}.

i. Write the equation for the dissociation of ethanoic acid in water.

ii. Write the equilibrium expression for the dissociation of ethanoic acid in water.

iii. Deduce which of the two acids given above is weaker and explain your reasoning.

4. The ethoxide ion, $C_2H_5O^-$, is a stronger base than the hydroxide ion, OH^-. Deduce how the equilibrium constant for the dissociation of ethanol will differ to the dissociation of water at the same temperature

5. Sulfuric acid is often assumed to be a strong diprotic acid. In fact, the equilibrium constant for the dissociation of $H_2SO_4(aq)$ to form $HSO_4^-(aq)$ and $H^+(aq)$ is 2.4×10^6 and the equilibrium constant for the dissociation of $HSO_4^-(aq)$ to form $SO_4^{2-}(aq)$ and $H^+(aq)$ is 1.0×10^{-2}.

Use this information to properly describe the strength of sulfuric acid.

6. i. Distinguish between the words "*concentrated*", "*corrosive*" and "*strong*" when applied to an acid.

ii. Distinguish between the words "*dilute*" and "*weak*" when applied to an alkali.

iii. Explain why a dilute aqueous solution of a strong acid might be a better conductor of electricity than a concentrated aqueous solution of a weak acid.