EXPERIMENT NO: **DATE:**

Determination of pK_a of a weak acidusing pH Meter.

PRINCIPLE: The dissociation constant of a weak acid referred as K_a and it is given by Ostwald's dilution law.

$$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$$

$$K_a = \frac{[CH_3COO^-]\,[H^+]}{[CH_3COOH]}$$

The strength of the acid is indicated by its dissociation constant. Generally dissociation constant value of a weak acid is small. In order to obtain the dissociation constant value in whole number or to avoid the negative power to it a new term called pK_a value has been derived.

$$pK_a = -\log K_a$$

The pK_a and pH values of a weak acid are related by Henderson-Hasselbalch equation:

$$pH = pK_a + \log \frac{[Salt]}{[Acid]} \quad \text{.....(1)}$$

Addition of a strong base like sodium hydroxide to weak acid like acetic acid neutralizes the acid partially liberating the salt sodium acetate. At the equivalence point or end point all the acid is neutralized. At half equivalence point [salt] = [acid]. Therefore the above equation (1) reduces to $pH = pK_a$. This indicates that at half equivalence point pK_a of the weak acid is equal to pH. Hence pK_a of the weak acid can be defined as pH at half equivalence point.

During the acid base titration, initially pH value of the solution increases gradually and increases more rapidly thereafter till the equivalence point is reached. Once the equivalence point is reached pH value increases in small amounts. To measure the pH values developed by acid two electrodes namely glass electrode and calomel electrodes are used.

PROCEDURE: Pipette out 25 cm^3 of the given weak acid into a clean 100cm^3 beaker. Insert the two electrodes in to it and connect them to pH meter and measure the pH value of the acid and note down the same. Fill a burette with the given sodium hydroxide solution and run down 0.5cm3 of the same in to the beaker. Mix the solution in the beaker well and note down the pH value.

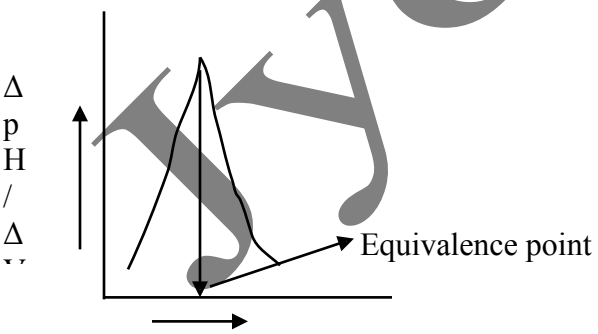
Continue the addition 0.5cm^3 of the solution regularly and note down pH value till a comparatively large jump in pH value is obtained. Then continue the addition of sodium hydroxide for another five times and note down the pH values. Draw two graphs i.e. **$\Delta pH/\Delta V$** versus volume ofsodium hydroxide added and **pH** versus volume of sodium hydroxide added. Then determine pK_a.

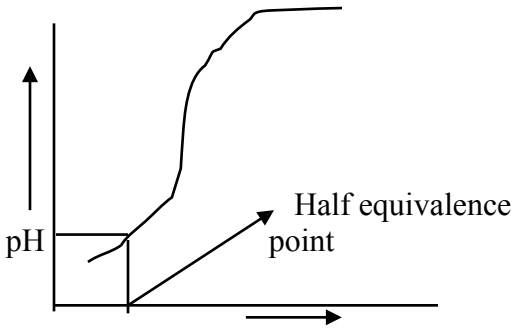
Experiment no:

Observation and Calculations

Volume of NaOH added in cm^3	pH	ΔpH	ΔV	$\frac{\Delta pH}{\Delta V}$

Equivalent point (x) cm^3=
Half equivalence point (x/2) cm^3=
pH corresponding to half equivalence point=





RESULT: pK_a value of the given weak acid= (y)

Signature of the teacher