NEATH PORT TALBOT COLLEGE
COLEG CASTELL NEDD PORT TALBOT

School of Maths & Science
Science Practical

pH Titrations

◆ Aim

By the end of this experiment you should be-able to;

(1) Measure the pH changes that occur using different strength acids and bases
(2) Understand how to use a pH meter to test pH changes
(3) plot graphs of pH against volume of base
(4) Calculate the volume and pH at end point

◆ Safety

Control Measures

- The wearing of safety goggles, gloves and a laboratory coat at all times will be sufficient to take account of most hazards and significant risks.
- Keep stoppers on bottles as much as is possible.
- All waste is to be placed in the labelled container immediately after use.
- You are reminded of the need of good laboratory practise in order to maintain a safe working environment.

Hazards

Corrosive Hydrochloric Acid, Ethanoic Acid, Sodium Hydroxide

◆ **Procedure**

(1) Hydrochloric Acid v Sodium Hydroxide (Strong acid / strong base)

$$HCl + NaQH \longrightarrow NaCl + H_2O$$

Pipette *25* cm^3 of the hydrochloric acid provided into a 25.0cm^3 beaker and add approximately 75cm^3 of deionised water. Rinse the pH electrode and magnetic follower with deionised water. Place the follower in the beaker and clamp the electrode so that it dips into the solution but is clear of the follower. Complete the assembly as shown in the diagram. Fill the burette with the 0.1 mol dm^{-3} sodium hydroxide provided.

Measure the initial pH of the diluted HCl solution. Add 2cm^3 of the NaOH solution and measure the new pH. Repeat the 2cm^3 additions of NaOH, measuring the pH each time, until about 18cm^3 has been added. Reduce the additions to 0.25cm^3 each time until 24cm^3 has been added. Then continue with 2cm^3 aliquots until at least 3.0cm^3 has been added.

Record the results on the answer sheet provided in the columns headed "Volume NaOH added" and "pH". Plot a graph of pH against volume of NaOH added and locate the end-point of the titration as the mid-point of the region where the pH rises rapidly. Report in the appropriate spaces:
i) The volume added at the end-point
ii) The pH at the end-point
(iii) Calculate the concentration of the hydrochloric acid solution provided.

(2) Ethanoic Acid v Sodium Hydroxide (Weak acid / strong base)

$$CH_3CO_2H + NaOH \longrightarrow CH_3CO_2Na + H_20$$

Repeat the method above, using 25cm^3 of ethanoic acid provided instead of hydrochloric acid. Having plotted the graph, report on the answer sheet:

(1) The volume added at the end-point.
(ii) The pH at the end-point
(iii) Calculate the concentration of the ethanoic acid provided.
(iv) Measure the PKa of ethanoic acid, which is equal to the pH of the solution when half the end-point volume had been added. Hence calculate the Ka value for ethanoic acid as the antilog (inverse function to log on a calculator) of PKa.

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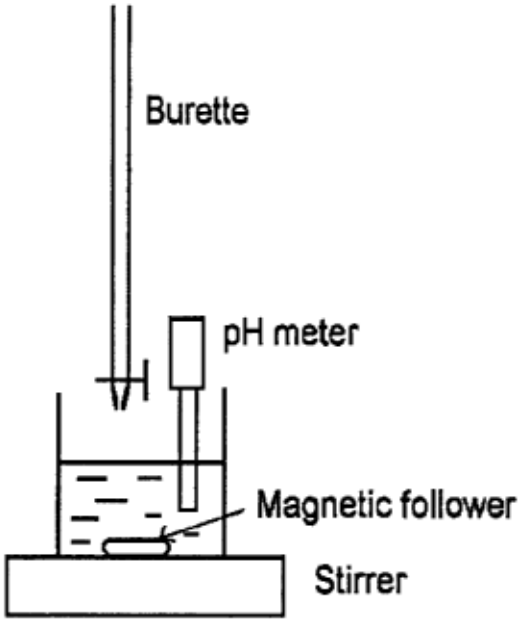

◆ **Results**

(1) Hydrochloric Acid v Sodium Hydroxide

Volume NaOH added	**pH**
units	

Volume NaOH added	**pH**
units	

Volume NaOH added	pH
units	

(1) Volume NaOH added at end-point =

(2) pH at the end-point =

(3) Calculation of HCl concentration =

HCl concentration = moldm^{-3}

(2) Ethanoic Acid v Sodium Hydroxide

Volume NaOH added	pH
units	

Volume NaOH added	pH
units	

Volume NaOH added	pH
units	

(i) Volume NaOH added at end-point =

(ii) pH at the end-point =

(iii) Calculation of ethanoic acid concentration =

Ethanoic acid concentration = $moldm^{-3}$

(iv) pKa ethanoic acid =

(v) K_a ethanoic acid =