Name _____ Date _____

Worksheet 19.1: Practical on acid–base titration using a pH meter, with 0.1 mol dm^{-3} aqueous solutions of NaOH, HCl, NH_3 and CH_3COOH

(TR material subchapter 19.14, main teaching ideas, activity 2)

Analysis of results

1 Record the raw quantitative data in a table. You need to include their units and absolute uncertainties where appropriate.

2 Write a chemical equation for each acid–base titration.

3 Plot a pH titration curve for each acid–base combination (HCl and NaOH, HCl and NH_3, CH_3COOH and NaOH, and CH_3COOH and NH_3), for every 0.5 cm^3 of alkali added to an acid.

4 Identify the equivalence point on each titration curve and measure the pH at the equivalence point.

5 Using the given concentrations of HCl and CH_3COOH, calculate the expected initial pH for the acids (pKa of CH_3COOH is 4.76).

Evaluation of experiment

6 Explain why a pH meter should be calibrated before use.

7 Describe how 25 cm^3 of HCl can be accurately measured.

8 Compare the measured initial pH for each titration with the values obtained in Question 5 and calculate the percentage errors in initial pH values.

9 Explain, using suitable equations, the pH values of the titration mixtures at their equivalence points.

Extension of experiment

10 Using HIn as an example of an indicator, explain qualitatively how an acid–base indicator works.

11 Select a suitable indicator from the IB Chemistry data booklet for each of the acid–base titration combinations. Justify your selection.

12 Explain the difference between the pH range of an indicator and the equivalence point of a titration curve.