

pH scale and salt hydrolysis

1. Titration of a base with an acid

1.1. Into the beaker containing the magnetic dipole, introduce **25 ml of 0.1 M NaOH** solution and top up to 50 ml red cabbage decoction (use a graduated cylinder). Immerse the electrode [the end of the electrode should be 1-2 cm above from the bottom so that the rotating magnetic dipole does not destroy the electrode tip!], start the magnetic stirrer and slowly add (0.5 ml portions) **0.1 M HCl** solution from the burette - while simultaneously measuring and note the pH of the solution.

Add hydrochloric acid and note the pH until the pH is approximately 3 (minimum 3 similar measurement values). While adding the acid, observe and record the color of the titrated solution and the pH meter values at which subsequent permanent color changes.

1.2. Into the beaker containing the magnetic dipole, introduce **25 ml of 0.1 M NH₃ aq** and **25 ml distilled water**. Immerse the electrode [the end of the electrode should be 1-2 cm above from the bottom so that the rotating magnetic dipole does not destroy the electrode tip!], start the magnetic stirrer and add 5 to 10 drops of the indicator chosen by the instructor (bromothymol blue, methyl orange, phenolphthalein or methyl red) to the solution. Then slowly add (0.5 ml portions) **0.1 M HCl** solution from the burette - while simultaneously measuring and note the pH of the solution.

Add acetic acid and note the pH until the pH is approximately 3 (minimum 3 similar measurement values). While adding the acid, observe and record the color of the titrated solution and the pH meter values at which subsequent permanent color changes.

Compilation of the results

- ✓ the results of the measurements should be presented in the form of a table [dependence of added acid (ml) and pH]. On their basis, draw graphs of the solution pH depending on the volume of the titrator. In the graphs mark the neutralization point and the equivalent saturation point. Write a short characterization of the titration curves,
- ✓ based on the observation of the color change of solutions during the titration performed according to points 1.1. and 1.2., give the pH range of the color change of the indicators used and assess their suitability for determining equivalence saturation points for a given titration system.

2. Determination of the acidic, neutral or basic nature of salts

Weigh 0.2 grams of salt into a small beaker, add water up to 2/3 of the volume, and mix until the salt will be dissolve. From the colour obtained, estimate the pH of the solution.

Compilation of the results

- ✓ In the report write the equations of cation as an acid or anion as a base. The results should be presented in a table.

No	Salt	pH	Equation of the reaction of a cation as an acid or anion as a base
1			
2			

3. The scope of the material

Brönsted's theory of acids and bases the ionic product of water and pH concept reactions of acids with bases: strong acid - strong base, strong acid - weak base, weak acid - weak base, weak acid - strong base pH indicators hydrolysis of salts

4. Literature

M. D. Joesten, J. L. Wood, World of Chemistry, second edition, Thomson, USA 1996

G. Charlot, Quantitative inorganic analysis, John Wiley & Sons inc., London 1954

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D. W. Oxtoby, N. H. Nachtrieb, Principles of modern Chemistry, Saunders College Publishing, USA 1996

M. Weller, T. Overton, J. Rourke, F. Armstrong, Inorganic chemistry, Oxford University Press, 2018

C. E. Housecroft and A. G. Sharpe, Inorganic chemistry, Pearson, 2018

