Analysis of Two-component Acid and Base Mixtures

Experiment 3 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To resolve components of the assigned acid-base mixture using the stated titration scheme.

Principle

Two distinguishable titration stages or independently measured equivalents can resolve a mixture when their stoichiometry and endpoint basis are known.

Requirements

- Assigned sodium hydroxide-sodium carbonate, boric acid-borax or oxalic acid-sodium oxalate mixture.
- Standardised titrant, prescribed indicators or pH measurement system and volumetric glassware.

Procedure

1. Select the mixture

Record which of the three mixtures is assigned; complete at least the college-required two options.

2. Write equivalent relations

Use the assigned method equations, hydration forms and endpoint definitions before interpreting readings.

3. Measure endpoints

Perform the prescribed titration stages on measured test portions with appropriate blanks. Record each endpoint separately.

4. Resolve the components

Calculate equivalents of each component from the independent equations and convert to the required concentration basis.

5. Check plausibility

Confirm non-negative component quantities, dilution basis and agreement of replicate results.

Observations and Record

Mixture / reading	Value
Assigned mixture and test portion	_____
First endpoint and definition	_____
Second measurement / endpoint	_____
Component 1 and component 2 content	_____

Worked Example

The numbers below are illustrative; enter your own observations in the record.

- For NaOH + Na2CO3 only: let P be acid volume to phenolphthalein and T be total acid volume to the complete endpoint on the same aliquot.
- NaOH equivalents = N(2P − T)/1000; Na2CO3 moles = N(T − P)/1000, with mL volumes and mol/L acid equivalents.
- Illustration: N = 0.1, P = 15 mL, T = 20 mL. NaOH = 0.001 mol; Na2CO3 = 0.0005 mol. Other mixtures require their own specified relations.

Result

Record the completed observations, calculations and conclusion with units. State any limitation of the observation.

Precautions

- Do not apply the NaOH-carbonate equation to boric acid-borax or oxalic acid-oxalate.
- Use the exact assigned hydration state and endpoint convention.

Viva Questions and Answers

1. Why use two independent measurements?

A mixture has two unknown component amounts and needs sufficient independent analytical information.

2. What does a negative calculated component indicate?

An unsuitable mixture assumption, endpoint error or calculation problem.

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