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Sodium Benzoate by Non-aqueous Titration

Experiment 18 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To standardise the stated titrant and calculate the content of the named compound from a prescribed titration.

Principle

Sodium benzoate is titrated with perchloric acid in the prescribed non-aqueous medium. The medium supports measurement of a weak-base salt that may not give a satisfactory ordinary aqueous endpoint. One mole of sodium benzoate corresponds to one mole of acid under the stated method.

Reaction and Calculation Basis

- $\text{C}_6\text{H}_5\text{COONa} + \text{HClO}_4 \rightarrow \text{C}_6\text{H}_5\text{COOH} + \text{NaClO}_4$.
- Mass sodium benzoate in mg = $V(\text{mL}) \times C(\text{mol/L}) \times 144.11$.

Requirements

- Prescribed assay method, balance, burette, pipette, volumetric glassware and labelled test portion.
- Titration: Approximately 0.1 mol/L perchloric acid in the prescribed non-aqueous system.
- The primary standard or certified standard, prescribed medium and endpoint system named below.

Standardisation of the Titrant

1. Use the standard

Use certified KHP on the stated purity and preparation basis, dissolved in the prescribed non-aqueous solvent.

2. Check the titrant

Use the instructor-provided or commercially standardised reagent. Students do not prepare concentrated perchloric-acid mixtures.

3. Titrate

Use the prescribed potentiometric or validated visual endpoint and solvent blank. $\text{CHClO}_4 = \text{moles KHP} \div \text{corrected volume in litres}$, with the method's temperature correction if required.

Procedure

1. Prepare the portion

Accurately weigh sodium benzoate on the stated assay basis. Use the specified dry non-aqueous solvent and dissolution method.

2. Set the endpoint

Use the prescribed electrode system or indicator; do not substitute an aqueous pH interpretation without validation.

3. Titrate

Titrate with the standardised reagent and run the specified solvent blank under matched conditions.

Pharmaceutical Inorganic and Analytical Chemistry**4. Calculate**

Use the blank-corrected titre, actual acid concentration and 144.11 g/mol formula mass. Apply any specified temperature or basis correction.

Observations and Record

Record	Standardisation	Assay
Standard / test mass	___ g	___ g
Initial / final burette	___ / ___ mL	___ / ___ mL
Blank / corrected titre	___ / ___ mL	___ / ___ mL
Concentration / result	___ mol/L	___% on stated basis

Worked Example

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

- Illustrative KHP standard: $0.40844 \text{ g} / 204.22 \text{ g/mol} = 2.000 \text{ mmol}$. A corrected 20.00 mL titre gives 0.1000 mol/L acid.
- A 0.2000 g sodium benzoate portion gives a corrected 13.88 mL at 0.1000 mol/L. Mass found = $13.88 \times 0.1000 \times 144.11 \approx 200.03 \text{ mg}$.
- Assay $\approx 100.0\%$. At 0.1 mol/L, each mL is equivalent to 14.411 mg sodium benzoate.

Result

Titrant concentration = ___ mol/L. Corrected titre = ___ mL. Calculated content = ___% on the ___ basis; prescribed criterion comparison: ___.

Precautions

- Perchloric-acid reagents require the laboratory's designated facilities and handling controls.
- Use the provided titrant and approved solvent system; do not heat or concentrate perchloric-acid mixtures.
- Water content and temperature can affect the non-aqueous method; follow its specified conditions.
- Use the actual standardised concentration, correct for the prescribed blank and account for any aliquot or dilution. The monograph defines acceptance limits and the as-is, dried or hydrated basis.

Viva Questions and Answers**1. Why use a non-aqueous medium?**

It provides suitable acid-base behaviour and a measurable endpoint for the prescribed assay.

2. Why run a solvent blank?

The solvent or reagents may consume part of the titrant.

3. What is the stoichiometric ratio?

One mole acid per mole sodium benzoate under the stated method.

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