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Sodium and Potassium Estimation by Flame Photometry

Practical 6 - Bench practical

Aim

To determine sodium and potassium concentrations by comparison with suitable flame-emission calibration standards.

Principle

In flame photometry, dissolved species are introduced into a flame, and emitted light at a selected elemental channel is measured. The response is calibrated against known concentrations.

The result depends on aspiration, flame stability, background, ionisation and matrix effects. Sodium and potassium channels require their own calibration; a response in one channel is not the concentration of the other ion.

Materials and Requirements

- Flame photometer with the selected channels
- Certified sodium and potassium standards
- Method-specified blank and matrix-matched diluent
- Calibrated pipettes and volumetric glassware

Procedure

1. Record the instrument channel, gas and aspiration settings, standard concentrations and intended concentration units.
2. Prepare separate or approved mixed calibration standards and an independent check. Match the diluent and relevant matrix conditions.
3. Have the operator complete the prescribed gas, flame and waste checks and establish a stable blank signal.
4. Measure the calibrators from the selected range, then the check and diluted test preparations. Rinse as prescribed between preparations.
5. Repeat checks at intervals and inspect readings for drift, memory effects or unstable aspiration.
6. Calculate concentrations using each channel calibration, reverse dilution and convert units only after checking the atomic-mass basis.
7. Record observed replicate variation and review the result against the applicable material specification.

Observations and Record

Enter actual measurements or the supplied teaching data. Record the method, material identity, conditions and units.

Preparation	Na response	K response	Dilution / result
Blank	Record	Record	Baseline
Calibration levels	Record	Record	Concentration known
Independent check	Record	Record	Recovery
Test preparations	Record	Record	Calculate each ion

Calculations

- Original ion concentration = concentration from channel calibration x dilution factor
- For Na: mmol/L = mg/L / 22.99; for K: mmol/L = mg/L / 39.10

Worked Example

Illustrative sodium calibration gives 2.30 mg/L in a ten-fold dilution.
Original sodium concentration = 23.0 mg/L; amount concentration = 23.0/22.99 = 1.00 mmol/L approximately.
If potassium is 3.91 mg/L in the same dilution, its original level is 39.1 mg/L, or 1.00 mmol/L. These are analytical teaching values, not patient reference intervals.

Result and Interpretation

- Report sodium and potassium separately with the dilution and units.
- Acceptability depends on check-standard recovery, repeatability and the relevant product specification.
- Unexpected concentrations require review of matrix effects and preparation steps.

Precautions

- Gas ignition and shutdown follow the instrument procedure.
- Prevent high-salt deposits and aspirator blockage.
- Use suitable low-contamination water and containers.
- Do not apply biological reference intervals to a pharmaceutical or food preparation.

Viva Questions and Answers

Why use matrix matching?

Matrix differences can alter aspiration and emission response.

Is mg/L the same as mmol/L?

No; conversion depends on the atomic or molecular mass.

Why recheck a standard during the run?

It can reveal drift or changing aspiration efficiency.

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