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Metal Estimation by Flame Photometry and AAS

Practical 6 - Practical study

Aim

To compare flame-emission and atomic-absorption measurements for specified metals.

Principle

Flame photometry measures emitted radiation, whereas AAS measures absorption of element-specific radiation. Calibration, matrix effects, atomisation conditions and interferences must be controlled separately for the selected element and technique.

Materials and Requirements

- Approved metal reference, blank and matrix check
- Qualified flame-emission or AAS instrument
- Validated digestion or dilution record and gas-system controls
- Approved method or teaching-data pack and a dated record sheet

Procedure

1. Define the preparation or dataset, study question and method version. Record identities, units and the criteria to be used before examining the outcome.
2. Choose the element, wavelength, atomisation system and validated preparation for the actual matrix.
3. Prepare calibration, blank and an independent check; verify background and interference controls.
4. Have trained staff operate the specified instrument and assess calibration and replicate readings.
5. Calculate metal content with all dilution and preparation factors and compare technique selectivity and limitations.
6. Retain the original observations and calculations. State deviations, missing information and the limits of the conclusion; do not replace measured values with expected results.

Observations and Record

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

Preparation	Technique / wavelength	Response / concentration	Metal content
Blank	Specify	Measure	Evaluate
Reference check	Specify	Measure	Recovery
Test digest	Specify	Measure	Calculate

Calculations

- Metal content (mg/kg) = concentration (mg/L) x final digest volume (L) x dilution / test mass (kg)

Worked Example

Illustrative digest contains 0.40 mg/L metal in 0.050 L from 0.0020 kg material: content = 10 mg/kg.
This is an arithmetic example; use the actual element-specific specification to assess it.

Result and Interpretation

• State the element, method, blank, recovery and quantitation limits.

Precautions

• Use trained gas and flame operation.
• Prevent metal contamination.
• Do not assume identical matrix effects across elements.

Viva Questions and Answers

What does AAS measure?

Absorption of radiation by atomised analyte species.

Why analyse a blank?

Preparation and reagents may introduce the metal.

Why use a matrix check?

The preparation matrix can change analytical response.

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