Absorption Maxima and Solvent Effects

Practical 01 | Instrumental Methods of Analysis and Novel Drug Delivery Systems

Aim

To study Absorption Maxima and Solvent Effects, and interpret the recorded observations.

Principle

- An absorption maximum is the wavelength of a peak in the stated spectrum. Solvent polarity, hydrogen bonding, pH and analyte ionization can change the spectrum; their effects depend on the transition and molecular form.
- An optical response is related to analyte concentration over the validated working range.
- A blank, suitable standards and consistent optical conditions are necessary for interpreting the response.

Materials and Apparatus

- Assigned organic compound, appropriate solvents, UV-visible instrument and compatible cells.
- Assigned analyte, suitable reference standard, solvent/reagents and volumetric glassware.
- Specified optical instrument and compatible cells or sample-introduction system.

Method

1. Identify the analyte, solvent and relevant ionization conditions.
2. Prepare comparable solutions within a suitable optical range.
3. Run the solvent blank and record the spectrum for each solution.
4. Identify the peak wavelength without confusing it with an instrument artefact.
5. Compare spectral position and shape at documented concentration and conditions.
6. Explain any bathochromic or hypsochromic shift using the stated molecular/solvent context.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Compound/solvent	_____
pH where relevant	_____
Scan range	_____
Peak wavelength	_____
Peak absorbance	_____

Calculations and Interpretation

- Wavelength shift = test-solvent peak wavelength - comparison-solvent peak wavelength.
- Positive shift means movement to a longer wavelength; a shift direction cannot be assumed from polarity alone.

Worked Illustration

Illustration: a peak moving from 260 nm to 270 nm has a +10 nm wavelength shift, described as bathochromic.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use clean compatible cells and consistent orientation where cells are used.
- Keep readings within the calibration range and examine the calibration fit.
- Avoid assuming that another analyte or solvent has the same response factor.

Viva Questions

1. What is a bathochromic shift?

A movement of an absorption feature toward a longer wavelength.

2. What is the role of a blank?

It corrects the contribution of the solvent, reagents and measurement background.

3. Why use several calibration levels?

They establish the usable response-concentration relationship and help reveal nonlinearity.

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