GENERAL

analysis of aspirin tablets lab report spectrophotometric

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Introduction

In the pharmaceutical industry, ensuring the potency and purity of active ingredients is paramount. Aspirin tablets, containing acetylsalicylic acid, are among the most widely used medications worldwide. A reliable, accurate, and reproducible method is essential for determining the exact amount of aspirin present in each tablet. Spectrophotometry, especially UV Vis spectrophotometry, has become the gold standard for the quantitative analysis of aspirin in pharmaceutical dosage forms. This article provides a detailed, step by step guide to preparing a lab report on the spectrophotometric analysis of aspirin tablets. It covers everything from sample preparation and instrument calibration to data interpretation and quality control, making it a valuable resource for students, laboratory technicians, and quality assurance professionals.

Why Spectrophotometry for Aspirin Analysis?

Several analytical techniques can be employed to assay aspirin tablets, including chromatography, titrimetry, and gravimetric analysis. However, spectrophotometry offers unique advantages:

- Speed and simplicity: A UV Vis spectrophotometer can deliver results in minutes without the need for elaborate chromatographic setups.
- High sensitivity: Aspirin absorbs strongly in the UV region, allowing detection at low concentrations.
- Non destructive measurement: Samples can be recovered for further analysis if needed.
- Cost effective: Requires relatively inexpensive reagents and consumables compared to chromatographic solvents.

Because of these benefits, many pharmacopeial monographs and quality control laboratories rely on spectrophotometric assays for routine aspirin testing.

Principles of UV Vis Spectrophotometry

UV Vis spectrophotometry measures the amount of light absorbed by a sample at a specific wavelength. According to Beer Lambert's law, the absorbance (A) is directly proportional to the concentration (c) of the absorbing species, the path length (l), and the molar absorptivity (;R“

A = ;R r Â r 0

For aspirin, the maximum absorbance (;¶Ö ,• typically occurs around 275–280 nm, depending on the solvent and pH. By preparing a calibration curve using known concentrations of acetylsalicylic acid, one can determine the concentration of aspirin in unknown samples by measuring their absorbance at ;¶Ö ,à

Lab Report Structure Overview

A comprehensive lab report should follow a logical sequence that reflects the experimental workflow. The key sections are:

1. Title
2. Abstract

3. Introduction
4. Materials and Methods
5. Results
6. Discussion
7. Conclusion
8. References
9. Appendices (if necessary)

Each section plays a distinct role: the abstract summarizes the work, the introduction sets the context, the methods detail the procedure, results present raw data, discussion interprets the findings, and the conclusion offers final remarks.

Title and Abstract

The title should be concise yet descriptive, e.g., “Spectrophotometric Determination of Aspirin in Commercial Tablets: A Comprehensive Lab Report.”

The abstract (150–250 words) should include:

- Purpose of the study
- Key methodology (spectrophotometric assay at 275 nm)
- Main findings (average content, % deviation from label claim)
- Significance (implications for quality control)

Introduction

In the introduction, explain the importance of aspirin as a therapeutic agent and the regulatory requirement for its accurate quantification. Discuss the common analytical methods and justify the choice of spectrophotometry. Provide a brief literature review of previous spectrophotometric assays, highlighting typical ;¶Ö ,À solvent systems, and calibration ranges. End the section with a clear statement of the study’s objectives, such as “to develop a validated spectrophotometric method for the determination of acetylsalicylic acid in tablet dosage forms and to prepare a detailed lab report documenting the procedure and results.”

Materials and Methods

Reagents and Standards

List all chemicals and materials with purity grades:

- Acetylsalicylic acid ("e 99% purity)
- Acetonitrile (HPLC grade)
- Water (Milli Q or distilled)
- Standard aspirin tablets (e.g., 325 mg)
- Analytical balance (±0.0001 g)
- Ultrasonic bath (optional for dissolution)

Instrumentation

Detail the spectrophotometer specifications:

- Model: Shimadzu UV 2600 (or equivalent)
- Wavelength range: 190–800 nm
- Slit width: 1.0 nm

- Temperature control: 25 /± /1 /°C

Also mention any auxiliary equipment such as a 10 /mL volumetric flask, micropipettes, and a 1 /cm quartz cuvette.

Preparation of Standard Solutions

Describe the step by step preparation:

1. Weigh 0.200 g of pure acetylsalicylic acid on the analytical balance.
2. Dissolve the weighed sample in a 100 /mL volumetric flask with 80 /mL of acetonitrile.
3. Sonicate for 5 /min to ensure complete dissolution.
4. Fill the flask to the mark with acetonitrile and mix thoroughly.
5. Prepare a series of standard solutions (e.g., 10, 20, 30, 40, 50 /µg/mL) by serial dilution.
6. Store standards in amber bottles at 4 /°C until use.

Tablet Sample Preparation

1. Weigh 10 tablets (or a portion equivalent to 10 tablets) and grind them into a fine powder using a mortar and pestle.
2. Weigh an accurate portion of the powder (e.g., 0.500 g) into a 100 /mL volumetric flask.
3. Dissolve in 80 /mL of acetonitrile, sonicate for 10 /min, and filter through a 0.45 /µm PTFE syringe filter.
4. Transfer the filtrate to a 100 /mL volumetric flask and make up to the mark with acetonitrile.
5. Dilute an aliquot (e.g., 1 /mL) of the sample solution to 10 /mL with acetonitrile to obtain the working concentration.
6. All sample solutions should be prepared in triplicate to assess precision.

Calibration Curve Construction

Measure the absorbance of each standard solution at ;¶Ö € (275 nm). Record the absorbance values and plot absorbance versus concentration. Fit the data to a linear regression equation (y = mx + b). Report the regression coefficient (R^2), slope (m), and intercept (b). The acceptable R^2 value should be "e 0.999, indicating excellent linearity.

Sample Analysis

Measure the absorbance of each tablet sample solution at 275 nm under identical conditions. Use the calibration curve to calculate the concentration of acetylsalicylic acid in the sample. Multiply by dilution factors and the tablet weight to determine the drug content per tablet.

Quality Control and Validation Parameters

Discuss the validation criteria according to ICH guidelines:

- Accuracy: Recovery studies at 80%, 100%, and 120% levels.
- Precision: Repeatability (intra day) and intermediate precision (inter day) expressed as %RSD.
- Specificity: Ability to measure aspirin in the presence of common excipients.
- Limit of Detection (LOD) and Limit of Quantitation (LOQ): Calculated using 3.3<2öÒ æB Ã/m respectively.
- Robustness: Variation of parameters such as pH, solvent composition, and wavelength ±1 /nm.

Results

Calibration Curve Data

Present a table of standard concentrations and corresponding absorbance values. Include the regression equation and R^2.

Tablet Assay Results

Show a table summarizing the absorbance readings, calculated concentrations, and drug content per tablet for each sample (in triplicate). Provide the mean, standard deviation, and %RSD.

Recovery Studies

Include a table of spiked samples at 80%, 100%, and 120% with observed recoveries and %RSD.

Discussion

Interpret the results in the context of the method's performance:

- Explain the high linearity and why the chosen ;¶Ö , pas optimal.
- Discuss any deviations from the label claim (e.g., 325 /mg ±5%) and whether the tablets meet regulatory standards.
- Analyze the precision data and compare %RSD values to acceptable limits ("d 2% for repeatability).
- Address the accuracy results, noting that recoveries within 98–102% demonstrate good method reliability.
- Highlight any challenges encountered (e.g., turbidity from excipients) and how they were mitigated (filtering, sonication).
- Compare the spectrophotometric method to alternative techniques like HPLC, noting advantages and limitations.

Conclusion

The spectrophotometric assay described herein provides a rapid, accurate, and cost effective approach for determining acetylsalicylic acid content in commercial aspirin tablets. The method exhibits excellent linearity, high precision, and satisfactory accuracy, meeting the stringent requirements set by pharmacopeial guidelines. It is suitable for routine quality control laboratories and can serve as a benchmark for validating more sophisticated analytical techniques.

References

Include at least five peer reviewed sources, pharmacopeial monographs, and standard analytical texts. Format them in APA or Vancouver style, as preferred.

Appendices

Append any raw data sheets, instrument calibration logs, or safety data sheets (SDS) that support the report.

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