

Continue Learning with FirstHope

Complete Notes on the FirstHope App

Complete subject and semesters are available on FirstHope app only.

- Get complete subject and semester notes in the FirstHope app.
- Available for B.Pharm, D.Pharm, M.Pharm and Pharm.D students.

[Click here to get the FirstHope app](#)

Join the FirstHope Telegram Channel

Join FirstHope Notes and keep up with channel updates.

[Click here to join Telegram](#)

Instagram

@firsthope.official

[Click here to follow Instagram](#)

YouTube Channel

FirstHope-Pharmacy / Live streams

[Click here to watch the YouTube channel](#)

WhatsApp Channel

Follow FirstHope on WhatsApp.

[Click here to join the WhatsApp channel](#)

FirstHope Website

firsthopenotes.com

[Click here to visit the website](#)

Semester 3 - Practical Notes

Pharmaceutical Microbiology

Complete Subject Manual

10 practicals and activities. Use the PDF bookmarks to move between practicals. Page numbers restart within each practical; the page counts below exclude the promotion pages.

Contents

No.	Practical / Activity	Pages
1	Study of Microbiology Equipment and Processing	2
2	Study of Sterilization of Glassware and Culture-Media Principles	2
3	Study of Subculture, Stabs and Slants - Demonstration Study	2
4	Study of Simple, Gram and Acid-Fast Staining	2
5	Study of Pure-Culture Isolation by Streak-Plate Demonstration	2
6	Study of Antibiotic Assay by Cup-Plate and Related Methods	2
7	Study of Motility by Hanging-Drop Demonstration	2
8	Study of Sterility Testing of Pharmaceuticals - Result Interpretation	2
9	Study of Bacteriological Analysis of Water - Data Interpretation	2
10	Study of Biochemical Tests - Teaching-Panel Interpretation	2

Study of Microbiology Equipment and Processing

Practical 01 | Pharmaceutical Microbiology

Aim

To study Microbiology Equipment and Processing, and interpret the recorded observations.

Principle

- Distinguish heating, incubation, refrigeration, microscopy and airflow equipment by their function. A laminar-flow clean bench is not interchangeable with a biological safety cabinet.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Labelled demonstrations of incubator, aseptic hood, autoclave, hot-air sterilizer, freezer, refrigerator and microscope.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Equipment	_____
Working principle	_____
Controlled variable	_____
Application	_____
Operational check	_____

Calculations and Interpretation

- Create a function-to-equipment comparison; no numerical calculation is required.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Study of Sterilization of Glassware and Culture-Media Principles

Practical 02 | Pharmaceutical Microbiology

Aim

To study Sterilization of Glassware and Culture-Media Principles, and interpret the recorded observations.

Principle

- Sterilization is a validated process, not merely exposure to heat. Load characteristics and material compatibility determine the choice of process.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Instructor-completed sterilization records, glassware demonstrations and prepared medium examples.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Material/load type	_____
Process category	_____
Physical records	_____
Indicator interpretation	_____
Medium purpose	_____

Calculations and Interpretation

- Interpret supplied physical and indicator records together; a changed indicator alone does not establish every part of process validity.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Study of Subculture, Stabs and Slants - Demonstration Study

Practical 03 | Pharmaceutical Microbiology

Aim

To study Subculture, Stabs and Slants - Demonstration Study, and interpret the recorded observations.

Principle

- Subculture transfers an established culture to another medium. Stab and slant formats differ in surface area, geometry and observation purpose.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Completed demonstration images of labelled teaching cultures, stabs and slants.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Parent identity	_____
Medium format	_____
Demonstration stage	_____
Appearance	_____
Control interpretation	_____

Calculations and Interpretation

- Describe the purpose and appearance of each prepared format; no growth-rate calculation is required.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Study of Simple, Gram and Acid-Fast Staining

Practical 04 | Pharmaceutical Microbiology

Aim

To study Simple, Gram and Acid-Fast Staining, and interpret the recorded observations.

Principle

- Simple staining emphasizes morphology. Gram staining differentiates cell-envelope staining behaviour; acid-fast staining examines retention of a primary dye after the assigned decolorization stage.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Instructor-supplied fixed slides or completed staining images with controls.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Stain type	_____
Cell shape/arrangement	_____
Observed colour	_____
Control colour	_____
Interpretation	_____

Calculations and Interpretation

- Compare morphology and staining pattern; do not identify a species from stain colour alone.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Study of Pure-Culture Isolation by Streak-Plate Demonstration

Practical 05 | Pharmaceutical Microbiology

Aim

To study Pure-Culture Isolation by Streak-Plate Demonstration, and interpret the recorded observations.

Principle

- Progressive distribution on a prepared streak-plate demonstration can separate visible colonies. A colony appearance does not by itself prove purity or identity.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Completed labelled plate images and instructor-supplied purity-confirmation observations.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Streak region	_____
Distribution pattern	_____
Colony appearance	_____
Purity evidence	_____
Control status	_____

Calculations and Interpretation

- Explain why separated colonies are useful and why further identity/purity evidence is needed.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Study of Antibiotic Assay by Cup-Plate and Related Methods

Practical 06 | Pharmaceutical Microbiology

Aim

To study Antibiotic Assay by Cup-Plate and Related Methods, and interpret the recorded observations.

Principle

- The supplied inhibition-zone data reflect antimicrobial activity under a defined test system. Potency estimation needs a suitable reference preparation and valid controls.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Completed teaching-zone measurements, antibiotic/reference labels and control records.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Preparation label	_____
Reference level	_____
Zone diameter	_____
Replicates	_____
Control status	_____

Calculations and Interpretation

- Use the supplied validated response model to estimate potency.
- Do not assume zone diameter is proportional to concentration or compare different test systems directly.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Study of Motility by Hanging-Drop Demonstration

Practical 07 | Pharmaceutical Microbiology

Aim

To study Motility by Hanging-Drop Demonstration, and interpret the recorded observations.

Principle

- True motility shows directed movement relative to the surroundings. Brownian motion is random displacement and must not be classified as motility.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Instructor-provided completed movement videos or images with comparison material.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Movement direction	_____
Change in position	_____
Background movement	_____
Control observation	_____

Calculations and Interpretation

- Make a qualitative comparison between directed movement and Brownian motion.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Study of Sterility Testing of Pharmaceuticals - Result Interpretation

Practical 08 | Pharmaceutical Microbiology

Aim

To study Sterility Testing of Pharmaceuticals - Result Interpretation, and interpret the recorded observations.

Principle

- A sterility test assesses a defined tested portion. Product inhibition and procedural contamination can invalidate the interpretation.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Completed teaching records for a pharmaceutical sterility test and method-suitability/negative controls.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Product/test portion	_____
Test approach	_____
Growth observation	_____
Control result	_____
Suitability result	_____

Calculations and Interpretation

- A valid absence-of-growth observation applies to the tested portion and conditions; it is not a mathematical guarantee for every unit in a batch.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Study of Bacteriological Analysis of Water - Data Interpretation

Practical 09 | Pharmaceutical Microbiology

Aim

To study Bacteriological Analysis of Water - Data Interpretation, and interpret the recorded observations.

Principle

- Water microbiology uses defined indicator and enumeration methods. A result must retain its unit, dilution and detection limit.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Completed teaching datasets for water indicator tests or plate-count records.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Water record	_____
Test method	_____
Dilution	_____
Observed count or pattern	_____
Control status	_____

Calculations and Interpretation

- When a valid count dataset is supplied: $\text{count per mL} = \text{observed count} \times \text{reciprocal dilution} / \text{volume examined in mL}$.
- For MPN, use the applicable table and stated tube/volume design rather than a plate-count equation.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Study of Biochemical Tests - Teaching-Panel Interpretation

Practical 10 | Pharmaceutical Microbiology

Aim

To study Biochemical Tests - Teaching-Panel Interpretation, and interpret the recorded observations.

Principle

- Biochemical panels compare defined reaction patterns. Individual reactions support identification only within the specified test system and appropriate controls.
- Interpret the prepared teaching material using the biological or quality-control principle assigned to the exercise.
- Positive, negative and procedural controls determine whether an observation can be interpreted.

Materials and Apparatus

- Completed teaching panels for carbohydrate use, catalase, oxidase, indole or other assigned tests.
- Instructor-supplied fixed slides, prepared demonstration images or completed teaching datasets.
- Appropriate viewing equipment, the assigned comparison/control records and an observation sheet.

Method

1. Identify the question being tested and the teaching material supplied.
2. Review the labelled demonstration sequence and identify what each stage is intended to show.
3. Compare the supplied test observations with the relevant control observations.
4. Record the morphology, pattern or numerical endpoint specified for this exercise.
5. Explain the biological meaning of the observation and identify a control failure where present.
6. Write the conclusion only to the extent supported by the completed teaching observations.

Observation Record

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

Observation / parameter	Record / finding
Test name	_____
Test observation	_____
Positive control	_____
Negative control	_____
Interpretation	_____

Calculations and Interpretation

- Prepare a reaction-pattern table; avoid equating one positive result with a confirmed species.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use fixed, prepared or completed teaching material specified by the instructor.
- Preserve specimen labels and avoid interpreting an uncontrolled or mixed result as a verified identity.
- Handle biological material and contaminated waste only through the laboratory arrangements provided.

Viva Questions

1. Why include a negative control?

It reveals an observation caused by background or contamination rather than the intended test.

2. What happens if a required control fails?

The affected test result cannot be accepted as a valid interpretation.

Continue Learning with FirstHope

Complete Notes on the FirstHope App

Complete subject and semesters are available on FirstHope app only.

- Get complete subject and semester notes in the FirstHope app.
- Available for B.Pharm, D.Pharm, M.Pharm and Pharm.D students.

[Click here to get the FirstHope app](#)

Join the FirstHope Telegram Channel

Join FirstHope Notes and keep up with channel updates.

[Click here to join Telegram](#)

Instagram

@firsthope.official

[Click here to follow Instagram](#)

YouTube Channel

FirstHope-Pharmacy / Live streams

[Click here to watch the YouTube channel](#)

WhatsApp Channel

Follow FirstHope on WhatsApp.

[Click here to join the WhatsApp channel](#)

FirstHope Website

firsthopenotes.com

[Click here to visit the website](#)