Pharm.D - Year 1

Remedial Biology

Complete subject manual: 12 practicals and activities. Each chapter includes a student observation or work record.

Use the PDF bookmarks to navigate. The table gives each practical's content-page count; the combined manual has continuous page numbers.

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Introduction to Biology Practicals

Experiment 1 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify the working areas, teaching materials and observation-record format

Principle

Biological observation uses consistent labelling, magnification, comparison and recorded evidence.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Locate microscopy, plant-material and model-study equipment; record their purposes and required care.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Identify the working areas, teaching materials and observation-record format

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Cell Wall Constituents and Cell Inclusions

Experiment 2 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To distinguish cell walls and major inclusions on prepared plant slides

Principle

Plant-cell walls provide support; visible inclusions may include starch grains, crystals, oil bodies and other stored or deposited material.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Compare wall outline, storage bodies and crystal shape with labelled prepared material.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Distinguish cell walls and major inclusions on prepared plant slides

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Stem Modifications

Experiment 3 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify common stem modifications on labelled material

Principle

A modified stem retains features such as nodes, internodes or buds while performing storage, support, protection or vegetative propagation.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Compare rhizome, tuber, bulb, corm, runner, stem tendril and thorn; record the visible feature supporting stem origin.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Identify common stem modifications on labelled material

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Root Modifications

Experiment 4 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify common root modifications

Principle

Roots may be modified for storage, support or specialised gas exchange. Identifying root origin requires structural evidence.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Compare storage roots, prop roots, stilt roots and breathing roots on models; state the observed structure and function.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Identify common root modifications

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Leaf Modifications

Experiment 5 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify common leaf modifications

Principle

Leaves may be modified for protection, climbing, storage or specialised nutrition. Shape alone does not establish the organ of origin.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Compare spines, leaf tendrils, scale leaves, storage leaves and insectivorous-leaf models.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Identify common leaf modifications

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Identification of Fruits and Seeds

Experiment 6 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To classify supplied fruits and seeds using visible structure

Principle

Fruits arise from flower structures and contain seeds; seed coat, embryo and reserve tissue are useful identifying features.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Record fleshy or dry fruit type, splitting behaviour where shown, seed number and labelled seed parts.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Classify supplied fruits and seeds using visible structure

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Permanent Slide Preparation Study

Experiment 7 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To explain the stages of a permanent plant-slide preparation

Principle

A permanent mount preserves a prepared section for repeated viewing. Section quality, staining, dehydration, clearing and mounting influence visibility.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Use an instructor demonstration and prepared sections to trace sectioning, staining, dehydration, clearing, mounting and labelling. Record artefacts seen in the finished mount.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Explain the stages of a permanent plant-slide preparation

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Transverse Sections of Medicinal Plants

Experiment 8 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To compare prepared sections of Senna, Cassia, Ephedra and Podophyllum

Principle

Plant sections can be compared by epidermis, vascular arrangement, supporting tissue and identifying inclusions.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Observe each authenticated prepared section; locate epidermis, cortex, vascular region and the instructor-identified diagnostic feature.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Compare prepared sections of senna, cassia, ephedra and podophyllum

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Simple Plant Physiology Experiments

Experiment 9 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To interpret simple osmosis and transpiration teaching experiments

Principle

Water movement, diffusion and light-dependent processes can be studied by controlled comparisons. A visible change needs a matched control.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Compare an instructor-provided osmosis setup and transpiration record; identify changed and controlled variables and describe the measured outcome.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Interpret simple osmosis and transpiration teaching experiments

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Identification of Animals

Experiment 10 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify teaching animal models and their broad classification

Principle

Animal classification uses structural organisation, symmetry, segmentation and characteristic body structures.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Compare labelled models or photographs and record two visible distinguishing features for each.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Identify teaching animal models and their broad classification

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Detailed Study of the Frog

Experiment 11 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify frog anatomy and compare major systems

Principle

A frog provides a comparative vertebrate model. External and internal structures should be identified on labelled models or prepared teaching diagrams.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Use a labelled model or virtual anatomy session; trace digestive, circulatory, respiratory, urinary and reproductive structures without performing a dissection.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Identify frog anatomy and compare major systems

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

Computer-Based Biology Tutorials

Experiment 12 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To complete a structured digital biology activity and record outcomes

Principle

An interactive tutorial can connect a labelled structure, a process and feedback on an identification task. Completion requires evidence of learning.

Requirements

- Instructor-provided labelled diagrams, traces or data for this activity.
- Calculator, graph paper or spreadsheet, and the activity record.

Procedure

1. Prepare

Identify the supplied material, teaching objective and observation format.

2. Observe

Record tutorial topic, complete the assigned identification or process tasks and explain corrected errors using labelled diagrams.

3. Record and explain

Draw or tabulate the observed features. Explain a conclusion supported by those observations and one limitation.

Observations and Record

Record item	Entry
Activity / material identifier	_____
Measurement or visible feature	_____
Comparison / calculated outcome	_____
Interpretation and limitation	_____

Result

The recorded finding is ____; the supporting observation or calculation is ____. The main limitation is ____.

Precautions

- Use the supplied teaching material; distinguish a measured observation from an assumed value.
- Keep units, axes, labels and measurement conditions consistent.
- Record limitations and seek instructor review before applying a conclusion to a live case.

Viva Questions and Answers

1. What is the main endpoint?

Complete a structured digital biology activity and record outcomes

2. Does one observed result prove a general conclusion?

No. Controls, repeatability and the limitations of the method must be considered.

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