Lab 3: Introduction to Microscopy

BIOL-8

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Objectives

By the end of this lab, you will be able to:

- **Identify and label the parts** of a compound light microscope
- **Describe the function** of each microscope component
- **Demonstrate proper microscope handling** and focusing techniques
- **Calculate total magnification** using eyepiece and objective powers
- **Prepare wet mount slides** for observation
- **Draw biological specimens** as seen through the microscope at different magnifications

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Introduction

The microscope is one of the most important tools in biology. It allows us to see structures invisible to the naked eye—from individual cells to microorganisms to the intricate details of tissues. The term "microscope" comes from the Greek words *mikros* (small) and *skopein* (to look at).

Historical Note: In 1665, Robert Hooke used an early microscope to observe cork and coined the term "cells" because the tiny compartments reminded him of monks' rooms (cells) in a monastery.

Key Terms:

- **Magnification**: How many times larger an object appears compared to its actual size
- **Resolution**: The ability to distinguish two close objects as separate (clarity)
- **Field of View (FOV)**: The circular area visible through the microscope

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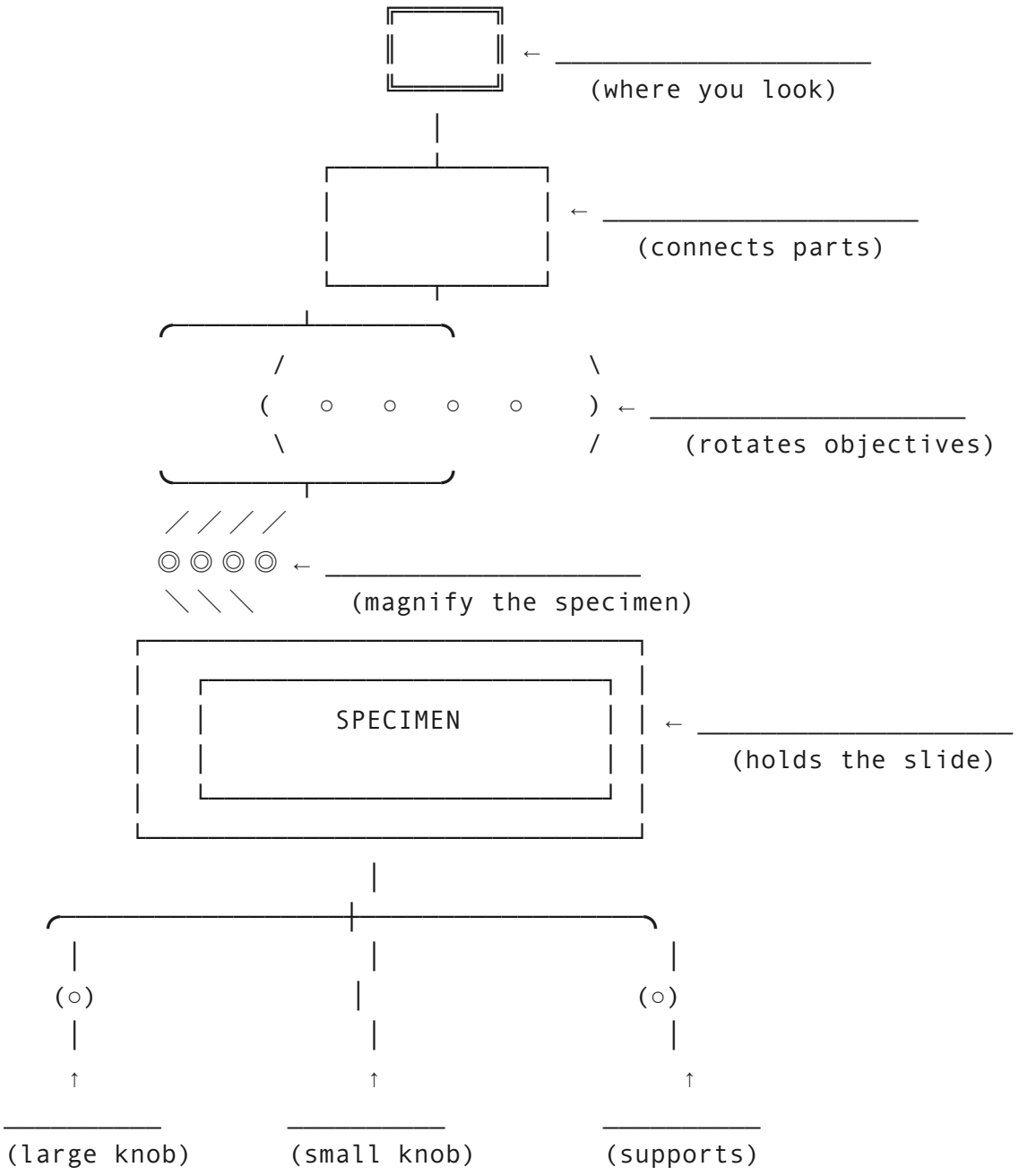
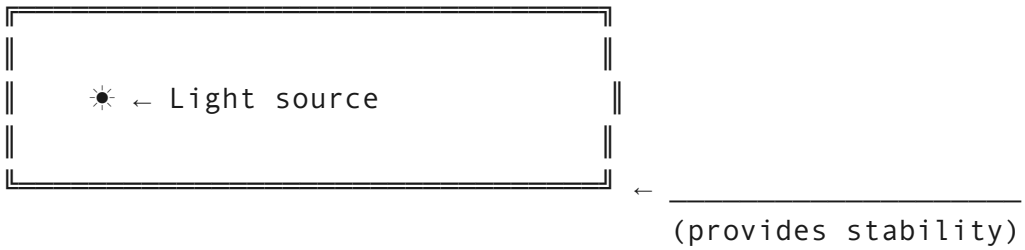
Part 1: Parts of the Compound Microscope

> ***Learning Goal:*** *Identify and understand the function of each component of the compound light microscope.*

Microscope Diagram

Study the microscope at your station. Label each part on the diagram below by writing the part name on the corresponding line.





Microscope Parts Reference Table

Complete the table below by filling in the location and function of each microscope part.

Microscope Parts — Identification and Function

#	Part Name	Location	Function
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Magnification Calculations

Calculate the total magnification for each objective lens. The eyepiece on your microscope is **10×**.

Formula: Total Magnification = Eyepiece Power × Objective Power

Calculating Total Magnification

#	Objective Lens	Objective Power	Eyepiece Power	Total Magnification
1				
2				
3				
4				

Part 2: The Letter "e" — Image Orientation

> ***Learning Goal:*** *Discover how images appear through the microscope compared to the naked eye.*

Background

The compound microscope uses two lens systems (eyepiece and objective) that together create an image that is both **inverted** (upside down) and **reversed** (left-to-right mirror image). Understanding this is essential for navigating specimens.

Procedure

1. Obtain a prepared slide of the letter "e" (or make one from newspaper)
2. Place the slide on the stage with the letter "e" **right-side up and facing you**
3. Start with the **4× (scanning) objective**
4. Use the **coarse adjustment** to bring the letter into focus
5. Refine with the **fine adjustment**
6. Center the letter "e" and increase to **10× objective**

Observations

Draw the letter "e" exactly as it appears:

As placed on stage (naked eye)	As seen through microscope (4×)	As seen through microscope (10×)
e		

1. Is the image upside down, right-side up, or rotated?

2. Is the image reversed (mirror image) compared to the original?

3. Complete this summary: Under the microscope, images appear ___ and _____.

Movement Investigation

While viewing the letter "e" at low power:

When you move the slide to the RIGHT, which direction does the image appear to move?

When you move the slide AWAY from you (toward the back of the stage), which direction does the image appear to move?

Practical Question: If you want to center a specimen that appears in the upper-left corner of your field of view, which direction should you actually move the slide?

Part 3: Observing and Drawing Prepared Slides

> ***Learning Goal:*** *Practice proper microscopy technique while observing and accurately drawing biological specimens.*

Proper Microscopy Procedure

1. **Always start with the lowest power objective (4×)**
2. Use **coarse adjustment** first, then **fine adjustment**
3. **Center the specimen** before switching to higher power
4. When switching to higher magnification:
5. Use **ONLY the fine adjustment knob** (never coarse!)
6. Adjust the **diaphragm** if the image is too bright or too dark
7. **Never use the coarse adjustment on high power** (40× or 100×)

Specimen Observations

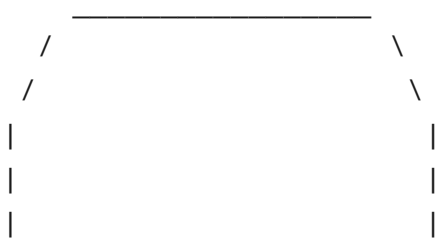
For each prepared slide, observe at multiple magnifications and create detailed drawings.

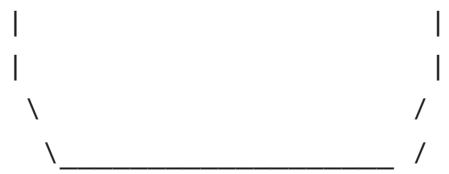
Specimen 1: _____

Specimen 1 Observations

#	Magnification	Field of View Description	Colors Observed	Structures Identified
1				
2				

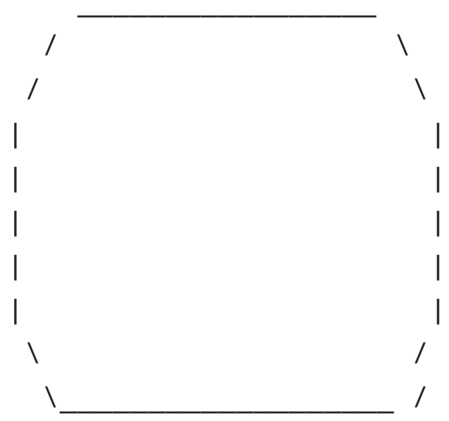
Drawing at Low Power (100×):





Total Magnification: _____×
Specimen: _____

Drawing at High Power (400×):



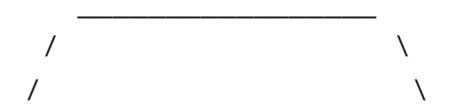
Total Magnification: _____×
Specimen: _____

Specimen 2: _____

Specimen 2 Observations

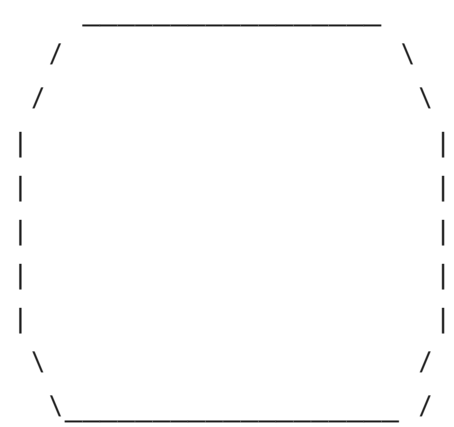
#	Magnification	Field of View Description	Colors Observed	Structures Identified
1				
2				

Drawing at Low Power (100×):



Total Magnification: _____×
Specimen: _____

Drawing at High Power (400×):



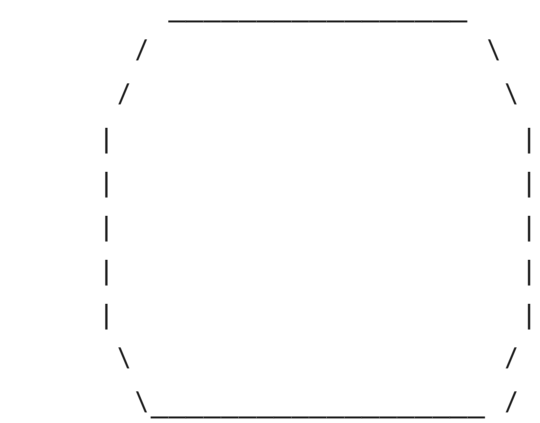
Total Magnification: _____×
Specimen: _____

Specimen 3: _____

Specimen 3 Observations

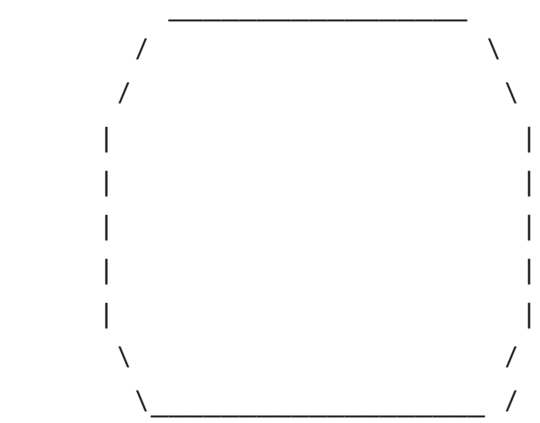
#	Magnification	Field of View Description	Colors Observed	Structures Identified
1				
2				

Drawing at Low Power (100×):



Total Magnification: _____×
Specimen: _____

Drawing at High Power (400×):



Total Magnification: _____×
Specimen: _____

Part 4: Making Wet Mount Slides

> ***Learning Goal:*** *Learn to prepare your own slides for microscopic observation.*

Materials

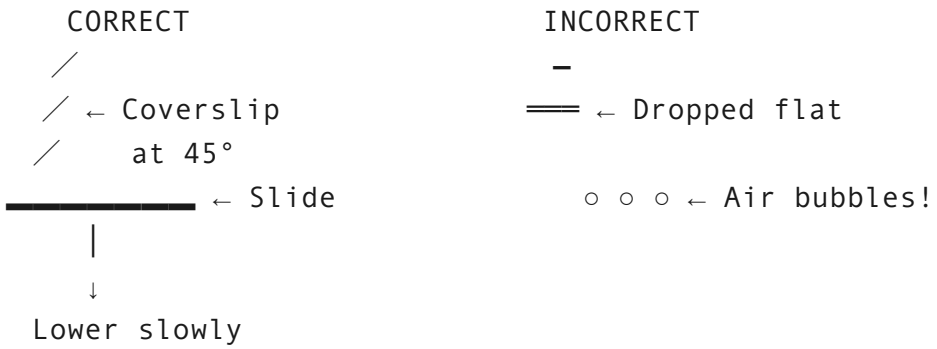
- Clean glass slides
- Coverslips

- Dropper bottle with water
- Specimens provided by instructor

Wet Mount Procedure

1. Place a **clean glass slide** on a flat surface
2. Add **ONE small drop of water** to the center of the slide
3. Place the specimen **in the water drop**
4. Hold a coverslip at a **45° angle**, touching one edge to the water
5. **Slowly lower** the coverslip to avoid trapping air bubbles
6. Blot excess water with a paper towel if needed

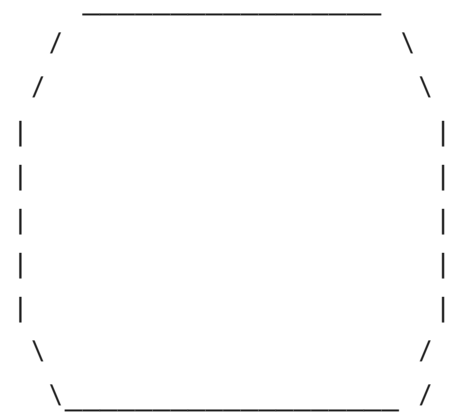
Avoiding Air Bubbles:



Wet Mount Observations

Wet Mount 1:

Drawing:

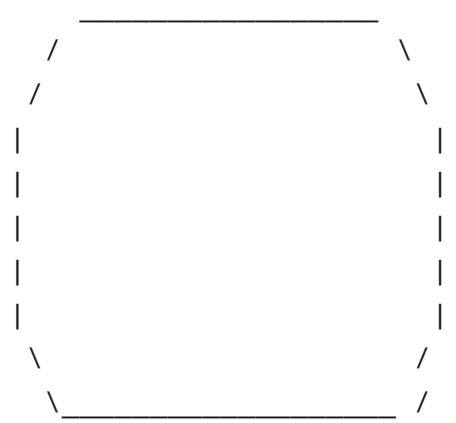


Total Magnification: _____×
Specimen: _____

Describe what you observed. What details became visible at higher magnification?

Wet Mount 2:

Drawing:



Total Magnification: _____×
Specimen: _____

Describe what you observed. Were there any challenges with this specimen?

Part 5: Microscope Care and Storage

> ***Learning Goal:*** *Learn proper care and storage procedures to maintain microscope function.*

End-of-Lab Checklist

Before putting away your microscope, complete the following:

- [ ] Rotate to the **lowest power objective (4×)**
- [ ] Remove slide from stage and clean if needed
- [ ] **Lower the stage** to its lowest position
- [ ] Clean lenses with **lens paper only** (never paper towels or tissues!)
- [ ] **Turn off the light source**
- [ ] Wrap the cord neatly
- [ ] Cover the microscope (if covers are used)
- [ ] Return to the proper storage cabinet

Why is it important to store the microscope on the lowest power objective?

Why should you never use paper towels to clean the lenses?

Conclusions

1. Summarize in your own words how the compound microscope creates a magnified image:

2. What was the most interesting or surprising thing you observed under the microscope today?

3. Why do biologists and medical professionals use microscopes? Give two specific examples:

4. What difficulties did you encounter, and how did you solve them?

Quick Reference

Magnification Formula

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Total Magnification = Eyepiece Power × Objective Power
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Common Objective Lens Colors (may vary by manufacturer)

Objective	Color Band	Magnification
Scanning	Red	4×
Low Power	Yellow	10×
High Power	Blue	40×
Oil Immersion	White	100×

Rules for Focusing

1. **START LOW** — Always begin with the lowest power objective
2. **COARSE FIRST** — Use coarse adjustment to find the specimen

3. **FINE FOCUS** — Use fine adjustment to sharpen the image
4. **HIGH POWER = FINE ONLY** — Never use coarse adjustment on 40× or higher

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Connection to Module 03: Understanding microscopy is fundamental to studying cell biology. The techniques you learned today—proper focusing, slide preparation, specimen drawing—will be essential for observing cells, tissues, and microorganisms throughout this course. Microscopy is also a critical diagnostic tool in medicine, from blood smears to tissue biopsies.

Lab adapted for BIOL-8: Human Biology, Spring 2026