Lab 3: Introduction to Light 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
- **Observe and draw biological cells** at different magnifications
- **Prepare wet mount slides** for microscopic observation

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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Materials

- Compound light microscope (1 per student or pair)
- Prepared slides (cells, tissues)
- Blank glass slides and coverslips
- Lens paper
- Dropper bottle with water
- Optional specimens for wet mounts

Part 1: Microscope Anatomy & Labeling

> ***Learning Goal:*** *Become familiar with the parts of a compound light microscope and their functions.*

Using the microscope at your station, examine its parts carefully. In the large box below, **draw your microscope** and label it using the terms from the list.

Draw your compound light microscope here:

Terms to Label on Your Drawing

Use the following terms to label your drawing. Draw lines from each part to its label on your diagram.

Term	Function
Eyepiece (Ocular Lens)	Lens you look through; typically 10× magnification
Objective Lenses	Rotating lenses providing different magnifications (4×, 10×, 40×)

Term	Function
Revolving Nosepiece	Rotates to change objective lenses
Stage	Platform where the slide is placed
Stage Clips	Hold the slide in place on the stage
Coarse Adjustment Knob	Large knob for rough focusing (use only with low power)
Fine Adjustment Knob	Small knob for precise focusing
Diaphragm/Iris	Controls the amount of light passing through specimen
Light Source	Illuminates the specimen from below
Arm	Used to carry the microscope; connects body to base
Base	Bottom support of the microscope

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				

Reflection Questions:

1. Why should you always start focusing with the lowest power objective lens?

1. Why is it important to never use the coarse adjustment knob with high power objectives?

Part 2: Observing Prepared Cell Slides

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

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×)

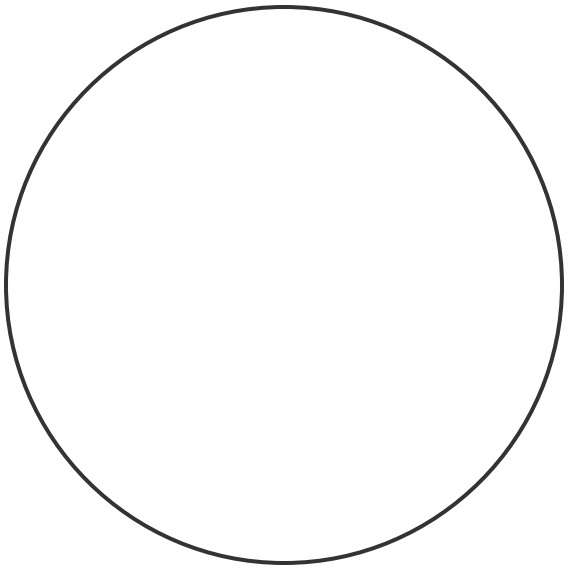
Specimen A: _____

Slide Description: _____

Observation Drawings

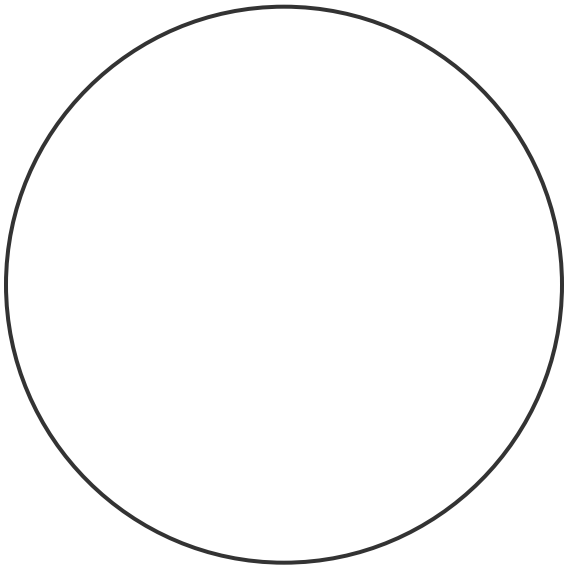
In the circles below, draw what you see at **low power** and **high power**. Your drawings should accurately represent what you observe—include details like cell shapes, structures, colors, and relative sizes. Label any identifiable structures.

Low Power (Total Magnification: ____×)



Magnification used:

High Power (Total Magnification: ____×)



Magnification used:

Observations for Specimen A:

1. Describe the overall shape of the cells:

1. What structures can you identify inside the cells?

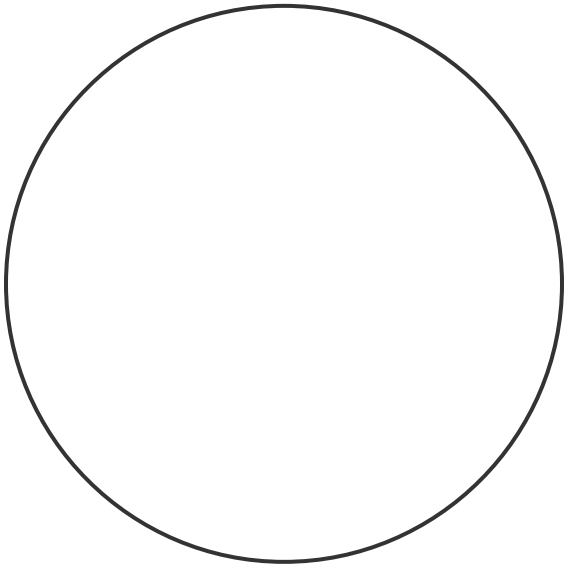
1. Are the cells all the same size? Estimate how many cells fit across the field of view:

Specimen B:

Slide Description:

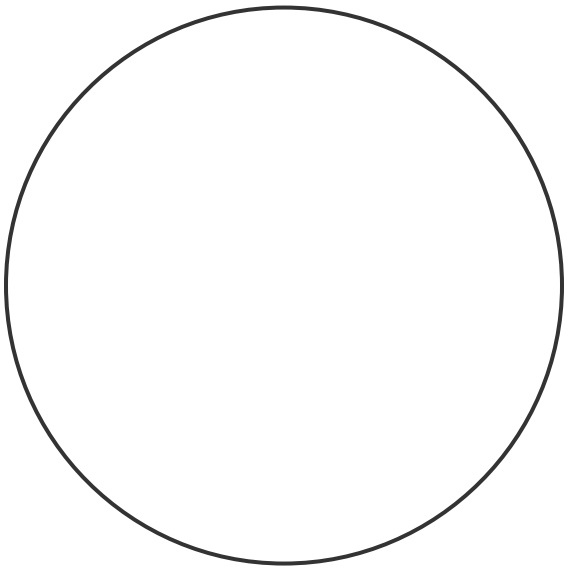
Observation Drawings

Low Power (Total Magnification: ____×)



Magnification used:

High Power (Total Magnification: ____×)



Magnification used:

Observations for Specimen B:

1. Describe the overall shape of the cells:

1. What structures can you identify inside the cells?

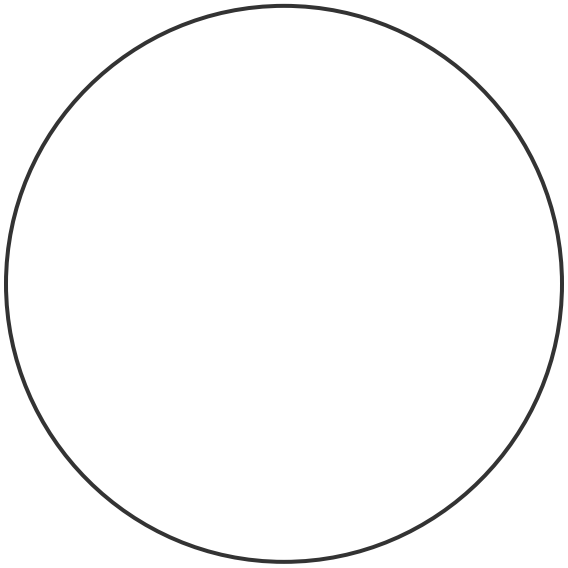
1. How do these cells compare to Specimen A?

Specimen C:

Slide Description:

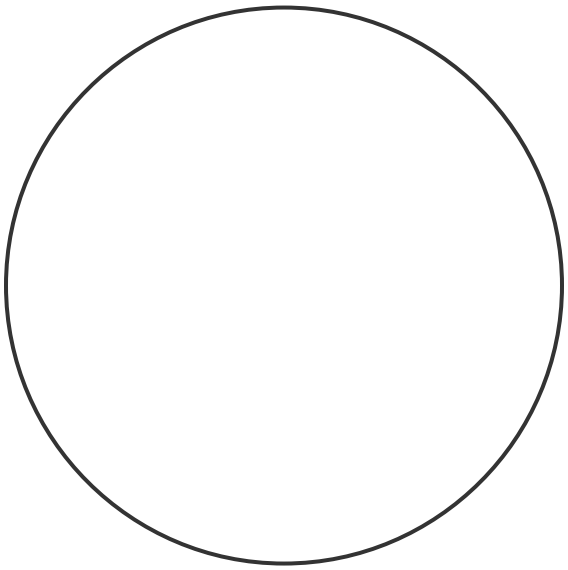
Observation Drawings

Low Power (Total Magnification: ____×)



Magnification used:

High Power (Total Magnification: ____×)



Magnification used:

Observations for Specimen C:

1. Describe the overall shape of the cells:

1. What structures can you identify inside the cells?

1. What is unique or interesting about this specimen?

Part 3: Comparing Cell Types

Learning Goal: *Compare and contrast the structural features of different cell types.*

Based on your observations from Part 2, complete the comparison table below.

Cell Type Comparison

#	Feature	Specimen A	Specimen B	Specimen C
1				
2				
3				

Analysis Questions:

1. Which specimen showed the clearest cellular structures? Why do you think this is?

1. Based on your observations, what might be the function of cells that are:
2. Long and thin (like some muscle cells)?

- Flat and scale-like (like some skin cells)?

1. Why is it important for scientists and medical professionals to be able to identify different cell types?

Part 4: Making Wet Mount Slides

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

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

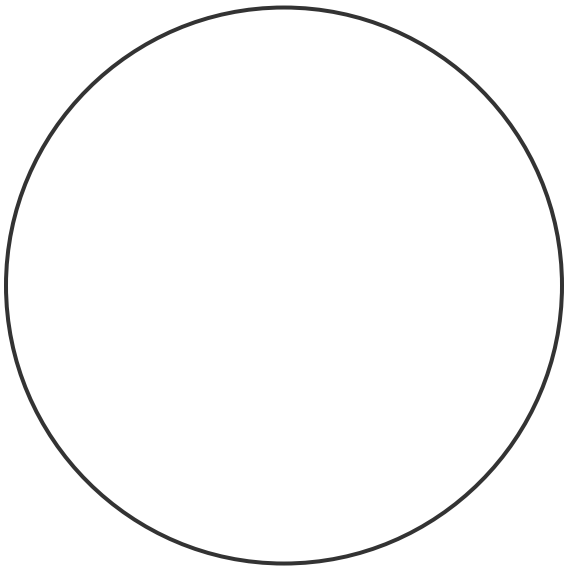
Tip: If you see large circular objects that are all the same size, those are likely air bubbles, not cells!

Wet Mount Observation: _____

Specimen/material used: _____

Observation Drawing

Magnification: ____×



Total magnification used:

Describe what you observed:

Were there any challenges with preparing or viewing this specimen?

Part 5: Optional — Creative Specimen Observation

> ***Learning Goal:*** *Apply your microscopy skills to explore specimens of your own choosing.*

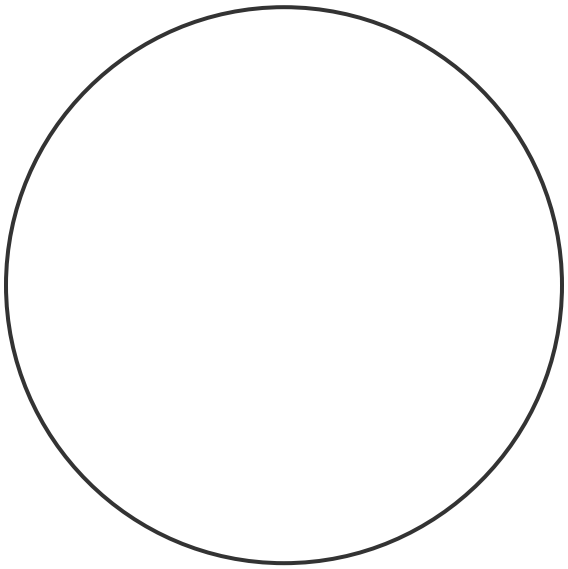
Complete this section if time permits and with instructor approval.

Specimen chosen:

Why did you choose this specimen?

Observation Drawing

Magnification: ____×



Total magnification used:

What did you discover about this specimen?

What questions do you have about what you observed?

Part 6: 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 return prepared slides
- [ ] Dispose of any wet mount slides properly
- [ ] **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?

Conclusions

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

2. Of the cells you observed today, which type was most interesting to you? Why?

3. How might microscopy be used in medical settings? Give two specific examples:

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

5. What specimen would you want to examine under a microscope in the future? Why?

Quick Reference

Magnification Formula

Total Magnification = Eyepiece Power × Objective Power

Common Objective Lens Colors (may vary by manufacturer)

Objective	Color Band	Magnification
Scanning	Red	4×
Low Power	Yellow	10×
High Power	Blue	40×

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 Human Biology: Understanding microscopy is fundamental to studying cells and tissues. The techniques you learned today—proper focusing, slide preparation, specimen drawing—will be essential for observing human cells, tissues, and microorganisms throughout this course. In medicine, microscopy is a critical diagnostic tool used for analyzing blood smears, tissue biopsies, and identifying pathogens.

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