BIO 201 Lab 1
Experiments 1, 2, 3

Professor Diane Hilker
Overview

I. Exp. 1: Introduction to the Microscope
II. Exp. 2: Survey of Microbes
III. Exp. 3: Collection of Microbes
I. Exp. 1: Intro. to the Microscope

- **Purpose:** To review the use & care of the compound light microscope

Fig. 3.1 Textbook
I. Exp. 1: Intro. to the Microscope

- Compound Binocular Light Microscope
  - (2) Sources of Magnification:
    - Eyepiece or Ocular (10x)
    - Objectives (4):
      - Scanning Power: 4x
      - Low Power: 10x
      - High Power: 40x
      - Oil Immersion: 100x
  - Parfocal: ability to go from one objective to another with minimal focusing
I. Exp. 1: Intro. to the Microscope

- Total Magnification: TM
  - TM = Magnification of Eyepiece × Magnification of Objective

<table>
<thead>
<tr>
<th></th>
<th>Eyepiece Magnification</th>
<th>Objective Magnification</th>
<th>TM</th>
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<tbody>
<tr>
<td>Scanning</td>
<td>10X</td>
<td>4X</td>
<td>40X</td>
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<tr>
<td>Low</td>
<td>10X</td>
<td>10X</td>
<td>100X</td>
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<tr>
<td>High Dry</td>
<td>10X</td>
<td>40X</td>
<td>400X</td>
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<tr>
<td>Oil Immersion</td>
<td>10X</td>
<td>100X</td>
<td>1000X</td>
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I. Exp. 1: Intro. to the Microscope

- Resolution or Resolving Power (RP)
  - Ability to distinguish detail clearly
  - To be able to tell 2 points as separate points and not one point

- \[ RP = \frac{\text{Wavelength of Light}}{2 \times \text{Numerical Aperture}} = \frac{\lambda}{2\text{NA}} \]
I. Exp. 1: Intro. to the Microscope

- Wavelength of light (nm)
  Red light = 700 nm
  Blue light = 400 nm

- \[ \text{RP}_{\text{red}} = \frac{700 \text{ nm}}{2(1)} = 350 \text{ nm} \]
- \[ \text{RP}_{\text{blue}} = \frac{400 \text{ nm}}{2(1)} = 200 \text{ nm} \]

- Lower the resolution, better the clarity
- Blue filter provides the best resolution with a halogen light bulb
- Blue filter NOT needed with microscopes that have a LED light bulb
Numerical Aperture (NA): describes the cone of light that enters the lens so as to see fine detail. Two things make up NA:

- **Angular Aperture**: angle of light as it goes through the lenses & filters of the condenser & into the objective (Constant)
- **Refractive Index**: how light travels through a medium
  - Refractive Index of Air = 1.0
  - Refractive Index of Oil = 1.5
I. Exp. 1: Intro. to the Microscope

- \( R_{\text{air}} = \frac{400 \text{ nm}}{2(1.0)} = 200 \text{ nm} \)
- \( R_{\text{oil}} = \frac{400 \text{ nm}}{2(1.5)} = 133 \text{ nm} \)

- Better resolution with oil
Overview

I. Exp. 1: Introduction to the Microscope

II. Exp. 2: Survey of Microbes

III. Exp. 3: Collection of Microbes
II. Exp. 2: Survey of Microbes

**Purpose:** To become familiar with using a microscope & to view various microbes

- **Wet Mount:** observing living cells
  - Focus on edge of coverslip
  - Scanning–dim light using diaphragm
  - Move toward center of slide
  - Observe under Low & High Powers
  - Slides will dry out quickly
II. Exp. 2: Survey of Microbes

4 Slides: Largest to smallest microorganisms

1. Pond Water: algae—much variation
II. Exp. 2: Survey of Microbes

2. Protozoa: single celled eukaryotic microbes that move by different methods that belong to the Protista kingdom.

- **Pseudopods**: false feet
  - Amoeba

- **Cilia**
  - Paramecium

- **Flagella**
  - Euglena
3. **Yeast**: single celled eukaryotic microbes that belong to the Fungi kingdom

- Ovoid & irregular
- Budding: method of reproduction
- Brownian movement
- Smaller than protozoa
- Larger than bacteria
II. Exp. 2: Survey of Microbes

4. Bacteria (Hay infusion): single celled prokaryotic microbes that belong to the Monera kingdom.
   - Must view under 400x
   - Very small
   - Motile & non-motile
   - Looks like specks of sand
   - Hard to discern shape
   - Smaller than yeast and protozoa
   - Protozoa may be present in the sample
Overview

I. Exp. 1: Introduction to the Microscope

II. Exp. 2: Survey of Microbes

III. Exp. 3: Collection of Microbes
III. Exp. 3: Collection of Microbes

- **Purpose:** To collect and grow microbes from the environment for observation
  - Procedure to be described by lab instructor