LAB WORK 2

Subject: The Laboratory Microscope.
Session Purpose: How to Use a Compound Light Microscope.
Objectives:
1. Learn proper use and care of a compound light microscope.
2. Use the terminology (listed) correctly.
3. Perform exercises 1-3.

Parts of the Microscope.

Basically, the microscope consists of a support system, a light system, a lens system, and a focusing system. Each of these systems works together to produce a magnified image of the specimen.

Support System. The support system consists of the base, arm, and stage. The base and arm are structural elements which hold the other parts of the microscope in place while the stage holds the slide. Depending on the microscope, the slide can be positioned under two **spring clips** and moved by the fingers, or it can be held in place by a mechanical stage and moved by means of two control knobs.

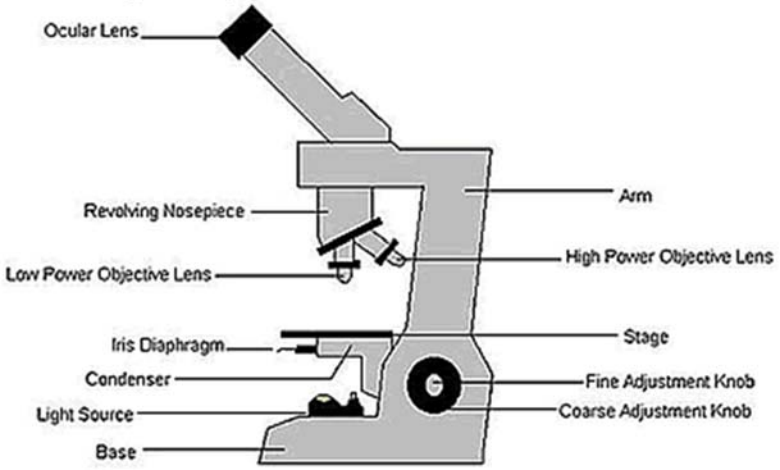
Light System. The light system passes light through the specimen using the light source, the condenser, and the iris diaphragm. In a bright-field microscope, an incandescent bulb is usually used as the source of illumination. Light from the light source then passes through the condenser which focuses the light on the specimen. An iris diaphragm is used to control the **intensity**, or brightness, of light which passes through the specimen, thus allowing the operator to adjust the intensity and achieve an optimum viewing contrast.

Lens System. The lens system forms the actual image which you will see when you look through a microscope. A typical compound microscope has two lenses - an objective lens near the specimen and an ocular lens at the top - each of which magnifies the image of the specimen by a certain amount.

The ocular lens on most microscopes magnifies 10x (meaning that the image produced by the ocular lens is ten times as large as the specimen). In contrast, the typical microscope has at least three **objective lenses** mounted on a revolving nosepiece to allow for different magnifications. The low-power objective is the shortest and generally magnifies 10x; the middle-sized lens is the high-dry objective which usually magnifies between 40x and 45x; and the longest lens is the oil-immersion lens which usually magnifies between 97x and 100x.
To determine the **total magnification(TM)** of the image, **simply multiply** the magnification power of the ocular lens by the magnification power of the objective lens which is being used. For example, if you are using a high-dry objective with a magnification power of 40x, then the total magnification will be 10 × 40 = 400x. Alternatively, using the 10x low-power objective, the total magnification would be simply 10 × 10 = 100x. As you can see, you would use the higher power objective lenses to magnify smaller objects and the low-power objective lens to magnify large objects. There is a limit to the amount of useful magnification one can achieve with a light microscope. The maximum resolving power normally possible with a light microscope is about 0.2 micrometers (um), or 1/100,000 inch. Smaller objects can be viewed using an electron microscope.

Focusing System. The final system at work in the microscope is the focusing system. So far, we have learned how all of the components of the microscope are held together by the support system, how the light system sends light through the specimen, and how the lens system uses that light to magnify the specimen's image and transmit it to our eyes. The focusing system adjusts the **distance** between the **slide** and the **objective lens** so that the image comes into focus.

The focusing system consists of **two knobs** - the coarse adjustment knob and the fine adjustment knob. When focusing, the operator first turns the coarse adjustment knob (which is the larger focus knob) in order to move the stage a large distance and bring the image into the focal plane of the objective lens. At this stage, the image will be visible but fuzzy. Then the operator turns the smaller knob, known as the fine focus knob, to fine tune the focus and to make the image sharply focussed.



Parts of the Microscope

Care of the Microscope.

Microscopes are delicate pieces of equipment, so you should follow a few basic rules to prevent damage to the microscope. These rules are meant to prevent you from:

- dropping the microscope
- damaging the lenses;
- storing the microscope improperly.

Dropping a microscope can break the lenses or can alter the alignment of the lenses. To prevent this damage, you should always carry the microscope with two hands - one hand under the base and the other hand on the arm of the microscope. When using the microscope, keep the instrument at least six inches from the edge of the lab table and keep any excess electrical cord on the table top to keep the microscope from being pushed or pulled off the table. The microscope's lenses are very delicate and can easily be scratched or damaged by oils. **Lenses should be cleaned before and after each use with special lens paper.** (Cleaning with paper towels or cloth can damage the lenses.)

In addition, you should refrain from touching the glass lens with your finger to avoid depositing oils or scratching the glass. When using the microscope to view a specimen, you should follow common sense rules of behavior. **Do not tamper with any part of the microscope unless you understand its purpose.** A common mistake is to focus quickly while looking through the eyepiece of the microscope so that the objective lens bumps into the slide. To prevent damage to the lens, you should **always make large focus changes slowly** while observing the movement of the objective lens from the side of the microscope.

Finally, the microscope should be **stored carefully**. Unplug the electrical cord by pulling on the plug instead of the cord. Remove oil from the oil-immersion objective using lens paper, then turn the nosepiece so that the low-power objective is in place. Carefully lower the objective to its lowest position by turning the coarse adjustment knob. Then store the microscope under a dust cloth.

Lab Exercise 1.Parts of the Microscope.

Examine your microscope carefully. Find the location of each of the parts listed below:

- OcularLens
- Nosepiece
- Objectives
- Low-dry
- High-dry
- Oil-immersion
- MechanicalStage
- CoarseAdjustmentKnob
- FineAdjustmentKnob
- Condenser
- CondenserAdjustmentKnob
- MicroscopeBase
- Arm
- IrisDiaphragmLever
- LightSource

Lab Exercise 2. Observe the Letter "e".

To familiarize yourself with the workings of the microscope, perform the following exercises:

1. Cut a small case letter "e" from the newspaper. Prepare a "wet mount" using the following technique:

a. Get a clean microscope slide

b. Place a drop of water on the slide

c. Place the "e" in the drop of water

d. Apply a cover slip

2. Observe the "e" under scanning, low and high power. Draw or take a photomicrograph (depending on which version of the lab report you are completing) of what you see at 100xTM and 400xTM and label with the magnification power. (**Note:** Always label micrographs with the total magnifying power).

3. What happened to your field of view as you increased your magnification? (Think about how much of the '"e" you see as you go from scanning to high power.)

4. Compare the '"e" that you observe with your unaided eye to the view through the microscope. What is different about it? (i.e. Look at the "e" the way it is mounted on your slide and then view it through the microscope. Does its orientation change?)

5. Create a micrograph of your "e" at 100xTM and 400xTM. A micrograph is a photo of what you see through the microscope.

Lab Exercise 3.Complete the Table.

PART	FUNCTION
Base	
Light Source	
Iris Diaphragm	
Condenser	
Stage	

Arm	
Coarse Adjustment Knob	
Fine Adjustment Knob	
LowPowerObjective	
HighPowerObjective	
OcularLens	
RevolvingNosepiece	

Equipment:

- Microscope
- Slide
- Coverslip
- Dropper
- Dropper bottle of water
- Newspaperprint