LABORATORY NO. 2

THE MICROSCOPE

Scope of the Laboratory Activity

This laboratory activity consists of two (2) worksheets:

Worksheet 1 The Parts and Care of a Microscope
Worksheet 2 Magnification: Macroscopic and Microscopic Objects

Overview

Have you ever wondered how scientists view very tiny objects such as microbial cells, and turn their images with definitive structures that are recognizable and identifiable?

Having been invented in the 16th century, microscopes have helped humankind in scientific and technological advancements by enabling them to visualize very minute objects such as cells, and projecting them in magnified images. Often found in science laboratories, microscopes are made up of lenses of different magnification, each with their own magnification powers, and focal strengths.

Objectives

After completing this exercise, you should be able to:

1. Identify the parts of the microscope.
2. Demonstrate the proper techniques for use and care of the microscope.
3. Demonstrate proper focusing technique.
4. Determine the total magnification of the specimen

Materials

Watch the YouTube videos on following:

"How to Use a Compound Microscope"

https://www.youtube.com/watch?v=uEgM3gk8n6k

Compound Light Microscope: Introduction to Parts and Operation

https://www.youtube.com/watch?v=tVcEEw6qbBQ

Worksheet 1 – The Parts and Proper Care of a Microscope

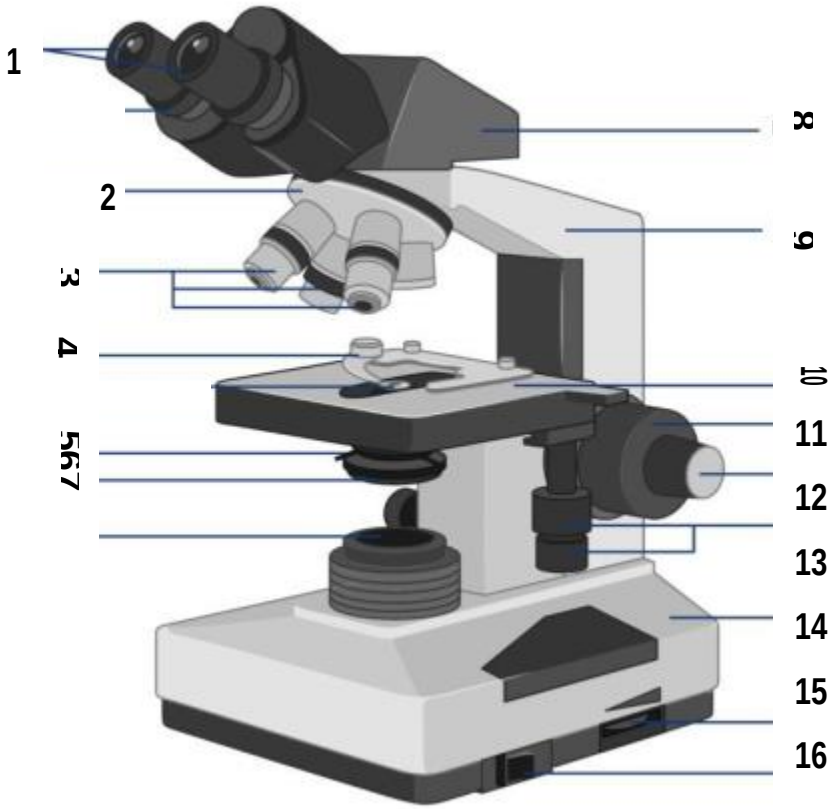

Figure: Parts of a microscope, Image Copyright © Sagar Aryal, www.microbenotes.com

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Fill in the blanks according to the parts' numbers in the microscope below:

1)	9)
2)	10)
3)	11)
4)	12)
5)	13)
6)	14)
7)	15)
8)	16)

In caring for the microscope, you must make sure that it is on an evenly-flat, steady, and stable surface or a table. This is the step-by-step procedure when using it:

1. Have the microscope in front of you as you sit down on a stool. Tilt or incline it a little to avoid overreaching or standing up when peering through the eyepiece or ocular lens.

2. Select an appropriate prepared slide and mount it on the mechanical stage. Carefully put the stained specimen directly above the center of the glass circle on the mechanical stage. Use the stage clips to secure the prepared slide in place to prevent it from falling.

3. Looking first from the side of the microscope, identify the nosepiece where the objective lenses stem out. Select the low power objective (LPO) and rotate the nosepiece until a click is heard. This sound means that the objective lens is in place.

4. Turn the coarse adjustment knob away from you to lower down the LPO SLOWLY TO ABOUT 5 MM ABOVE THE SLIDE. BE CAREFUL NOT TO HIT THE SLIDE BECAUSE DOING SO WILL DAMAGE BOTH THE SLIDE AND THE LENS.

5. Raise the condenser up as far as it will go underneath the mechanical stage. Locate the iris diaphragm lever and open it wide. Peer through the eyepiece using both eyes, and adjust the mirror until a bright field of light is seen.

6. Looking from the side again to check that the slide is still in position and not hitting the lens, hold the coarse adjustment knob with two hands. Peer through the eyepiece and raise up the LPO by slowly turning the knob towards you until a clear image of the stained specimen appears. This is focusing in LPO and only the first step of the focusing process. Image contrast is dependent on the amount of light entering the condenser. Thus, to adjust, gradually and alternately close and open the iris diaphragm and observe what happens. Set the opening at a point when image contrast is at its best. Sharpness of the object may also be attained by raising or lowering the condenser.

7. Look once more from the side to make sure that the objective lens will not hit the slide upon turning the nosepiece to switch to high power objective (HPO) to complete the process of focusing (If your microscope is *parfocal*, you can switch lenses without danger of hitting the slide without disturbing much the focused image).With the image clearly seen on LPO, turn the nosepiece to use the HPO. Looking through the eyepiece, sharpen the image using the fine adjustment knob ONLY. Adjust the iris diaphragm lever to reduce or increase the contrast, as needed.

IMPORTANT POINTS TO REMEMBER:

- When using the coarse adjustment knob, do not look into the eyepiece to focus downwards to avoid breaking both lens and slide.
- Make sure the objective lens under use (LPO/HPO/oil immersion) is locked in. A slight clicking sound can be heard when it locks in place.
- You cannot go directly to focusing with HPO. Always start with LPO.
- Move the fine adjustment knob ONLY when focusing under HPO

---------- DO NOT ANSWER THE ACTIVITIES BEYOND THIS POINT----------

Worksheet No .2

Magnification: Macroscopic and Microscopic Objects

Materials:

Magnifying glass	Transparent 12-inch millimeter ruler
Mongo bean	White kidney bean

A. Macroscopic Objects

Most magnifying glasses typically have low magnifying power: 2×–6×, with the lower-power types being much more common than those with high magnifying power.

1. Measure the length and width in millimeters of a mongo bean (Specimen 1) by examining it under a hand lens or magnifying glass. Measure its length and width in millimeters by placing the specimen and ruler side by side under the magnifying lens. Draw the object 30 mm in length in the box provided below. In your drawing, resize the width in proportion to the length.

2. Get a white kidney bean (Specimen 2). Examine it under a hand lens. Measure its length and width in millimeters by placing the specimen and ruler side by side under the magnifying lens. Make a drawing of the tooth 30 mm in length. As in Specimen 1, be sure to resize the width and other dimensions in proportion to the length.

3. To compute for the magnification of macroscopic objects, use the following formula:

$$\text{Magnification of a drawin} = \frac{\text{Size of drawing (mm)}}{\text{Size of specimen (mm)}}$$

Specimen 2: _____

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B. Microscopic Objects

Similar to a magnifying glass, a microscope reflects a larger image of a specimen.

The total magnification of any specimen viewed through the microscope is equal to the power of the eyepiece (ocular) lens multiplied by the power of the objective lens used.

	POWER OF EYEPICE (OCULAR) LENS	POWER OF OBJECTIVE LENS	TOTAL MAGNIFICATION
*VERY LOW POWER OBJECTIVE	10X	3.5 to 4X	40X
LOW POWER OBJECTIVE	10X	10X	100X
HIGH POWER OBJECTIVE	10X	40X	400X
OIL IMMERSION OBJECTIVE	10X	100X	1000X

*****Very Low Power Objective is used for scanning larger sections of the slide and for locating objects which are scattered over a considerable area of the prepared slide.