

# THE MICROSCOPE AND CELLS

## INTRODUCTION – THE MICROSCOPE

The microscope is used to study anatomical features that cannot be seen by the unaided eye; its basic function is to enlarge (magnify) an object so that specific structures can be seen. Most structures at the tissue and cellular level of organization must be viewed microscopically in order to observe anatomical details. The microscope can be a very important tool for biologists, and a thorough knowledge of its components and how it is used is essential. Following is a brief review of the parts, use, and care of the microscope.

## PARTS OF THE MICROSCOPE

- 1) Obtain a microscope from the storage area of the bench. **CARRY THE MICROSCOPE IN AN UPRIGHT POSITION WITH TWO HANDS**, one hand holding the arm, the other supporting the base. Hold the microscope close to your body; do not swing it around abruptly or tip it from its upright position. Carry the microscope to your lab bench and set it down GENTLY.
- 2) If the lenses are dirty, **USE ONLY LENS PAPER TO CLEAN THEM.**
- 3) Identify the parts of the microscope listed in **TABLE 2.1** and know their functions. Refer to **FIGURE 2.1**.

## MAGNIFICATION

The magnification at which you are viewing an object is a result of the magnifying power of the ocular and objective lenses:

**TOTAL MAGNIFICATION = OCULAR MAGNIFICATION X OBJECTIVE MAGNIFICATION**

Magnifying power of the ocular lenses is 10X. Objective lenses will have magnifying powers of 4X, 10X, and 40X. The actual magnifying power will be engraved on each objective lens.

## MICROSCOPE USE

- 1) Position the microscope so that the ocular lens is facing toward you. Remove the dust cover and place it away from your work area.
- 2) Uncoil the microscope cord and plug the cord into the electrical outlet at the end of the bench. Make sure that excess cord does not hang over the edge of the lab bench.
- 3) Turn the microscope on using the power switch and adjust the intensity of the illumination to 5 using the dial on the side of the base.
- 4) Adjust the height of the condenser with the condenser focus knob so that it is fully elevated (i.e. as close as possible to the stage)

- 5) Open the adjustable diaphragm fully. Look through the ocular lens when doing this step to verify light intensity.
- 6) Revolve to nosepiece so that the lowest power objective is “clicked” into place. This will be the 4X objective.
- 7) Position the nosepiece as close to the stage as possible using the coarse adjustment knob.
- 8) PLACE A LETTER “e” SLIDE ON THE STAGE so that the “e” is centered in the stage opening.
- 9) Look through the ocular lens. Keep BOTH eyes open when viewing a slide; this will help decrease eye fatigue. Bring the “E” into focus using the coarse adjustment knob. Always move the stage downward from the objective lens when using the coarse adjustment knob. Then use the fine adjustment knob to bring the “e” into sharp focus.
- 10) Regulate the amount of light going to the stage with the adjustable diaphragm to provide maximum contrast. Be sure that you do not flood the slide with too much light; this is one of the most common mistakes made when first learning how to use a microscope.
- 11) Move the slide to the right using the stage manipulator. Which way does the letter “e” move? Look at the “e” with your unaided eye, then look at it using the ocular lens of the microscope. Is it upside down? Return the “e” to the center of the field of view.
- 12) You will want to view objects at higher magnification, so WITHOUT CHANGING THE ELEVATION OF THE STAGE, carefully and slowly revolve the nosepiece so that the next higher power objective lens (10X) is firmly in place. All objective lenses on the microscopes have corresponding focal points and are termed PARAFOCAL. This means that only the fine adjustment knob is needed to bring the object into sharp focus, once it has been focused using another objective lens.
- 13) Adjust the light with the adjustable diaphragm.
- 14) Note that the space between the slide and the 10X objective lens has decreased compared to the 4X objective lens. The space between the slide and the objective lens is called the WORKING DISTANCE. The working distance decreases with the use of higher-power objective lenses and resultant increased magnification. Also, notice that the diameter of the field of view decreases with increased magnification.
- 15) Revolve the nosepiece to the 40X objective and repeat steps 12 and 13.
- 16) ALWAYS rotate the nosepiece back to the lowest power objective lens (4X) BEFORE removing the slide from the stage.
- 17) Remove the letter “e” slide from the stage and return it to the appropriate place in the slide folder.

## **INTRODUCTION - CELLS**

Cells are the basic structural and functional units of all living organisms. A cell is the simplest biological structure that exhibits all the characteristics of human life. Human cells come in a variety of shapes and sizes, but to observe structures that make up a cell you must have a microscope. In fact, most cellular structures are so small that even a light microscope cannot view them; electron microscopes must be used to observe these very small cellular structures.

## **PROCEDURE**

- 1) From the slide folder select the prepared "frog skin" slide.
- 2) Observe the cells using all three objective lenses, and locate the structure listed in TABLE 2.2
- 3) When you are finished you will need to properly store the microscope

## **STORING THE MICROSCOPE**

- 1) Remove the slide from the stage and return it to the appropriate place in the slide folder.
- 2) Turn off the illuminator and then unplug the power cord.
- 3) Lower the stage all the way using the coarse adjustment knob.
- 4) Place the dust cover over the microscope.
- 5) Return the microscope to the storage area of the bench using two hands.