name _____ period _____

Introduction to the Microscope Lab Activity

Introduction

"Micro" refers to **tiny**, "scope" refers to **view or look** at. Microscopes are tools used to enlarge images of small objects so as they can be studied. The compound light microscope is an instrument containing **two lenses**, which magnifies, and a variety of **knobs to resolve (focus)** the picture. Because it uses more than one lens, it is sometimes called the compound microscope in addition to being referred to as being a light microscope. In this lab, we will learn about the proper use and handling of the microscope.

Instructional Objectives

- Demonstrate the proper procedures used in correctly using the compound light microscope.
- Prepare and use a wet mount.
- Determine the total magnification of the microscope.
- Explain how to properly handle the microscope.
- Describe changes in the field of view and available light when going from low to high power using the
  compound light microscope
- Explain why objects must be centered in the field of view before going from low to high power using the compound light microscope.
- Explain how to increase the amount of light when going from low to high power using the compound light microscope.
- Explain the proper procedure for focusing under low and high power using the compound light microscope.

Materials

- Compound microscope
- Glass slides
- Cover slips
- Eye dropper
- Beaker of water
- The letter "e" cut from newsprint
- Scissors

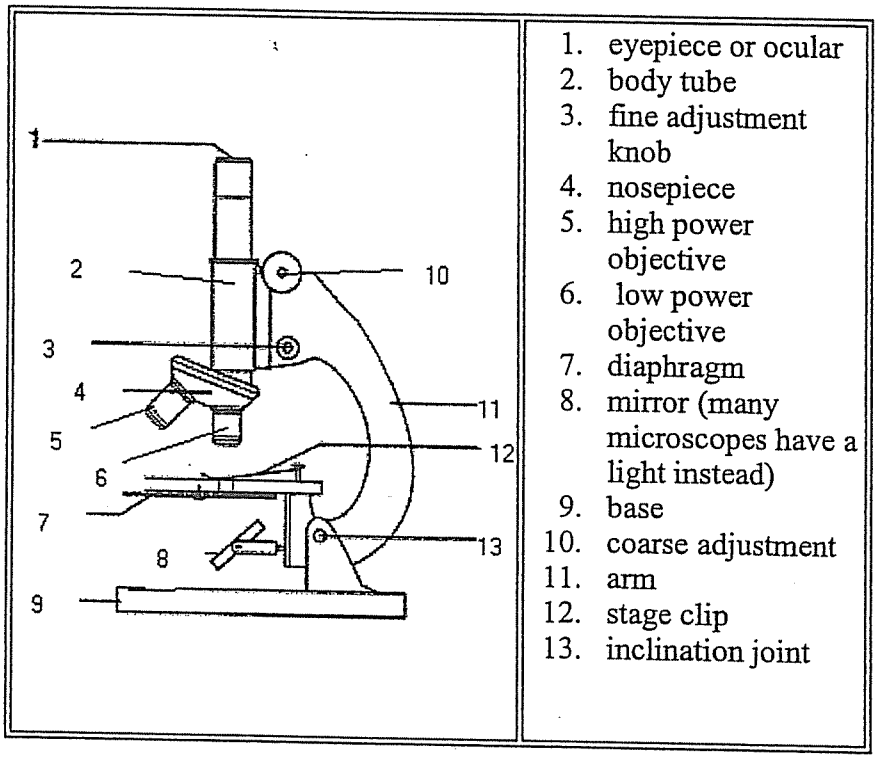
Procedures

I. Microscope Handling

1. **Carry the microscope with both hands** --- one on the arm and the other under the base of the microscope.
2. One person from each group will now go over to the microscope storage area and properly

transport one microscope to your working area.

3. The other person in the group will **pick up a pair of scissors, newsprint, a slide, and a cover slip.**
4. **Remove the dust cover** and store it properly. Plug in the scope. Do not turn it on until told to do so.
5. **Examine the microscope and give the function of each of the parts** listed on the right side of the diagram.

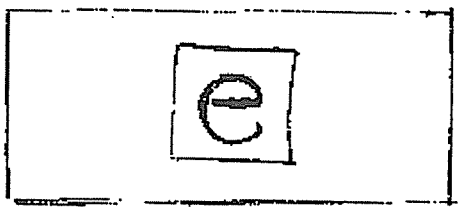


1. eyepiece or ocular
2. body tube
3. fine adjustment knob
4. nosepiece
5. high power objective
6. low power objective
7. diaphragm
8. mirror (many microscopes have a light instead)
9. base
10. coarse adjustment
11. arm
12. stage clip
13. inclination joint

Names of parts and their functions ***(place these on a sheet attached to this report)***

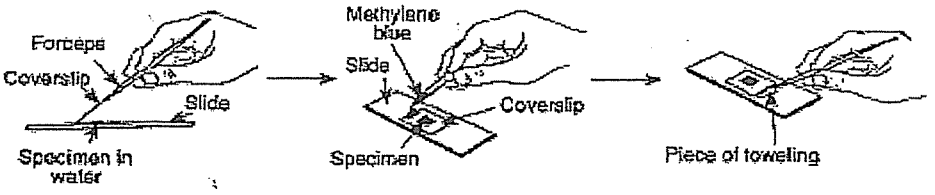
Part II. Preparing a wet mount of the letter "e".

1. With your scissors **cut out the letter "e" from the newspaper.**
2. Place it on the **glass slide** so as to look like (e).
3. **Cover it with a clean cover slip.** See the figure below.

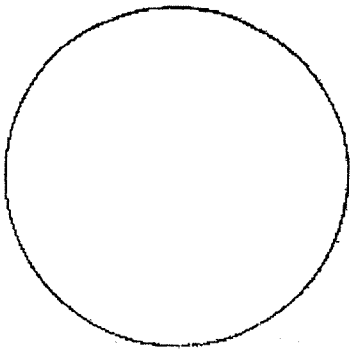


4. **Using your eyedropper, place a drop of water on the edge of the cover slip** where it touches the glass slide. The water should be sucked under the slide if done properly.

Technique for Adding a Stain when making a Wet Mount



5. **Turn on the microscope and place the slide on the stage; making sure the "e" is facing the normal reading position** (see the figure above). Using the course focus and low power, move the body tube down until the "e" can be seen clearly. **Draw what you see** in the space below.



6. Describe the relationship between what you see through the eyepiece and what you see on the stage.

_____

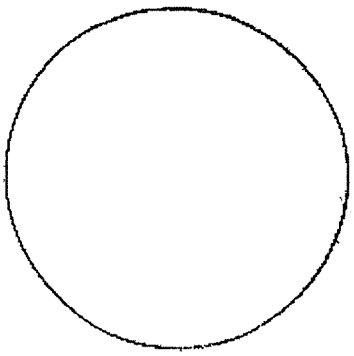
7. Looking through the eyepiece, move the slide to the upper right area of the stage. **What direction does the image move?**

_____

8. Now, move it to the lower left side of the stage. **What direction does the image move?**

_____

9. Re-center the slide and change the scope to high power. You will notice the "e" is out of focus. **Do Not** touch the coarse focus knob, instead use the fine focus to resolve the picture. Draw the image you see of the letter e (or part of it) on high power.



10. **Locate the diaphragm under the stage.** Move it and record the changes in light intensity as you do so.

_____

III. Determining Total Magnification:

1. Locate the numbers on the eyepiece and the low power objective and fill in the blanks below.

Eyepiece magnification _____	(X)	**Objective magnification** _____	=	**Total Magnification** _____ **X**

2. Do the same for the high power objective.

Eyepiece magnification _____	(X)	**Objective magnification** _____	=	**Total Magnification** _____ **X**

3. Write out the **rule for determining total magnification of a compound microscope.**

_____

4. **Remove the slide and clean it up.** Turn off the microscope and wind up the wire so it resembles its original position. Place the low power objective in place and lower the body tube. Cover the scope with the dust cover. Place the scope back in its original space in the cabinet.

Conclusion Questions:

1. State 2 procedures which should be used to properly handle a light microscope.

2. Explain why the light microscope is also called the compound microscope.

3. Images observed under the light microscope are reversed and inverted. Explain what this means.

4. Explain why the specimen must be centered in the field of view on low power before going to high power.

5. A microscope has a 20 X ocular (eyepiece) and two objectives of 10 X and 43 X respectively:

a.) Calculate the low power magnification of this microscope. Show your formula and all work.

b.) Calculate the high power magnification of this microscope. Show your formula and all work.

6. In three steps using complete sentences, describe how to make a proper wet mount of the letter e.

7. Describe the changes in the field of view and the amount of available light when going from low to high power using the compound microscope.

8. Explain what the microscope user may have to do to combat the problems incurred in question # 7.

9. How does the procedure for using the microscope differ under high power as opposed to low power?

Name: _____ Class Period: _____

In class lab- Organizing and Presenting Data

To seek answers to problems or questions they have about the world, scientists typically perform many experiments in the laboratory. In doing so, they observe physical characteristics and processes, select areas for study, and review the scientific literature to gain background information about the topic they are investigating. They then form hypotheses, test these hypotheses through controlled experiments, record and analyze data, and develop a conclusion about the correctness of the hypotheses. Finally, they report their findings in detail, giving enough information about their experimental procedure so that other scientists are able to replicate the experiments and verify
the results.

Our labs this year will provide you the opportunity to investigate scientific problems in the same manner as that of a typical scientist. As you perform these investigations, you will employ many of the techniques and steps of the scientific method a working scientist does. Some of the most important skills you will acquire are associated with the step of the scientific method known as recording and analyzing data. **Three of these skills are**

1. **Creating and filling in data tables,**
2. **Making drawings**
3. **Finding averages**

It is important to record data precisely—even if the results of an investigation appear to be wrong. And it is extremely important to keep in mind that developing laboratory skills and data analysis skills is actually more valuable than simply arriving at the correct answers. If you analyze your data correctly—even if the data are not perfect— you will be learning to think as a scientist thinks.

Part 1: Data Tables

When scientists conduct various experiments and do research, they collect vast amounts of information: for example, measurements, descriptions, and other observations. To communicate and interpret this information, they must record it in an organized fashion. Scientists use data tables for this purpose.

You will be responsible for completing data tables for many of our labs this year. Each column in a data table has a heading. The column headings explain where particular data are to be placed. The completed data tables will help you interpret the information you collected and answer the questions found at the end of each lab.

EXERCISE 1

Given the following information, complete Data Table 1. Then interpret the data and answer the five questions that follow.

Information: The following hair colors were found among three classes of students:

Class 1: brown—20, black—1, blond—4

Class 2: brown—18, black—0, blond—6

Class 3: brown—15, black—4, blond—15

Data Table

Hair Color	Class 1	Class 2	Class 3	Total
Brown				
Black				
Blond				

1. What type of information is being gathered?

2. Which hair color occurs most often?

3. From the information in the Data Table, can you give the number of boys with black hair?

4. What information can you give about the number of students with black hair?

5. Which class has the most blond students?

6. How many students made up the entire student population?

EXERCISE 2

Given the following information, organize the data into a table. Use the blank area provided in Figure 1 to draw in the necessary columns and rows. Then interpret the data and answer the questions that follow.

Information: On an expedition around the world, several scientists collected the venom of various snakes. One of the tests that the scientists conducted determined the toxicity (how poisonous it is) of the venom of each snake. Other data obtained by the scientists included the mortality percentage (death rate) from the bites of various snakes.

The snakes observed were the: (1) southern United States copperhead, **(2)** western diamondback rattlesnake, **(3)** eastern coral snake, **(4)** king cobra, **(5)** Indian krait, **(6)** European viper, **(7)** bushmaster, **(8)** fer-de-lance, **(9)** black-necked cobra, **(10)** puff adder.

The mortality percentage of people bitten by the snakes varied from 100% to less than 1%.

The scientists noted the mortality percentage for each of the snakes was
(1) less than 1%, **(2)** 5–15%, **(3)** 5–20%, **(4)** greater than 40%, **(5)** 77%, **(6)** 1–5%, **(7)** usually 100%, **(8)** 10–20%, **(9)** 11–40%, and **(10)** 11–40%.

CONSTRUCT DATA TABLE HERE

Figure 1

1. Which snake's venom has the highest mortality rate?

   _____

2. Which snake's venom has the lowest mortality rate?

   _____

3. From the information recorded, can you determine the snake whose venom works the most rapidly? The least rapidly?

   _____

4. Which two snakes' venom have the same mortality rate?

   _____

5. How many types of snakes were observed?

   _____

Part 2: DRAWINGS

Laboratory drawings can be made using several methods. Some drawings are made in circles that represent the viewing field of a microscope or another type of magnifier. When completing these drawings, be sure to include the magnification at which you viewed the object.

Other laboratory drawings represent organisms or parts of organisms. These drawings show the relative size, shape, and location of anatomical structures. When completing representative drawings, make the structures as clear and as accurate as possible. Most laboratory drawings are labeled.

Use the following guidelines to help make your laboratory drawings clear and legible:

- Use a ruler to draw label lines.
- Label lines should point to the center of the structure being labeled.
- Do not write on the label lines.
- Print all labels horizontally.
- Label the right-hand side of the drawing, if possible.
- Do not cross label lines.

EXERCISE 3

Directions: The following drawing was made without using the guidelines above.

1. Circle those parts of the drawing that do not follow the guidelines.
2. On the lines provided, explain how the drawing should be done.

EXERCISE 3

The following drawing was made without using the guidelines above.
Circle those parts of the drawing that do not follow the guidelines.
Then, on the lines provided, explain how the drawing should be done.

Magnification _____

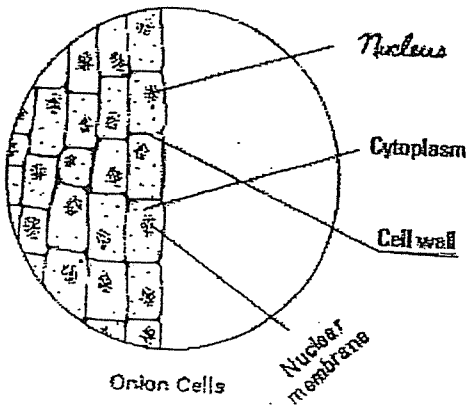


Figure 2

Part 3: AVERAGES

Occasionally you will be required to find the average of data gathered from an investigation. To find an average, add the items in the group together and then divide the total by the number of items. For example, if there were five students of different ages—12, 13, 14, 17, and 19—how would you find the average age of the group? Add the five ages together and divide the total by 5, which is the number of items (students) in the group. What is the average age of this group of students? Your answer should be 15 years old.

EXERCISE 4

In a garden the heights of six sunflowers are 135.0 cm, 162.5 cm, 180.0 cm, 235.0 cm, 185.0 cm, and 167.5 cm. What is the average height of the sunflowers?

_____

EXERCISE 5

Find the average for the following group of data. Then use the results to answer the questions that follow.

In an experiment on plant growth and overcrowding, plants of the following heights are in three equal-sized containers.

Flowerpot 1: 20.0 cm and 18.2 cm
Flowerpot 2: 12.0 cm, 10.8 cm, 11.2 cm, and 12.4 cm
Flowerpot 3: 7.5 cm, 8.0 cm, 6.0 cm, 6.2 cm, 5.8 cm, and 7.3 cm

1. What is the average height of the plants in each flowerpot?

   _____

   _____

2. In which flowerpot did the plants grow the tallest? Explain.

   _____

   _____

EXERCISE 6

Find the averages for the following groups of data. Express your answers to the nearest tenth.

In a sample group of students, the number of breaths per minute was measured at rest and after exercise. The results were as follows:

At rest
Males: 10.1, 13.0, 12.5, 10.2, 13.1, 11.8
Females: 10.4, 13.0, 12.1, 11.9, 10.5, 12.8

After exercise
Males: 18.9, 23.7, 22.6, 21.3, 19.2, 20.6
Females: 25.0, 26.7, 29.0, 35.3, 33.1, 31.7

1. What is the average number of breaths per minute for males at rest? _____
   Females at rest? _____
2. What is the average number of breaths per minute for males after exercise? _____
   Females after exercise? _____
3. How many students make up the sample group? _____
4. What is the average number of breaths per minute for the entire group at rest? _____
   After exercise? _____
5. Do males or females take more breaths per minute at rest? _____
   After exercise? _____