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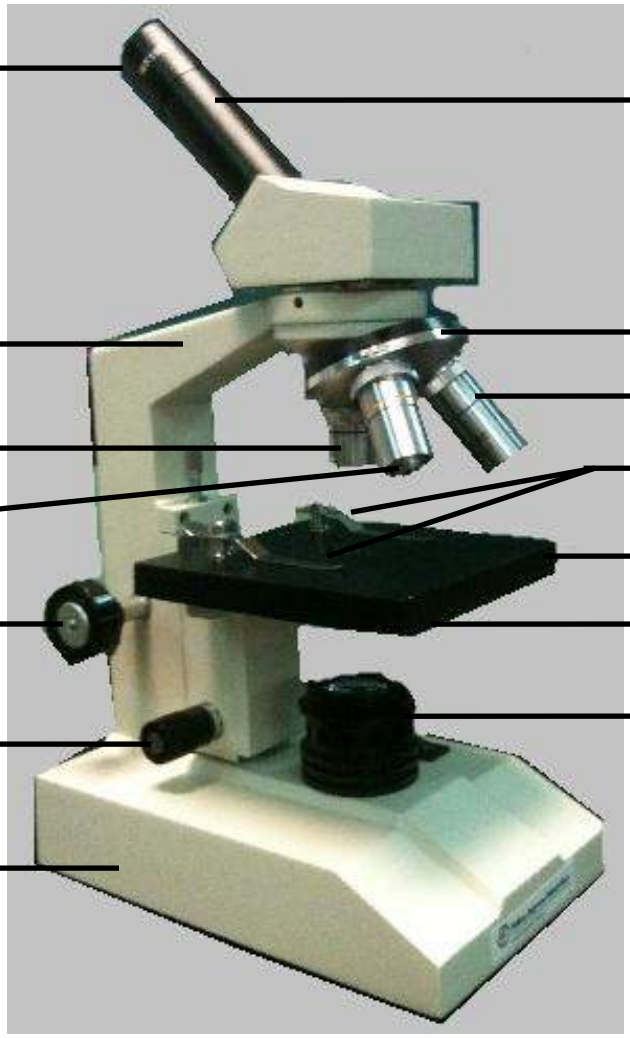
Microscope Madness: These Things are Crazy Small!

Name: _____

Microscope History

"Where the telescope ends, the microscope begins. Which of the two has a grander view?" – Victor Hugo

Way back in the day, people didn't know that microscopic organisms existed. It was until someone looked through a piece of transparent crystal that was thicker at the middle than around the edges did they realize that magnification could occur. Several hundred years later, the father and son team of Zaccharius and Hans Janssen experimented with a couple of lenses and a tube and discovered the notion of a "compound" microscope. The true father of microscopy though was Anton Von Leeuwenhoek. He created the first light microscope and was the first to describe bacteria, yeast cells, the microscopic life in a droplet of water, and the circulation of blood corpuscles in capillaries. While looking at a slice of cork under a microscope, Robert Hooke noticed that the tiny "compartments" of the cork resembled the barren walls of a monk's room in a monastery, thus calling the structures "cells." He confirmed Leeuwenhoek's findings and improved upon his compound light microscope. There is so much about the world we wouldn't know if it weren't for the invention of the microscope.



Microscope Madness – Vocabulary

Using the diagram, write the name of the microscope part being described in descriptions below.

1. _____ A hollow tube that holds the eyepiece lens and/or mirrors.
2. _____ This holds the objective lenses and rotates to use different lenses.
3. _____ The objective with power of 10x
4. _____ The objective with power of 4x - Smallest objective
5. _____ The objective with power of 40x - Longest objective.
6. _____ These hold the slide in place.
7. _____ Located under the stage, this controls how much light shines through the stage to illuminate the specimen.
8. _____ This provides the light that shines through the slide.
9. _____ The part you look through – also has a 10x lens in it.
10. _____ This supports the body tube and makes a good handle for carrying the microscope.
11. _____ It's the place where you place the slide for viewing.
12. _____ Knob used for finding stuff under low power – moves the stage up and down, too.
13. _____ Knob used for high-power focusing.
14. _____ This supports the weight of the microscope.

Free Response:

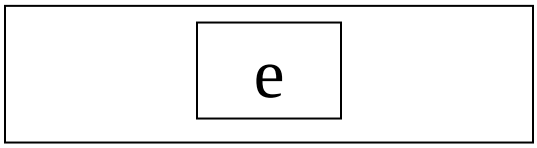
15. Referring back to the quote at the beginning of the *Microscope History* passage, what do you think Victor Hugo meant by "where the telescope ends, the microscope begins"?

16. Which do you feel has a grander view?

17. Find the **Total Magnification** for each objective lens using the following equation:
    Total Magnification **=** Eyepiece (10x) **X** Objective (# on Objective lens)
    a. objective = 4x
    b. objective = 10x
    c. objective = 40x

Microscope Madness: Applying Newspaper "e" Microscope Lab

Name: _____



Objective:
To learn how to use a compound microscope.

Here's what the letter "e" from a newspaper looks like on a prepared microscope slide. Use this image to help you prepare the slide and to answer the following questions.

Preparing the slide:

1. Cut out a letter "e" from a section of newspaper.
2. Place it in the center of a glass slide facing the normal reading position.
3. Cover with a glass cover slip.
4. Using an eye dropper, place a drop of water at the edge of the cover slip and watch as the water travels under the cover slip and secures the two pieces of glass together.

Hypothesis:

We know that microscopes make images appear larger and more detailed. What else do you think might happen to the image of the letter "e" when looked at through the microscope?

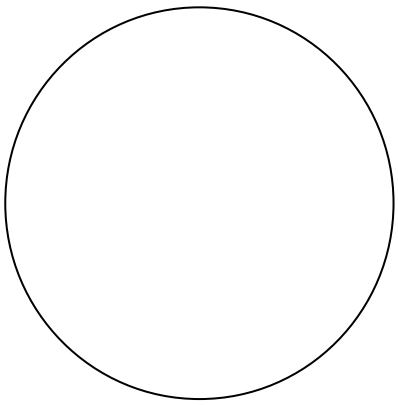
_____

_____

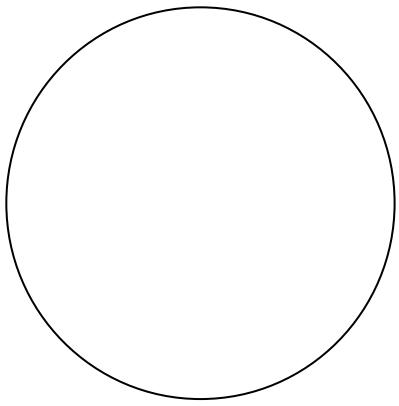
_____

Data and Conclusions:

1. Using the COARSE adjustment knob with the microscope on **LOW** power, raise the stage until the "e" can be seen clearly. Draw what you see below in the LOW POWER circle. Change the nosepiece to **MED/HIGH** Power - you'll notice the "e" is out of focus. DO NOT TOUCH the Coarse Adjustment knob; instead use the **FINE** adjustment knob to sharpen your picture**.** Draw what you see in the MED/HIGH power circle below.

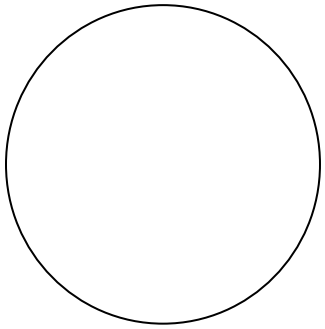


LOW POWER



MEDIUM/HIGH POWER

2. Why do you draw your pictures in a circle? _____
   _____
3. How does the procedure for using a microscope differ when using low power versus medium or high power? _____
   _____
   _____
4. Why is it necessary to center the letter "e" in the microscope field of view before switching the objective to medium or high power? _____
   _____
   _____
5. Estimate what fraction of the letter "e" is visible under high power as compared to low power: _____
6. Compare what you see through the eyepiece and the "e" that you see on the stage. Don't say it looks bigger…look closely! What happened? _____
7. Why do you think this happened? _____
   _____
   _____
8. How does the letter "e" as seen through the microscope differ from the way an "e" normally appears? _____
   _____
   _____
9. Looking through the EYEPIECE, move the slide to the **UPPER RIGHT** area of the stage. What direction does the image move through the eyepiece? Use an arrow in the circle below to indicate the direction of movement.



Explain why this happened: _____
_____
_____
_____
_____
_____

10. How does the ink appear under the microscope compared to normal view?
    _____
    _____
11. Why do you think a specimen placed under the microscope has to be thin?_____
    _____
    _____
12. Rotate the iris diaphragm in a clockwise motion. What do you notice about the letter "e" as you rotate? How does this relate to the question above? _____
    _____

ANSWER KEY

Microscope Madness – Vocabulary

Using the diagram, write the name of the microscope part being described in descriptions below.

1. **BODY TUBE** A hollow tube that holds the eyepiece lens and/or mirrors.
2. **NOSEPIECE** This holds the objective lenses and rotates to use different lenses.
3. **MIDDLE OBJECTIVE** The objective with power of 10x
4. **LOW OBJECTIVE** The objective with power of 4x - Smallest objective
5. **HIGH OBJECTIVE** The objective with power of 40x - Longest objective.
6. **STAGE CLIPS** These hold the slide in place.
7. **IRIS DIAPHRAGM** Located under the stage, this controls how much light shines through the stage to illuminate the specimen.
8. **LAMP/LIGHT** This provides the light that shines through the slide.
9. **EYEPIECE** The part you look through – also has a 10x lens in it.
10. **ARM** This supports the body tube and makes a good handle for carrying the microscope.
11. **STAGE** It's the place where you place the slide for viewing.
12. **COARSE ADJUSTMENT KNOB** Knob used for finding stuff under low power – moves the stage up and down, too.
13. **FINE ADJUSTMENT KNOB** Knob used for high-power focusing.
14. **BASE** This supports the weight of the microscope.

Free Response:

15. Referring back to the quote at the beginning of the *Microscope History* passage, what do you think Victor Hugo meant by "where the telescope ends, the microscope begins"? **ANSWERS WILL VARY**.

16. Which do you feel has a grander view? **ANSWERS WILL VARY**

17. Find the **Total Magnification** for each objective lens using the following equation:
Total Magnification **=** Eyepiece (10x) **X** Objective (# on Objective lens)

d. objective = 4x **10x X 4x = TOTAL MAGNIFICATION OF 40x**
e. objective = 10x **10x X 10x = TOTAL MAGNIFCATION OF 100x**
f. objective = 40x **10X X 40x = TOTAL MAGNIFICATION OF 400x**

2. Why do you draw your pictures in a circle? **it mimics the view when looking through microscope and correctly depicts the field of vision**
3. How does the procedure for using a microscope differ when using low power versus medium or high power? **In low power, the coarse knob is used. In high power, only the fine adjustment knob is used.**
4. Why is it necessary to center the letter "e" in the microscope field of view before switching the objective to medium or high power? **Because the magnification change is so great, the picture must be centered in order to ensure it is within the field of view.**
5. Estimate what fraction of the letter "e" is visible under high power as compared to low power: **answers will vary, but should be around 25%**
6. Compare what you see through the eyepiece and the "e" that you see on the stage. Don't say it looks bigger…look closely! What happened? **The image is reversed and upside down.**
7. Why do you think this happened? **This has to do with the use of lenses which bends the light from the image and causes it to cross before it reaches the eye.**
8. How does the letter "e" as seen through the microscope differ from the way an "e" normally appears? **Answers will vary; It actually doesn't look like an "e" at all, but instead smudges on a mess paper fibers.**
9. Looking through the EYEPIECE, move the slide to the UPPER RIGHT area of the stage. What direction does the image move through the eyepiece? Use an arrow in the circle below to indicate the direction of movement. **LOWER LEFT**
Explain why this happened: **Again has to do with the lenses and the bending of light.**
10. How does the ink appear under the microscope compared to normal view? **The ink looks smooth to the naked eye, but appears grainy, wiry, and disconnected under the microscope.**
11. Why do you think a specimen placed under the microscope has to be thin? **In order for the light to shine through so it can be viewed.**
12. Rotate the iris diaphragm in a clockwise motion. What do you notice about the letter "e" as you rotate? How does this relate to the question above? **The iris diaphragm allows various amounts of light to show through the specimen, making it lighter or darker. Depending in the thickness of the specimen, you may want more or less light to view it.**