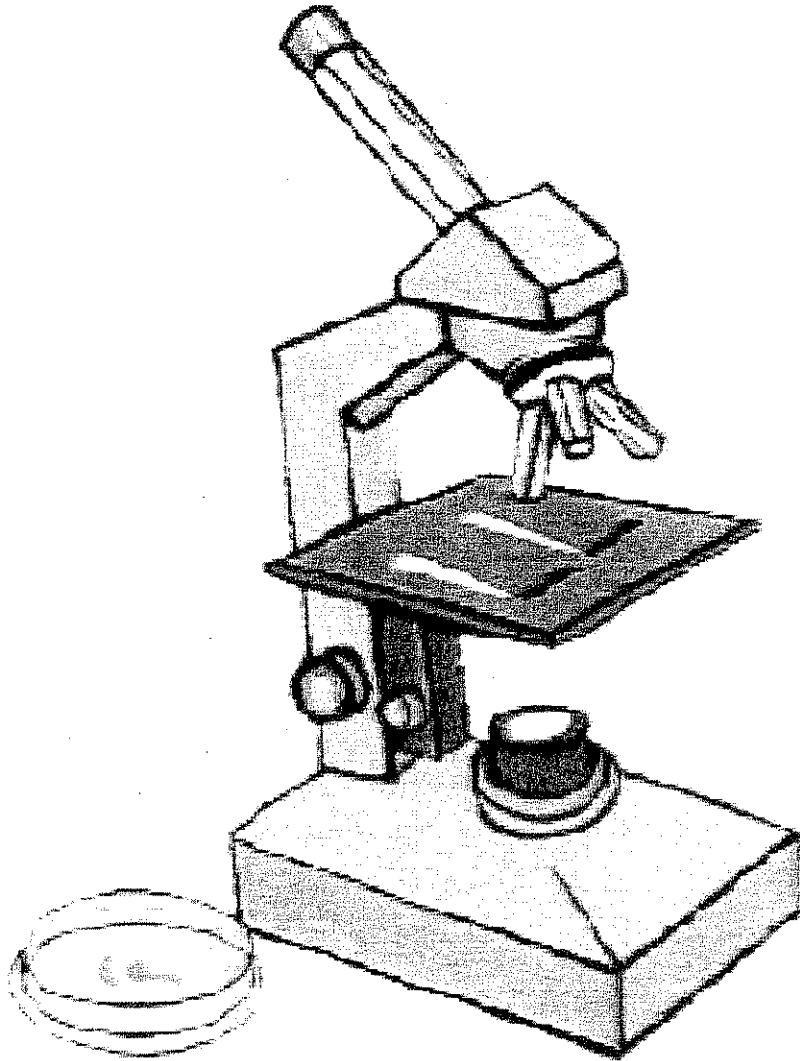


BIOLOGY 9-A

UNIT 1: LAB PROCEDURES & MICROSCOPE USE



NAME: _____

Important Vocabulary:

Compound Light Microscope
Field of View
Resolution
Focus
Ocular Lens
Slide
Pipette

Magnification
Working Distance
Depth of focus
Objective Lens
Total magnification
Coverslip
Wet-mount slide


Learning Goals:

After this unit you should be able to

- Describe lab safety procedures
- Identify important lab equipment and what it is used for
- Recognize and identify the parts and functions of a compound light microscope
- Properly use a microscope to view various objects
- Determine total magnification of an object for each objective lens
- Make a wet-mount slide
- Properly sketch and label microscope specimens

Safety Symbols

These safety symbols are used in laboratory and field investigations in this book to indicate possible hazards. Learn the meaning of each symbol and refer to this page often. *Remember to wash your hands thoroughly after completing lab procedures.*

SAFETY SYMBOLS	HAZARD	EXAMPLES	PRECAUTION	REMEDY
DISPOSAL 	Special disposal procedures need to be followed.	certain chemicals, living organisms	Do not dispose of these materials in the sink or trash can.	Dispose of wastes as directed by your teacher.
BIOLOGICAL 	Organisms or other biological materials that might be harmful to humans	bacteria, fungi, blood, unpreserved tissues, plant materials	Avoid skin contact with these materials. Wear mask or gloves.	Notify your teacher if you suspect contact with material. Wash hands thoroughly.
EXTREME TEMPERATURE 	Objects that can burn skin by being too cold or too hot	boiling liquids, hot plates, dry ice, liquid nitrogen	Use proper protection when handling.	Go to your teacher for first aid.
SHARP OBJECT 	Use of tools or glassware that can easily puncture or slice skin	razor blades, pins, scalpels, pointed tools, dissecting probes, broken glass	Practice common-sense behavior and follow guidelines for use of the tool.	Go to your teacher for first aid.
FUME 	Possible danger to respiratory tract from fumes	ammonia, acetone, nail polish remover, heated sulfur, moth balls	Make sure there is good ventilation. Never smell fumes directly. Wear a mask.	Leave foul area and notify your teacher immediately.
ELECTRICAL 	Possible danger from electrical shock or burn	improper grounding, liquid spills, short circuits, exposed wires	Double-check setup with teacher. Check condition of wires and apparatus.	Do not attempt to fix electrical problems. Notify your teacher immediately.
IRRITANT 	Substances that can irritate the skin or mucous membranes of the respiratory tract	pollen, moth balls, steel wool, fiberglass, potassium permanganate	Wear dust mask and gloves. Practice extra care when handling these materials.	Go to your teacher for first aid.
CHEMICAL 	Chemicals that can react with and destroy tissue and other materials	bleaches such as hydrogen peroxide, acids such as sulfuric acid, hydrochloric acid, bases such as ammonia, sodium hydroxide	Wear goggles, gloves, and an apron.	Immediately flush the affected area with water and notify your teacher.
TOXIC 	Substance may be poisonous if touched, inhaled, or swallowed.	mercury, many metal compounds, iodine, poinsettia plant parts	Follow your teacher's instructions.	Always wash hands thoroughly after use. Go to your teacher for first aid.
FLAMMABLE 	Open flame may ignite flammable chemicals, loose clothing, or hair.	alcohol, kerosene, potassium permanganate, hair, clothing	Avoid open flames and heat when using flammable chemicals.	Notify your teacher immediately. Use fire safety equipment if applicable.
OPEN FLAME 	Open flame in use, may cause fire.	hair, clothing, paper, synthetic materials	Tie back hair and loose clothing. Follow teacher's instructions on lighting and extinguishing flames.	Always wash hands thoroughly after use. Go to your teacher for first aid.



Eye Safety
Proper eye protection should be worn at all times by anyone performing or observing science activities.



Clothing Protection
This symbol appears when substances could stain or burn clothing.



Animal Safety
This symbol appears when safety of animals and students must be ensured.



Radioactivity
This symbol appears when radioactive materials are used.



Handwashing
After the lab, wash hands with soap and water before removing goggles

Microscope History and Use

Directions: use the pages from the blue biology book indicated below to answer the questions.

Read pages 171 and 1064-1065

Microscope History

P. 171

1. List two major importance's for using the microscope. (these ideas may not be from the reading)

A _____

B _____

2. Define compound light microscope: (Try to use 8 words or less)

3. Explain the difference between a **simple light microscope** and a **compound light microscope**?

4. Describe the types of microscopes built/used by Anton van Leeuwenhoek.

P. 1064-1065

5. A)Who is Robert Hooke and B)what did he observe and make drawing of?

A _____

B _____

6. What did Anton van Leeuwenhoek discover with microscope he built? _____ and

7. "**How it works.**" Describe how to determine the magnifying power of a compound microscope?

8. List three other types of microscopes other than the compound microscope.

9. Which type of microscope uses beams of electrons to scan the **surface** of a specimen and produces a 3-D image?

10. Which type of microscope aims a beam of electrons **through** the specimen and produces a 2-D image?

11. What type of objects should be viewed under a **compound light microscope**? List 3

12. Compare and contrast the images seen with a SEM to those seen with a TEM.

Intro to Microscope Activity

Objectives:

1. Diagram and label the part of a microscope
2. Recognize and locate parts of a microscope
3. Be able to describe the functions of each microscope part
4. Properly use parts of the microscope

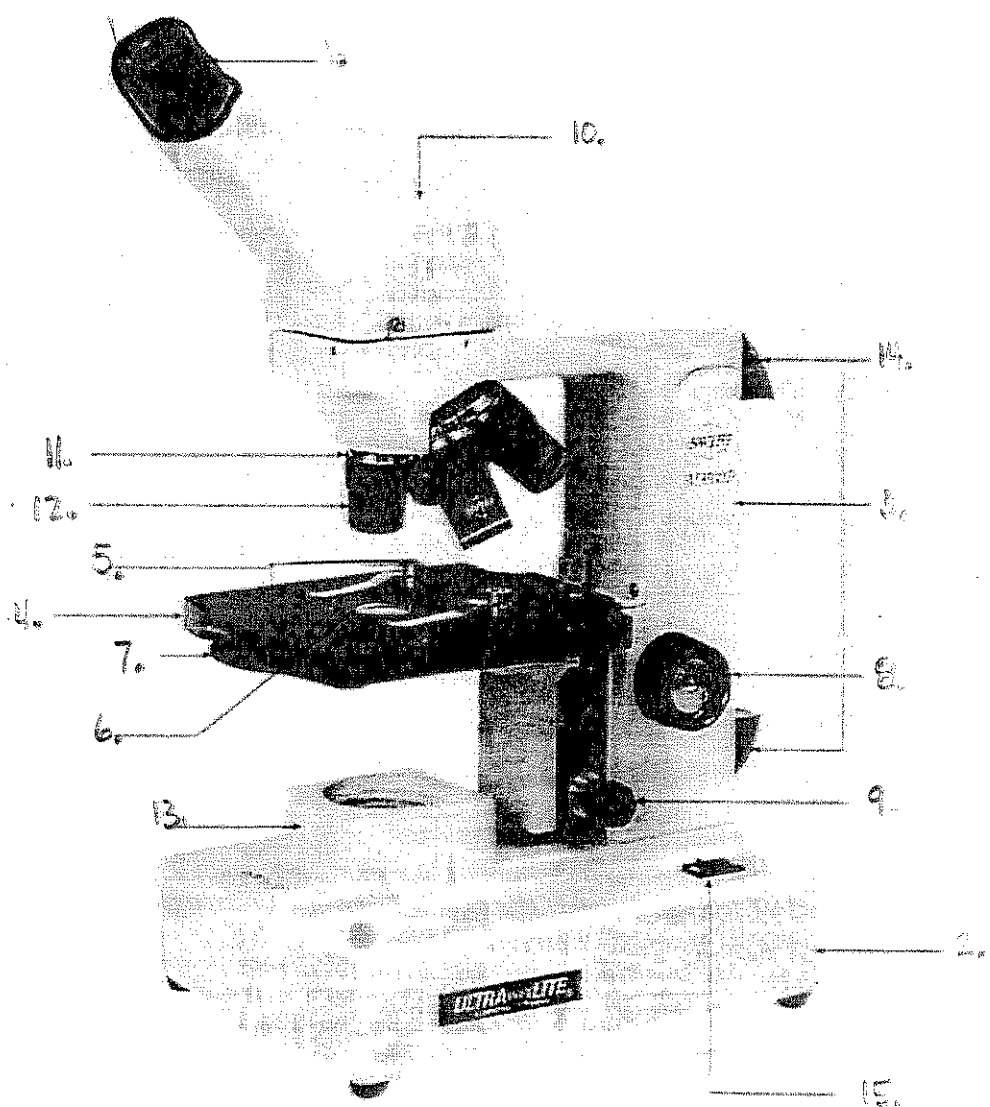
Materials:

Compound light microscope, colored pencils

Procedure:

I. Identification of Microscope Parts: Identify and color code the following structures.

1. Eyepiece with Ocular Lens
2. Base
3. Arm
4. Stage
5. Stage Clips
6. Condenser
7. Disc Diaphragm
8. Course Adjustment Knob
9. Fine Adjustment Knob
10. Body Tube
11. Nosepiece
12. Objective lens
13. Light source
14. Cord Holder
15. Power switch



II. Go to your assigned lab station and locate each microscope part that you color coded. Once you feel comfortable with locating the parts move on to the next part of the lab.

- a. Remove the dust cover from the microscope and remove it from the cabinet, holding the microscope by it arm and base. Do not tilt the microscope. Place it at least 6 inches from the edge.
- b. The eyepiece and objective lenses have glass lenses do not touch them.
- c. At this point do not turn on the microscope or turn any knobs.

III. Questions: Answer the following questions using the microscope and colored diagram.

****DO NOT PLUG THE MICROSCOPE IN!!**

1. The _____ is found at the upper part of the body tube and is used to view an object.
2. What is the solid foundation of the microscope that rests on the table? _____
3. The _____ is the portion of the microscope frame that extends upward from the base and is used to grasp and carry the microscope.
4. When viewing a microscope slide, what metal part secures it and is found on the stage?

5. Describe the position of the course adjustment knob found?

6. Where is the position of the fine adjustment knob found? _____
7. Reach directly beneath the stage. What is the device that functions to regulate the intensity of the light reaching the slide? _____
8. Where would you place a slide when you would examine it? _____
9. The circular glass opening in the center of the stage that admits light through to the object being viewed is called the _____
10. Count how many objective lenses there on your microscope? _____ (notice some may be missing, still count them.)
11. Describe the differences in appearance between the objective lenses.
12. The objective lenses are attached to this microscope part? _____
13. Is found at the base of the microscope and illuminates the object? _____
14. What is the lens called that is in the eyepiece? _____

III. How to Carry a Microscope: Using page 1088-1089 in your book answer the following questions.

15. Describe the proper way to transport a microscope.
16. What is the proper position of the microscope on the lab counter you are observing? Complete this procedure if this is not done already.

IV. Using the Microscope: Follow the directions below to learn and understand how to use parts of the microscope.

17. Plug the microscope in if necessary. Do not turn on the light.
18. Locate the large course adjustment knob on the side of the microscope. Turn it just slightly and observe what happened. Describe. _____

19. Move the stage to its lowest position. Rotate the nosepiece so that the shortest objective lens is located over the stage. You should feel it snap into place. Next, switch to the next longer objective lens. What did you observe happening to the **working distance** between the lenses and the stage as you rotated the nosepiece? _____
20. Which lens do you think might hit the stage if you were not paying close attention when moving the coarse adjustment knob? _____
21. Turn on the microscope light source.
22. Look through the eyepiece using one eye, this is your **field of view**. Describe the visible area in view. Be specific. _____
23. Locate disc diaphragm under the stage. If your disc diaphragm is a plastic disc, rotate a couple times. If the disc diaphragm has a metal arm, move it slightly back and forth using a gentle motion.
24. While looking through the eyepiece into the field of view, describe what is happening to the light as you slowly rotating the disc diaphragm. _____
25. While looking into the eyepiece you may have noticed an arrow called a pointer. Gently rotate the eyepiece. What happened to the pointer? _____
26. Locate the condenser. What do you think is the function of this lens? _____

STOP AND WAIT:

27. Move the stage into its lowest position. Rotate the nosepiece so that the shortest lens is positioned over the stage (you should feel it snap into position). You may be missing an objective lens; this would be your shortest lens. This lens is called? _____. What is its magnification? ____x
28. Position the next longest lens over the stage. This lens is called? _____. What is its magnification? ____x
29. Lastly, rotate the nosepiece to position the longest lens over the stage. What is this lens called? _____. What is its magnification? ____x
30. Once an object is being used the ocular lens found in the eyepiece along with an objective lens will help to magnify the object. A calculation must be used to find the **total magnification of the object**. Here's how you find it.

Ocular lens (10x) multiplied by Objective lens (scanning 4x, low 10x or high 40x)

- d. Find the total magnification of the object when using low power. Show calculation below.
- e. If an ocular lens had a magnification of 10x and the total magnification of an object was 1000x. What is the magnification of the objective lens? Show calculation below.

V. Putting the Microscope away:

31. Turn of the light to your microscope.
32. Describe how you should put away your microscope after you are finished using it.

Microscope Set-up Checklist

Inspection/Cleaning:

- 1) Remove the dust cover and store in cabinet.
- 2) Microscope should be placed 6 inches from table edge.
- 3) Inspect instrument for problems or damage. Report problems to teacher immediately
- 4) Use course adjustment knob making sure that stage is at its lowest position.
- 5) Clean eyepiece and glass lenses with lens paper provided - gently wipe each.

Slide Set-up: Before Focus

- 1) Turn course adjustment so stage is at lowest position and nosepiece is turned to the scanning lens.
- 2) Place slide on the center of the stage, overtop the condenser lens and secure with stage clips
- 3) Check the disc diaphragm to start with lowest level of light. You should see the #1
- 4) If you are using a prepared slide make sure the title is in a readable position.

The Steps of How to Focus a Specimen Slide: Using scanning, low and high power objectives.

Start with the Scanning Lens

- 1) Look into the eyepiece and move the stage up until you see the object clearly. Move the slide and center your object in the field of view. If it is blurry keep using the course adjustment knob.

Low Power Lens

- 2) Turn nosepiece to switch to Low power. The object may look blurry. At this point turn the course adjustment knob to get a clear focus and center the object if needed.

High Power Lens

- 3) Turn nosepiece to switch to High power. The object may look blurry. **ONLY USE THE FINE ADJUSTMENT KNOB TO FOCUS. DO NOT USE COUSE ADJUSTMENT IT MAY DAMAGE LENS OR SLIDE!**
- 4) You may have to reposition the object and readjust the light if microscope is not parfocal.

What to do when finished:

- 1) Lower stage, turn to scanning.
- 2) Return slide or clean slide you have made.
- 3) When you are finished, turn off the light switch and unplug the power cord.
- 5) Using two hands carefully place the microscope back in the appropriate cabinet and put the dust cover on microscope

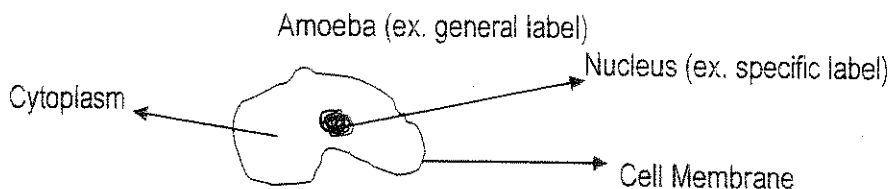
How to properly draw and label specimens

- 1) In left hand side of paper always state the objective lens used to view specimen
- 2) Underneath objective always give total magnification of the objective.
**Remember it is the ocular (10x) multiplied by the objective (scanning 4x, low 10x, high 40x, oil immersion 100x).
- 3) Object should be drawn as seen in microscope but enlarged on paper. (may be required to use color pencils)
- 4) Object should have title (General Label) and structures (Specific Labels) should be used.

Example

Low power

100x magnification



Name: _____ Date: _____ Hour: _____

How to Draw From Microscope Slides

By Dr. Alex Tan, etlow Contributor
The earliest images we have of cells and microorganisms were drawn by scientists like Leeuwenhoek looking through a microscope and sketching what they saw. Although photography has made imaging easier, many scientists today still depend on their drawing skills to capture the basic images they see when looking through the microscope. Since microscope observations are considered data, the goal is to see on the page exactly what you see through the microscope. With a little practice and patience, you can accurately capture what you see through the microscope.

Difficulty: Moderately Challenging

Sketching the Basics

Things You'll Need

- White paper
- Pencil
- Eraser
- Pen (optional)
- Microscope with slide

Instructions

- Using a pencil, draw a biggest circle you can given the space limitations. If space is not limited, beginners should use at least half of an 8 1/2- by 11-inch page to learn the technique. Lightly draw crosshatching on the circle to divide the space into four quarters.
- Start with biggest shape in the field of view. Looking through the microscope, mentally divide the field into four quadrants, just like the big circle. Determine where the big shape falls among these four sections.
- Lightly sketch an amorphous shape with a pencil where the edges of the item are. Check your proportions. Look through the microscope, then at your shape to get the outline as accurate as possible.
- Do the same for the other shapes in the field of view, starting with the next biggest and so on. Lightly sketch each shape, using the previous shapes and mental crosshatches to help determine proper proportions.
- Check each one, first by looking through the microscope then at your drawing, several times before starting the next shape.
- When all the general outlines are completed, look through the microscope again. Check that the ratio of proportions of one shape to another are preserved. Check that empty space in the field of view is also in your drawing.
- Move on to internal shapes within the already outlined shapes. If necessary, draw light crosshatches through the biggest shapes you have outlined to help guide you. Sketch internal shapes, constantly checking your proportions as before. Repeat for the all the visible shapes in the field of view.

Finalize and Perfect Your Drawing

- You should have a lightly drawn circle filled with several amorphous shapes filled with amorphous shapes. Transform these placeholder shapes into what you actually see. Look through the microscope and mimic the curvature of the actual shapes. Start with the simplest shape. Erase unnecessary lines and add new ones until you're satisfied.
- Once you have a light sketch of what you see in the microscope, go back and replace lightly sketched lines with dark, heavier ones. Check the image again in microscope for noteworthy textures or patterns in the outlines. If using a pen is allowed, now is the time to begin using it. Complete all larger shape outlines before going back and completing internal shapes in the same way.
- Add any remaining small structures not yet added. Add texture and depth to drawing with pencil shading, swirls, lines, etc. as time allows. At every stage, check your work through the microscope until the drawing is satisfactorily similar to what you see.

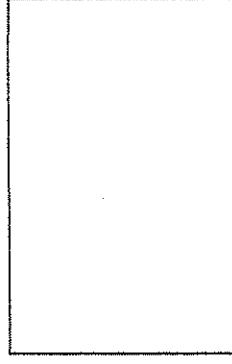
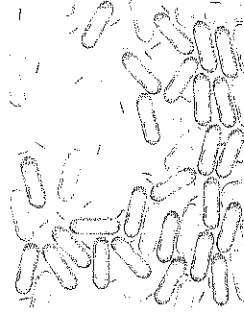
Tips & Warnings

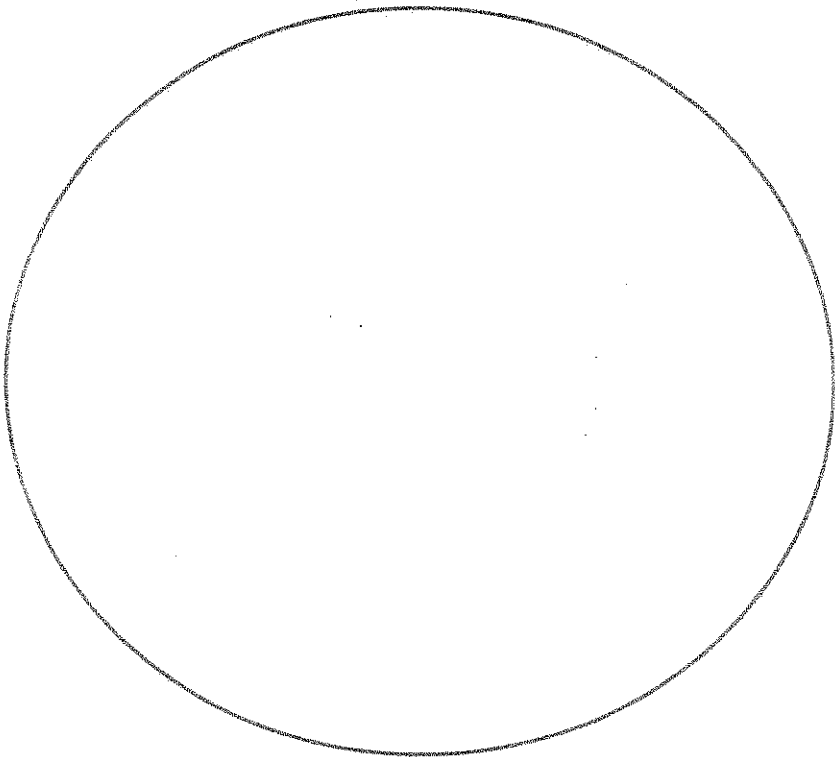
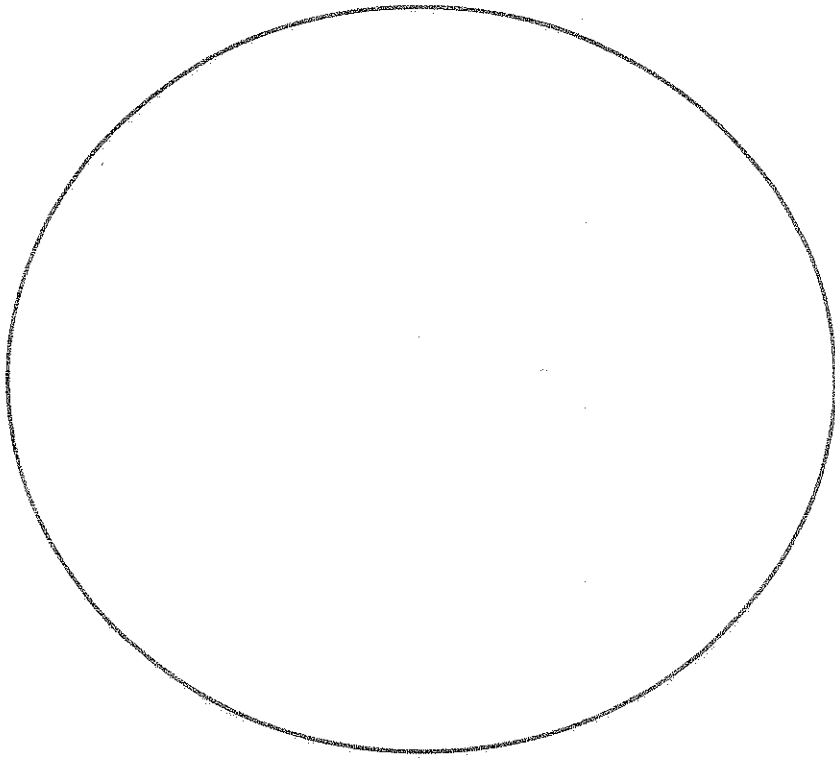
Using colored pencils can give your sketches more depth and interest. Once you have mastered the steps here, consider including them. Don't go overboard, but add little details of color to your final pen or pencil drawing.

References

Citizendium.org: Leeuwenhoek's early sketches of bacteria through microscope

Practice





- _____ 1. eyepiece
- _____ 2. arm
- _____ 3. base
- _____ 4. stage
- _____ 5. magnification
- _____ 6. condenser lens
- _____ 7. disc diaphragm
- _____ 8. stage clips
- _____ 9. nosepiece
- _____ 10. course adjustment
- _____ 11. fine adjustment
- _____ 12. objectives
- _____ 13. Light source
- _____ 14. working distance
- _____ 15. resolution
- _____ 16. field of view

- a. used to carry microscope and supports stage and body tube.
- b. supports entire microscope and contains light source.
- c. metal piece on stage used to hold specimen slides.
- d. revolving piece found at lower end of body tube and contains two or more objective lenses.
- e. The part of the microscope that brings the small details of an object into focus.
- f. houses the ocular lens and serves primarily as a magnifier and to see field of view.
- g. arrangement of lenses that are found on nosepiece closest to object and contains scanning, low, and high power lenses.
- h. flat platform that holds specimen slide.
- i. large knob which moves stage and quickly focuses object.
- j. flat, circular plate that is housed underneath the stage and functions to change the light and contrast of the object
- k. lens that allows and concentrates light rays to reach object.
- l. ability of the microscope to focus on closely spaced object and recognize them as individual objects
- m. apparent enlargement of an object
- n. distance between the slide and objective lenses
- o. light source of microscope
- p. lit up space where the object can be viewed

Steps of How to Focus the Microscope – Number 1-12

<p>SWITCH TO HIGH POWER, CENTER IF NEEDED</p> <p>_____</p>	<p>ADJUST THE DISC DIAPHRAGM SO THAT IT IS BEGINNING WITH THE LEAST AMOUNT OF LIGHT</p> <p>_____</p>
<p>GRASP BY ARM AND BASE, PUT AWAY IN CABINET, DUST COVER</p> <p>_____</p>	<p>USE THE COURSE ADJUSTMENT KNOB AND FOCUS USING THE SCANNING LENS, CENTER OBJECT IF NEEDED</p> <p>_____</p>
<p>LOWER THE STAGE TO LOWEST POSITION, SWITCH TO SCANNING LENS WHEN FINISHED WITH LAB</p> <p>_____</p>	<p>MAKE SURE STAGE IS IN LOWEST POSITION AND NOSEPIECE IS TURNED TO THE SCANNING LENS TO BEGIN, TURN ON LIGHT</p> <p>_____</p>
<p>PLACE SLIDE OVER THE CONDENSER LENS AND USE THE STAGE CLIPS</p> <p>_____</p>	<p>USE THE FINE ADJUSTMENT KNOB TO CLEARLY SEE FINE DETAILS OF THE OBJECT</p> <p>_____</p>
<p>SWITCH TO LOW POWER, USE THE COURSE ADJUSTMENT KNOB AND CENTER THE OBJECT IF NEEDED</p> <p>_____</p>	<p>REMOVE AND RETURN SLIDE to teacher</p> <p>_____</p>
<p>TURN OFF LIGHT AND UNPLUG</p> <p>_____</p>	<p>TAKE DUST COVER OFF, PLUG IN</p> <p>_____</p>