

Name _____

Period _____

Regents Biology

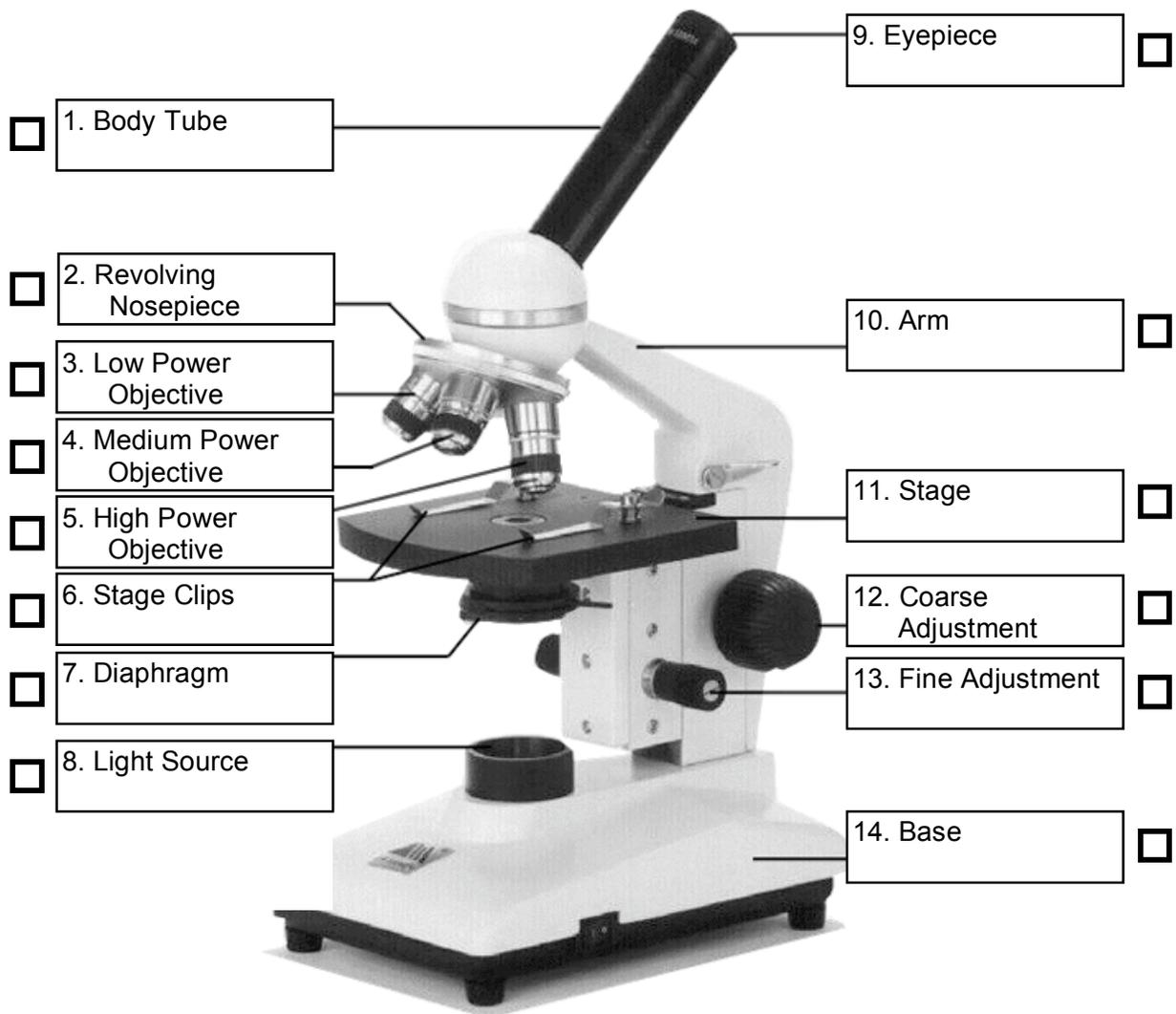
Date _____

LAB ____ . USING MICROSCOPES

Throughout the course of the year you will be using two different microscopes. Today you will refresh your knowledge of the compound light microscope and then extend your experience to the dissecting microscope. Please follow instructions.

A. COMPOUND LIGHT MICROSCOPE

Get a microscope and remind yourself of its parts by matching the labels on this diagram to the actual microscope. Check off the box next to each part, once you have identified it on the microscope in front of you.



DETERMINING MAGNIFICATION:

Check off each section **after** you read it and/or do what it says.

- Inscribed on each **objective lens** is the magnification, or power of that lens. This tells the number of times the lens magnifies the image. For example, if you are looking at a strand of hair with a 4X lens, the hair will appear four times its actual size.
- Your microscope probably has at least two, or even three or four objective lenses. Some microscopes have as many as four. Rotate the lenses in the **nosepiece** until they click into position. The objective lens in use is always the one directly under the **body tube**. Usual powers for objective lenses are 4X, 10X, and 40X. Record the powers of your microscope on the table below.

OBJECTIVE LENSES

LOW Power	MEDIUM Power	HIGH Power	OIL Immersion

- The second kind of lens in the microscope is the **ocular**, or the **eyepiece**. This lens is located at the top of the body tube. The ocular serves as a small telescope, magnifying the image made by the objective lens. This enlargement is called the **secondary magnification**. The magnification of the eyepiece can be 5X, 10X, 15X, or 20X. The most common is 10X. Record the power of your eyepiece on the table below. If it is not marked, you may assume it is 10X.

EYEPIECE LENS

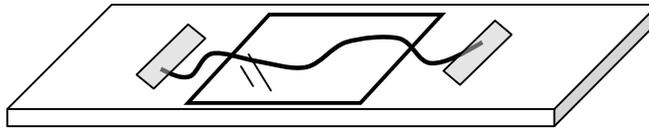
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- Now transfer this information to the chart below and calculate the total magnification for each power of your microscope by multiplying the objective X the eyepiece, and fill in the "**total magnification**" column of the chart. (You will need to do this each time you make a drawing, because you must include the magnification at which it was drawn.)

OBJECTIVE lens magnification		EYEPIECE lens magnification		TOTAL magnification
	x		=	
	x		=	
	x		=	
oil immersion lens	x		=	

USING THE MICROSCOPE

- Now you will learn to use the microscope by looking at some simple specimens. We will start with a human hair. Obtain a microscope slide and a cover slip. Cut a short piece (shorter than the length of the microscope slide) of hair from your own head.
- Place the hair on the center of the slide and carefully place a **cover slip** over the hair on the slide. Since you did not put your sample in a drop of water on the slide, we call this process a **dry mount** preparation. If you are having a lot of trouble keeping the hair and cover slip on the slide, you can use a little bit of tape on the ends of the hair.

**1. FOCUSING**

- You will **ALWAYS** begin with the **lowest power** lens of your microscope, and bring the specimen into focus with the **coarse adjusting knob**. Bringing the stage up towards you is what usually brings your specimen into focus. Once in focus on low power, make sure your specimen is in the middle of your **field of view** before you move to the medium power lens.
- Now switch to **medium power** lens and again, to focus, move the coarse adjustment knob **SLIGHTLY**. Again, once in focus on medium power, make sure your specimen is in the middle of your field of view before you move to the high power lens.
- For the final, **high power** lens, rotate the lens CAREFULLY over the slide (it may be almost touching it.) THEN, USE ONLY THE **FINE ADJUSTMENT KNOB!!!** Using the coarse adjustment knob at this point may cause you to *crunch* the slide between the objective lens and the stage, breaking a very expensive slide!

2. LIGHTING

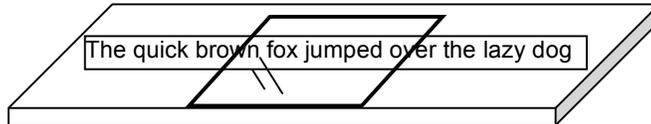
- In a compound microscope, for you to see the specimen, light must **PASS THROUGH** it and the lenses to your eye. (Hence the name — light microscope). The light is *under* the stage of the microscope.
- Under the stage you will also find the **diaphragm**. This is used to adjust the amount of light that passes through the specimen. Practice opening and closing the diaphragm while you are looking through the eyepiece at your specimen. Notice how the amount of light increases and decreases.
- Draw your hair on medium power and on high power, and then draw someone else's hair too. Note the **total magnification**.

Magnification:	Magnification:	Magnification:	Magnification:

3. MOVING

Here's something else you have to get used to when moving a microscope:

- Obtain a page from a newspaper or a magazine. Cut out a single line of words (about a 3 inch strip) that contains the lowercase letter "e" from the text of an article (*NOT* a headline!). Place the strip of letters on a slide and place a coverslip over it to hold it in place. Place the slide on the stage so the words appear **right-side up** as you look at them when looking just at the stage and not through the lenses of the microscope, yet. Now focus on the letter "e" under low power. In the table below, draw what you see of the letter "e" through the eyepiece.



- Now switch to high power and, again, draw what you see of the letter "e" through the eyepiece. Also make notes about any differences in light level (brightness) that you notice.

LOW POWER (x)	HIGH POWER (x)

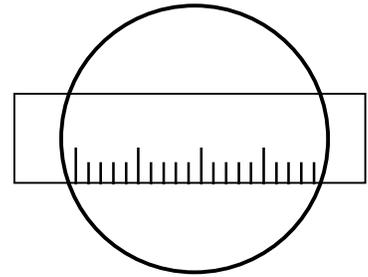
- Now go back to low power and focus on your letter "e" again. Using the LEFT-RIGHT mechanical stage slide knob, move the stage so it slides to the right. When you move the stage (and the slide) to the right, which way does the object appear to move when viewed through the microscope?

- Now use the FRONT-BACK stage slide knob. And when you move the stage (and the slide) away from you, which way does the object appear to move?

4. MEASURING

Now it's time to get a sense of size under the microscope.

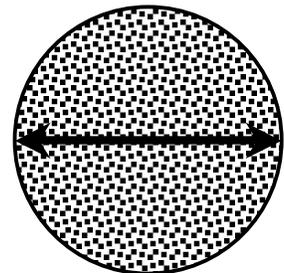
- Place a clear plastic ruler (supplied by your teacher) and place it on the stage of the microscope so you can see the measurements on it through the low power lens.



- Record the distance (in millimeters) across the field of view under low power in the table below.
- Leaving the ruler in the same position on the stage, now switch to medium power and measure the distance (in millimeters) across the field of view. Record the distance under medium power in the table below.
- Leaving the ruler in the same position on the stage, now switch to high power and measure the distance (in millimeters) across the field of view. Record the distance under high power in the table below.

DISTANCE ACROSS THE FIELD OF VIEW		
	millimeters (mm)	micrometers or microns (µm)
LOW POWER (x)		
MEDIUM POWER (x)		
HIGH POWER (x)		

- Obtain a prepared slide of red blood cells from your teacher and place it on the stage of the microscope. View the slide on low power, then medium and then high power. I know they're small, but try it — estimate how many red blood cells fit in a line across the center of your field of view.



DIAMETER OF RED BLOOD CELLS	
Distance across field of view on high power	
Estimate of number of red blood cells across the field of view	
Estimate of diameter of a single red blood cell (µm)	

PRACTICING

After you have done the hair drawings, the letter “e” drawings, and the measurement of size under the microscope, you are ready to go on to **ANIMALCULES!**

- Obtain a clean slide.
- Your teacher will provide you with some pond water specimens to view. View them under low, medium, and high power. Draw them at the highest power you can clearly see them.
- Another good place to find animalcules (teeny tiny organisms) is on the backsides of the leaves of the plants in the classroom. First, use a paint brush to pick up some of what looks like specks of dust or dirt from the underside of the leaves. Just ask your teacher if you need help with this. Then, wipe the brush around on your slide to transfer what’s on your brush onto the slide. No **coverslip** is even needed. Just focus the microscope and draw what you see. If you actually got dust or dirt, try again until you find an animalcule. Believe me — they are there! They will look like virtual giants under the microscope.

Magnification:	Magnification:
Description:	Description:

B. DISSECTING LIGHT MICROSCOPE

Now we need to look at a dissecting microscope to see the differences between the two and determine why we would use one over the other.

- Look at the **objective lenses** on this microscope. Record the powers of your dissecting microscope in the table below.

OBJECTIVE LENSES

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- There are two **ocular lenses**, or **eyepieces** on this microscope. This is why this is sometimes called a stereoscopic microscope. Record the power of your eyepiece on the table below. If it is not marked, you may assume it is 10X.

EYEPIECE LENS

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- Now transfer the information to the chart below and calculate the total magnification for each power of your dissecting microscope by multiplying the objective X the eyepiece, and fill in the **“total magnification”** column of the chart. (You will need to do this each time you make a drawing, because you must include the magnification at which it was drawn.)

OBJECTIVE lens magnification		EYEPIECE lens magnification		TOTAL magnification
	x		=	
	x		=	

LIGHTING

- Look to see where the light is coming from for a dissecting microscope. How does this differ from the compound microscope?

What does this mean about the type of specimen you would use a dissecting microscope to view?

PRACTICING

- Take a clean slide and obtain a flower specimen. View it in the dissecting microscope and draw it below. What would you have to do to view it in a compound microscope? Make a specimen of the flower to view in the compound microscope and draw it below as well.

DISSECTING MICROSCOPE	COMPOUND MICROSCOPE
Magnification:	Magnification:
Info:	Info:

- Obtain a specimen of cloth and view it in both types of microscopes. Draw it below.

DISSECTING MICROSCOPE	COMPOUND MICROSCOPE
Magnification:	Magnification:
Info:	Info:

SUMMARY QUESTIONS

1. What are the names of the two different types of microscopes?

2. List two things that are the **SAME** about the two types of scopes.

1. _____

2. _____

3. List three things that are **DIFFERENT** about the two types of microscopes.
(Be sure to include a discussion of what types of specimens each one is used for.)

1. _____

2. _____

3. _____

4. Explain why a specimen must be thin to be viewed under the compound light microscope.

5. What is the relationship between movement on the stage and movement seen through the lenses?

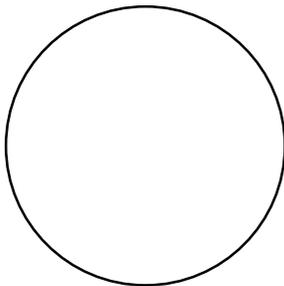
6. How do you adjust the amount of light that passes through the specimen on a compound microscope?

7. Why do you begin viewing with the lowest power objective lens?

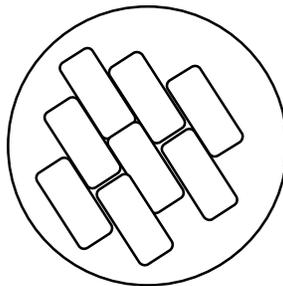
8. Why do you only use the fine adjustment focus knob with the highest power objective lens?

9. How do you determine the total magnification?

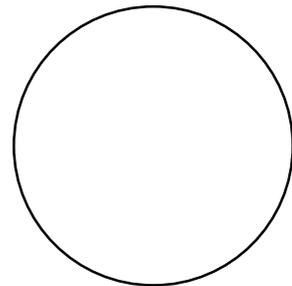
10. A slide of plant cells was viewed under **medium power** as shown below. In each of the other diagrams, draw what you would see for the *same slide* viewed under the other lenses.



LOW POWER



MEDIUM POWER



HIGH POWER

11. Who is usually credited with inventing the microscope lens (and the word *animalcule*)? It's in your text... or you may Google this...
