Name ____________________________

Lab 1: Using the Microscope
& Cell Biology

The anatomy of the compound microscope
- Review or learn the following parts of the compound microscope and their functions.

How to use the microscope
- Always carry the microscope with both hands—these are fragile, easily damaged instruments. Don’t let the cord drag on the floor.
- Clean the ocular and objective lenses with lens paper only.
- Plug the scope in and make sure the light works.
Learning to focus – using the letter “e”

1. Place the letter “e” slide on the stage. Make sure it’s held securely in the stage clamps. Practice moving the slide around the stage with the mechanical stage controls.

2. Center the slide’s coverslip over the opening in the stage so that light passes through the letter “e” (or specimen) on the slide.

3. **Looking from the side**, raise the stage so that the objective and slide are as close as possible.

4. **Always begin with the lowest power objective**—this is the shortest, or 4X, objective. Find the specimen and begin to focus using the coarse focus (bigger, inside) knob. You should see the letter “e” come into view.

5. Center the “e” within the field of view. Use the fine focus (outer) knob to bring the “e” into sharper focus.

   OR **focus on the edge of the coverslip**, then move to the specimen.

6. Adjust the amount of light coming through the slide. You’ll find that dim lighting is often better than bright lighting.

7. Switch to the 10X objective; use the fine focus knob to focus.

8. Switch to the 40X objective; use the fine focus knob to focus.

• What do you notice about the letter “e”? Is it right-reading still, as you’d see it in text?

• **Don’t use the 100X (or oil immersion) objective** – you need to use oil to focus, and you’re likely to smash the objective into the slide.

• Compound microscopes are parfocal. This means that once an object is in focus at low power (4X), it should remain in focus as you move to higher magnification. You should only need to adjust the fine focus (outer) knob.

**How can you tell how much the letter “e” is magnified?**

• Look at the numbers engraved on the side of the objective. Our microscopes have a 4X, 10X, 40X and 100X objective.

• To determine the **total magnification**, multiply the magnification of the eyepiece lens (10X) by the magnification of the objective lens.

• Calculate the total magnification when you are using the:

   • 4X objective

   • 10X objective

**Practice 3D focusing using the “Crossed Threads” slide.**

• Return the letter “e” slide to its tray, and pick up a “crossed threads” slide.

• Go through the steps above to locate, center and focus the heap of crossed, colored threads.

• Use the fine focus knob to scan through the pile of threads. Remember that you’re moving through 3-dimensions, even though the slide seems too thin to allow it.
A Brief Introduction to Cell Biology

Cells are the smallest living things—and all living things are composed of cells. They are able to perform all necessary metabolic functions as well as specialized tasks such as moving, feeding and reproducing. Despite their minute size, cells are amazingly complex and often very beautiful.

There are two general types of cells:
• **Prokaryotic cells**
  o Lack a nucleus, but they do contain DNA
  o Also lack other organelles, such as mitochondria, chloroplasts, etc.
  o Simple unicellular organisms like bacteria and cyanobacteria (blue-green “algae”) are prokaryotes.
  o They represent earth’s oldest organisms, having evolved about 4 billion years ago
• **Eukaryotic cells**
  o Do contain a membrane-bound nucleus and other organelles
  o Most organisms are eukaryotic—all protists, fungi, plants and animals are in this group.

In the space below, diagram two eukaryotic cells—an animal cell and a plant cell. Using your text as well as the cell models and posters in the lab, label the following structures on your drawings.

- Circle the names of the structures that are found only in plant cells.

  - Cell membrane
  - Cell wall
  - Chloroplast
  - Mitochondria
  - Nucleus
  - Central vacuole

  **Animal cell**

  **Plant cell**
Is there life in Pond Water?

- Make a wet-mount slide using a single drop of pond water; include some of the ‘gunk’ in your drop.
- **Critical step:** Drop a cover slip on top of the pond water on your slide.
- Begin on low power (4X). Focus on the edge of the cover slip if you can’t find anything ‘big’ to focus on.
- Take some time to scan the drop for living organisms. Many are quite small and may be moving, so be patient.
- Ask your instructor to help you ID or even find these little guys.
- Discard the glass slides in the glass waste box.

Sketch 3 different pond water organisms below. Indicate the total magnification, or TM, for each specimen.

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Examine an animal cell (your cheek cell) under the microscope

- *Gently* scrape the inside of your mouth with a toothpick. Smear the cells on a clean slide and stain them with a drop of methylene blue (being careful not to stain your fingers). Place a coverslip on top.
- Beginning on low power (4X), locate some cheek cells. Center them in the field of view and increase the magnification. You should be able to see some flat cells with a tiny, dark speck inside the cell – this is the nucleus. Are we prokaryotic or eukaryotic organisms?
- *Discard the toothpick and slide in the biohazard container.*
- **Sketch some of your cheek cells in the space below.** Label any organelles visible.

Examine a plant cell under the microscope

- Make a wet-mount slide of *Elodea* leaves (an aquatic plant often used in fish tanks). Take just a small sample from the growing tip of the *Elodea*, place it in a clean drop of water and *add a coverslip*. Do NOT add stain.
- Begin on low power … you know the drill.
- Sketch some *Elodea* cells in the space below. Label any organelles visible.

TM= _____X
Answer the following questions:

1. How are plant and animal cells different? How are they alike?

2. Give the functions of the organelles listed below
   - Nucleus
   - Mitochondria
   - Chloroplasts
   - Cell membrane
   - Cell wall
   - Endoplasmic reticulum
   - Golgi apparatus
   - Ribosome
Bacteria Gardens “Experiment”

This take-home “experiment” is designed to demonstrate that life is everywhere, and that most of it goes unnoticed by us. Microscopic organisms are big players in the environment—as decomposers, as food and predators for other organisms, as pathogens, as photosynthesizers. (Look up any of these terms you don’t recognize.)

Take home: 2 Petri plates (taped shut)
2 strips of parafilm

When you get home TODAY:

**Plate 1:** Expose the agar (the nutrient substance in the Petri plate) to the air in any location of your house (the bathroom, refrig, bird cage, cat litter box, etc). Open the Petri plate and leave it open for about 30 min, then close it and seal the lid with a strip of parafilm. Stretch the parafilm slowly and gently; it should go all the way around the Petri plate to seal it closed.

Write your name and exposure site on the plate using a marker or felt pen.

**Plate 2:** Expose the agar to some part of your anatomy—your fingertip, tongue, hair, spit, nose, toes, etc. You just need to touch the agar gently with the relevant body part (the agar is sterile, don’t worry). Close the plate immediately and seal it with the parafilm.

Don’t forget to label the plate with your name and anatomy part.

**Incubate the plates at room temp.** Place both sealed Petri plates with the agar UP (the plate will seem upside-down) in a warm, safe spot (on top of the refrigerator, computer, etc.) Do not open them again. Check your plates every few days. If no “spots” appear on the agar, move the plates to a warmer location.

Bring your bacteria “gardens” to lab next week! We’ll see what you’ve got growing.