

Activity 5.1.2 A Nuclear Onion

Purpose

The nucleus is the most visible organelle of a eukaryote cell. It is one of the largest cell organelles and contains many components, such as chromosomes and DNA. With the aid of a compound microscope and proper preparation of a microscope slide, you will be able to locate a nucleus as a dark round body within the cell membrane of a eukaryote cell. The nucleus is the primary mechanism a cell uses to replicate new cells and monitor the cellular function.

As an *Agriscience Investigator*, using a microscope and preparing slides is an important skill. Can you use scientific tools to prepare a slide and observe cells? Can you spot the nucleus of an onion cell?

Materials

Per pair of students:

- Compound microscope

Per class:

- Onion
- 5 iodine dropper bottles

Per student:

- 2 slides
- 2 coverslips
- Thread segment
- Dropper
- Water
- Lens paper
- Forceps
- Razor blade
- *AFNR Laboratory Safety Manual*
- Pencil
- *Agriscience Notebook*

Procedure

In this activity, you and a partner will learn how to use a microscope properly and prepare a slide. Your teacher will provide you a brief demonstration on the safe handling and use of a microscope.

Part One – General Care and Operation of a Microscope

1. Read the section on microscope care and handling in the *AFNR Laboratory Safety Manual*.
2. If the microscope is not already set up at your workstation, follow the steps below to bring the microscope to your area.
 - Pick up the microscope by the arm with one hand and use the other hand under the base for support. Use both hands while carrying the microscope.
 - Place the microscope securely on the workspace well away from the edge.
 - If the microscope has a power cord, secure the cord on the desk or countertop. Do not allow excess cord to hang down where it could be snagged by a passerby.
3. Plug your microscope in and be sure the light source works.
4. Use lens paper to clean the viewing surface of the nosepiece.
5. Turn the revolving nosepiece so the lowest power objective is in the viewing position.
6. Use the coarse adjustment to move the objectives and the stage as far apart as possible.

7. Place a slide on the stage using the stage clips.
8. With the objective set at the lowest magnification, use the coarse adjustment knob to bring the stage and objective as close together as possible without touching the slide to the objective.
9. Looking into the eyepiece, focus the objective by slowly raising the lens using the coarse adjustment.
10. Use the fine adjustment to complete focusing.
11. Once the specimen is centered and focused at low power, rotate the revolving nosepiece to a higher power. Watch carefully to avoid contact between the slide and the objective lens.
12. Use only the fine adjustment to focus at higher powers.

Part Two – Making a Wet Mount Slide

One of the most critical steps in microscope examination is to have a clear view of what you are examining. If you do not know the proper way to prepare slides for examination, results of your trials will be pointless. Start by making a wet mount slide. The goal is to create a slide free of air bubbles that distort the image under magnification.

1. Obtain a glass slide, coverslip, thread, water dropper, forceps, and lens paper.
2. Clean the slide with the lens paper. Prevent fingerprints by holding the edge or corners of the slide.
3. Using forceps, place a small section of thread in the middle of the slide.
4. Place a drop of water on top of the thread.
5. Hold a coverslip at a 45-degree angle on top of the slide next to the drop of water. Gently lower the coverslip onto the water drop so you don't trap air bubbles underneath.
6. Examine your slide under a microscope. Start by ensuring the nosepiece of the microscope is all the way up.
7. Select the lowest power lens (smallest lens) and try to focus on the thread by adjusting the coarse and fine adjustment knobs.
8. Once the structure of the thread appears in the view, look for any air bubbles. Air bubbles are round shapes with dark edges. Report any air bubbles you find to your teacher.
9. Carefully rotate the revolving nosepiece to the next magnification level. Watch the objective as you turn and stop if it appears that you will touch the objective to the coverslip. If necessary, raise the nosepiece slightly to allow the objective to slide into place. Again, try to focus on the thread.
10. If instructed to do so by your teacher, repeat Step 9 using the next power available.
11. Answer the analysis questions on the student worksheet.

Part Three – Plant Cells

Now you are ready to begin looking at cells. Cells are so tiny that even under a microscope the organelles are hard to identify. For this activity, your main goal is to locate the cell wall and nucleus. These basic structures are visible with a microscope. To see other organelles clearly, you would have to use a microscope with greater magnification abilities.

1. Use forceps to peel off a very thin layer of skin from the onion. The skin sample must be as thin as you can get it so light will penetrate the tissue.
2. Use a clean slide and place a drop of water in the center of the slide.
3. Using forceps, carefully place a small slice of onion on the water drop. Remember to avoid air bubbles.
4. Add a drop of iodine onion skin. The iodine will stain the nucleus so you will be able to locate it easily.

5. Add the coverslip and blot dry any water on the underside of the slide.
6. Examine the sample under both low power and high power. Sketch and label what you see under the clearest magnification in Figure 1. Circle the magnification that is used for your illustration.
7. On your drawing in Figure 1, label as many parts of the cell as possible including the following.
 - Cell wall
 - Nucleus
8. Answer the analysis questions on the student worksheet.

Conclusion

1. What role does the nucleus play in the cell?

The nucleus is the place where all of the DNA and chromosomes are held.

2. How does the nucleus compare to other cell organelles?

The nucleus can be easily seen in a microscope while others cannot be seen.

3. Why do scientists use tools such as microscopes?

Scientists use microscopes to study cells.

Activity 5.1.2 Student Worksheet

Part Two Analysis Questions

- Did you have any air bubbles under your coverslip? If so, how can you prevent them the next time you prepare a slide?
Yes, there were air bubbles under the coverslip, using less iodine on the slide.
- Which lens power provided the clearest view and most detail of your thread?

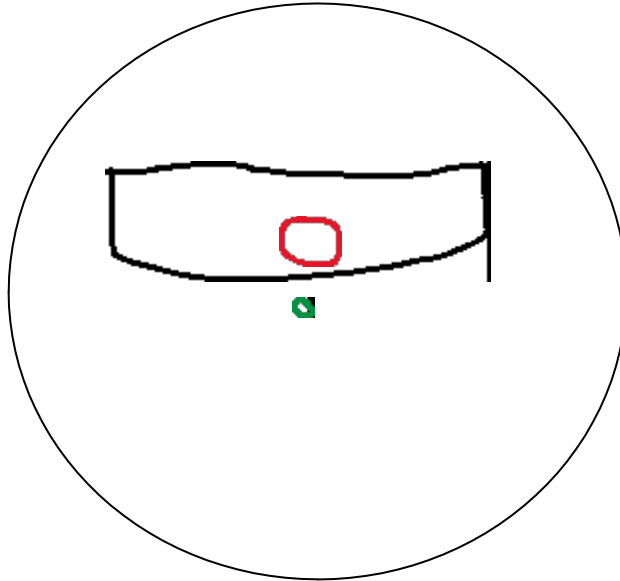


Figure 1. Part Three Observation

Circle which magnification was used:

Low-power

High-power

Part Three Analysis Questions

- What parts of the cell are clearly visible under magnification?
The nucleus, the cell wall, and the nucleolus
- Explain the shape and size of the nucleus of a cell.
The nucleus is a oval or circle shape.
- List three important safety features to consider when handling and using microscopes.
Pick up the microscope by the arm with one hand and use the other hand under the base for support. Use both hands while carrying the microscope.
Place the microscope securely on the workspace well away from the edge.
If the microscope has a power cord, secure the cord on the desk or countertop. Do not allow excess cord to hang down where it could be snagged by a passerby.
- What potential problems must you try to avoid when making a wet mount microscope slide?
A problem you must avoid is having bubbles under the slide.