

Using a Microscope to View the Phases of Mitosis

OVERVIEW

In this exercise, you will explore the stages of mitosis using the BioNetwork virtual microscope to visualize and identify each stage in both onion root tip and whitefish blastula slides.

LEARNING OBJECTIVES

- Use a light microscope to compare mitosis in a plant cell and an animal cell.
- Identify each stage of mitosis in the whitefish blastula or the onion root tip.
- Compare the location of the chromosomes in each phase of mitosis in the whitefish.

BACKGROUND

Eukaryotic organisms have one or more chromosomes. When these cells divide it is important for the cell to “keep track” of each chromosome to make sure that the new daughter cells have the DNA they need. This is accomplished in a Eukaryote through mitosis. In this lab you will use the light microscope to view cells at different stages of mitosis as well as the division of the cell called cytokinesis. You will view slides of an onion root tip and a whitefish blastula. Both of these organisms have cells in various stages of reproduction. You will look over the slide to identify and collect information about each stage of Mitosis: Prophase, Metaphase, Anaphase, and Telophase. Your textbook may also be a helpful resource to make sure you have identified a correct example of each phase.

A stain has been used to dye DNA in the cells. This will make the chromosomes show up in a darker color than the rest of the cell. Focusing the microscope with 40x objective should give you a close enough view of the chromosomes to find each phase. You will also look for spindle fibers which are attached to each chromosome and are used by the cell to separate the chromosomes and move them to each pole. The description and what to look for to identify each phase is listed in the chart below. As you examine each phase, sketch it in the corresponding circle below. Make sure to describe or label the location of the chromosomes and spindle fibers in each phase.

PROCEDURE: Mitosis in an Animal Cell

- 1) Click on the **Explore** link (bottom of the home page).
- 2) Click on the **question mark** on the slide box.
- 3) In the Slide Catalog, click on the Animal Slides.
- 4) Click on the **Whitefish Interphase** slide. It will automatically be placed on the stage of the microscope.
- 5) Follow the steps you learned in the previous lab to focus on and magnify the whitefish cells using different objectives.
- 6) Go through all 4 objectives to visualize the cells. Try to locate each phase of mitosis on the slide.

To learn more, visit:

ncbionetwork.org

Then click **Remove Slide** and clean the microscope.

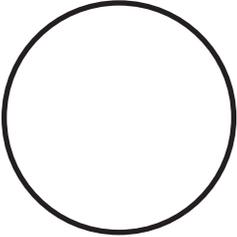
Hint: You may have to move the slide around to find each phase.

- 7) In the **Slide Catalog**, click on the **Plant Slides**.
- 8) Click on the **Onion Root** slide. It will automatically be placed on the stage of the microscope.
- 9) Follow the steps you learned in the previous lab to view the onion cells using different objectives.
- 10) Go through all 4 objectives to visualize the cells. Try to identify examples of each phase of mitosis. Take notes on the similarities and differences you noticed between the animal and plant mitosis.
Hint: You may have to move the slide around to find each phase.
- 11) When you have finished collecting your observations click **Remove Slide** and clean the microscope
- 12) In the **Slide Catalog**, click on **Animal** slides, then repeat steps 4 and 5 to view each separate stage of mitosis in the **Whitefish (Whitefish Late Prophase, Whitefish Metaphase, Whitefish Late Anaphase, and Whitefish Telophase/Cytokinesis)**. The microscope will automatically center on the correct stage.
- 13) View each stage magnified with the **40X** objective and complete the chart with a sketch and observations of the chromosomes and spindle fibers at each stage.
- 14) Examine the slides for signs of cytokinesis.
- 15) Sketch a cell in cytokinesis in the results section.
- 16) Repeat steps to remove the slide and return to the home page.

RESULTS: Sketch what you see in each example

QUESTIONS

- 1) Which is easier to identify: prophase, metaphase, anaphase, or telophase?
- 2) What was different about mitosis in the plant cell as compared to the animal cell?
- 3) Select the correct facts about the result of mitosis:
a) ___ 1 cell **OR** ___ 2 cells **OR** ___ 4 cells
b) ___ Cells with identical DNA **OR** ___ Cells with different DNA
- 4) Were you able to identify a cell undergoing cytokinesis in the onion cell? As a plant cell what extra layer must be formed to in the onion to separate the daughter cells?



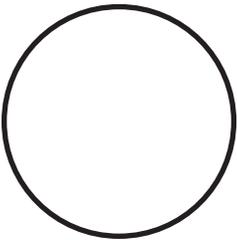
Interphase

Sample: Whitefish Magnification: 10x/40x

This is the normal life of the cell when it is not dividing. Most cells you see will be in interphase. Look for cells where the nucleus has a consistent color overall.

Describe the appearance of DNA:

Do you see spindle fibers?



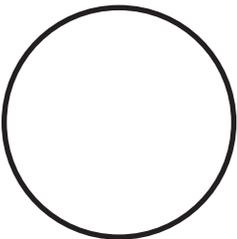
Prophase

Sample: Whitefish Magnification: 10x/40x

Mitosis begins with the chromatin condensing (coiling) into chromosomes. The nuclear envelope begins to break down. Look for areas in the nucleus that are becoming darker or look "bunched" up.

Describe the location of the chromosomes:

Describe the spindle fibers:



Metaphase

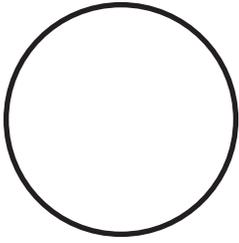
Sample: Whitefish Magnification: 10x/40x

Chromosomes are fully condensed and they line up across the middle of the cell. Look for thick, dark chromosomes lined up in the middle. You may also see the spindle fibers connecting the chromosomes to the centrosomes at each pole.

Describe the location of the chromosomes:

Describe the spindle fibers:

Anaphase

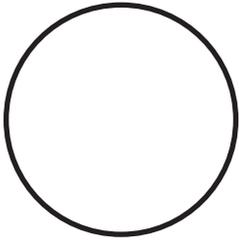


Sample: Whitefish Magnification: 10x/40x
Chromosomes separate and are pulled by spindle fibers to either end of the cell. Look for the dark chromosomes at each end.

Describe the location of the chromosomes:

Describe the spindle fibers:

Telophase

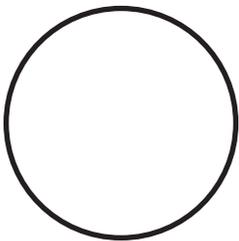


Sample: Whitefish Magnification: 10x/40x
Chromosomes reach the poles of the cell and begin to relax, nuclear envelopes begin to form. Look for dark bundles of DNA at each end, you may also be able to see the spindle fibers in the middle of the cell and the cell may look like it has 2 nuclei.

Describe the location of the chromosomes:

Describe the spindle fibers:

Cytokinesis



Sample: Whitefish Magnification: 10x/40x
Following mitosis the cell divides in two. Look for a “pinching-in” in the middle of two cells – this is the cleavage furrow. ***Cells at the end of telophase may begin cytokinesis.***

Describe the location of the chromosomes:

Describe the spindle fibers:

Describe cytokinesis: