

Lab 08: Cell Division

Estimated time to complete: 2 hours

Outcomes:

At the end of this lab students will be able to:

- Describe and illustrate the process of mitosis
- Identify phases of mitosis in models and microscopic specimens

Materials Needed:

- Mitosis & Microscopes PowerPoint or models
- Access to a computer for mitosis simulations
 - o Mitosis – http://www.biology.arizona.edu/cell_bio/tutorials/cell_cycle/main.html

Pre-Lab Questions:

- If you need to enable Flash (if the simulations won't run):
<https://support.google.com/chrome/answer/6258784?co=GENIE.Platform%3DDesktop&hl=en>

Review this week's chapters in the text (or feel free to find info from online sources).

1. Name the 3 main phases of the cell cycle.

The main 3 phases are interphase, mitotic phase, and G₀ phase.

2. During which phase of the cell cycle does DNA get replicated?

The S phase gets replicated by the DNA.

3. What happens during the G₀ phase of the cell cycle?

During the G₀ phase, the cell cycle machinery is dismantled and cyclins as well as cyclin that become dependent on kinases start to disappear.

4. What form is DNA in PRIOR to mitosis?

Prior to mitosis, the chromosomes are copied. They then coil up, and each chromosome looks like a letter X in the nucleus of the cell.

5. During mitosis?

During mitosis, a nuclear division happens to the eukaryotic cell that results in the daughter cells becoming identical

6. List the phases of mitosis in order.

- Prophase
- Prometaphase
- Metaphase
- Anaphase
- Telophase

Activities

1. Activity 1: Mitosis Mastery

- a. **Task #1:** Use the images and your knowledge of mitosis to determine the phase of the 15 images at the end of this document.
- b. **Task #2:** Go to the following website :
http://www.biology.arizona.edu/cell_bio/tutorials/cell_cycle/cells1.html
 - i. READ about “DNA Basics”, “The Cell Cycle”, and “Mitosis” (click next to go through the pages).
 - ii. I HIGHLY RECOMMEND ATTEMPTING TO VIEW ONE OF THE MITOSIS ANIMATIONS AVAILABLE ON THE LAST PAGE!!! They really put it all together for some people.
 - iii. Take the TEST YOURSELF QUIZ on this web page, but I would recommend clicking on ALL the available answers, NOT JUST THE RIGHT ONES, there is a lot of valuable information in the explanations of the “wrong” answers.
 - iv. When you finish the quiz section, go to the ONLINE ONION ROOT TIPS activity
 - v. **Task #3:** READ the 2 pages of introduction and complete the activity to fill in the table below then answer the question below the table:

	INTER-PHASE	PRO-PHASE	META-PHASE	ANA-PHASE	TELO-PHASE	TOTAL
# OF CELLS	20	10	3	2	1	36
% OF CELLS	55.5%	27.7%	8.3%	5.5%	2.7%	100

$$\% \text{ OF CELLS} = (\# \text{ OF CELLS} \div 36) \times 100$$

In total, how much of a cell’s life is taken up by MITOSIS based on your data? (Remember that Interphase is NOT part of Mitosis though it is part of the “Mitotic Cycle”)

2. Activity 2 – Mitosis under the microscope

- a. Return to: <https://www1.udel.edu/biology/ketcham/microscope/>
- b. Place the Onion Root Tip slide on the microscope and use the checklist to prepare it.
- c. Switch views and focus at scanning power.
- d. Switch to low power, refocus, then high power, refocus
 - i. Once you have good focus, use the directional knobs to scan the onion root tip and find at least 1 example of each phase of mitosis.
 - ii. Make a drawing of each phase (each one will just be a single cell, not an entire field of view).
- e. **Task #4:** Select a section with at least 20 cells in view – classify as many cells as you can in that section and fill out the table:

	INTERPHASE	PRO-PHASE	META-PHASE	ANA-PHASE	TELO-PHASE	TOTAL
# OF CELLS	18	4	2	1	0	25

% OF CELLS	72%	16%	8%	4%	0%	100
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- f. **Task #5:** Using the images at the end of this document, find and draw at least 1 example of each phase

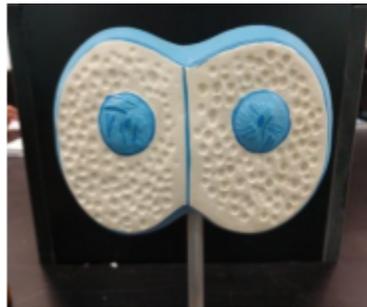
Lab Wrap-Up (For the best learning experience I recommend completing the wrap-up on a separate day from your activities so that you get the opportunity to review.)

- Review your images and those from the end of this document - based on your observations what is the most common phase?** The most common phase is interphase.
- Name 2 features of the mitotic process that are visible in the models but NOT in the actual cells you've observed?** It looks as though telophase is extremely hard to identify because the visual representation is hard and also for anaphase as well. If you know the characteristics of the phases you will be able to identify them but just looking at the visuals, it was hard to identify it.
- What phase was hardest to find?** I feel as though telophase was the hardest phase to find.
- Compare your images to the images in the PowerPoint file (Activity 5) and models.**
 - What differences do you notice between the onion root tip cells going through mitosis and the whitefish blastula cells going through mitosis?** It was extremely hard to differentiate between the phases in the whitefish cells rather comparing that to the white onion cells.

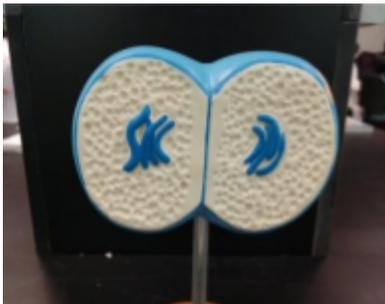
Activity 1 Images:

THESE IMAGES ARE IN NO PARTICULAR ORDER HERE –

CAN YOU PUT THEM IN ORDER? IDENTIFY PHASE? IDENTIFY KEY STRUCTURES?



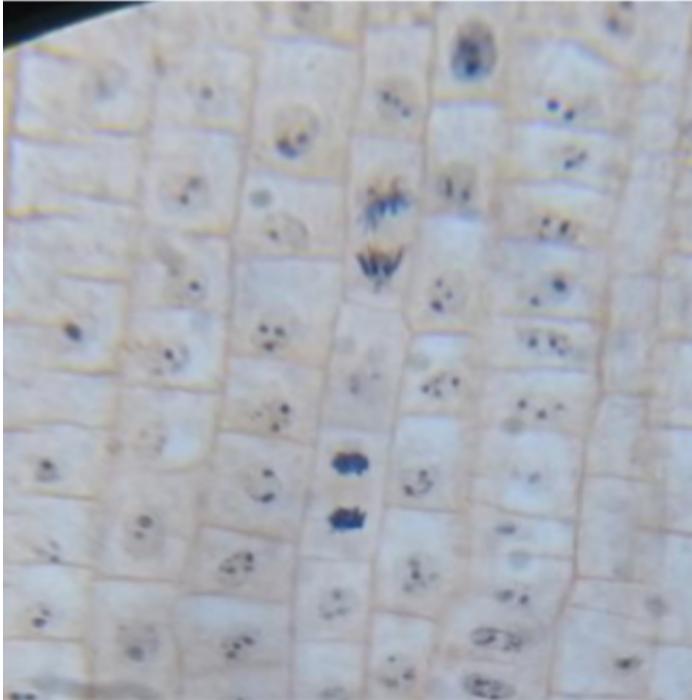
1. Prophase
2. Telophase
3. Metaphase
4. Anaphase
5. Interphase



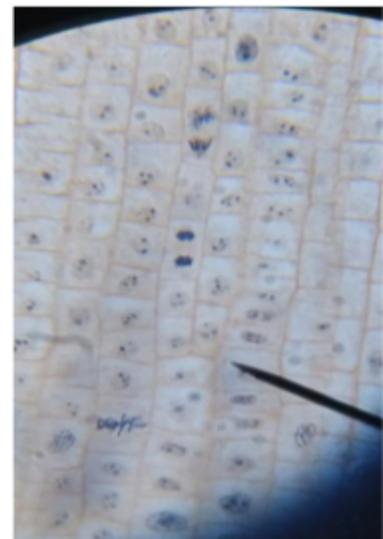
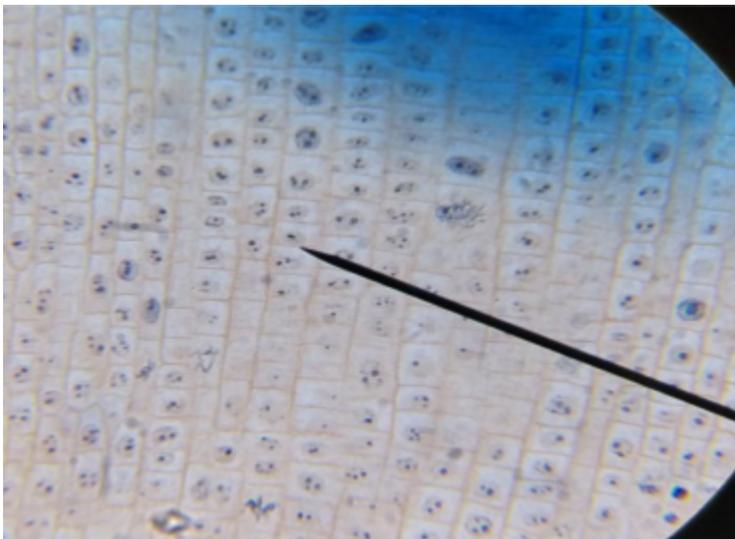
Activity 2

NO PARTICULAR ORDER – CAN YOU FIND CELLS IN VARIOUS PHASES AND IDENTIFY KEY STRUCTURES?

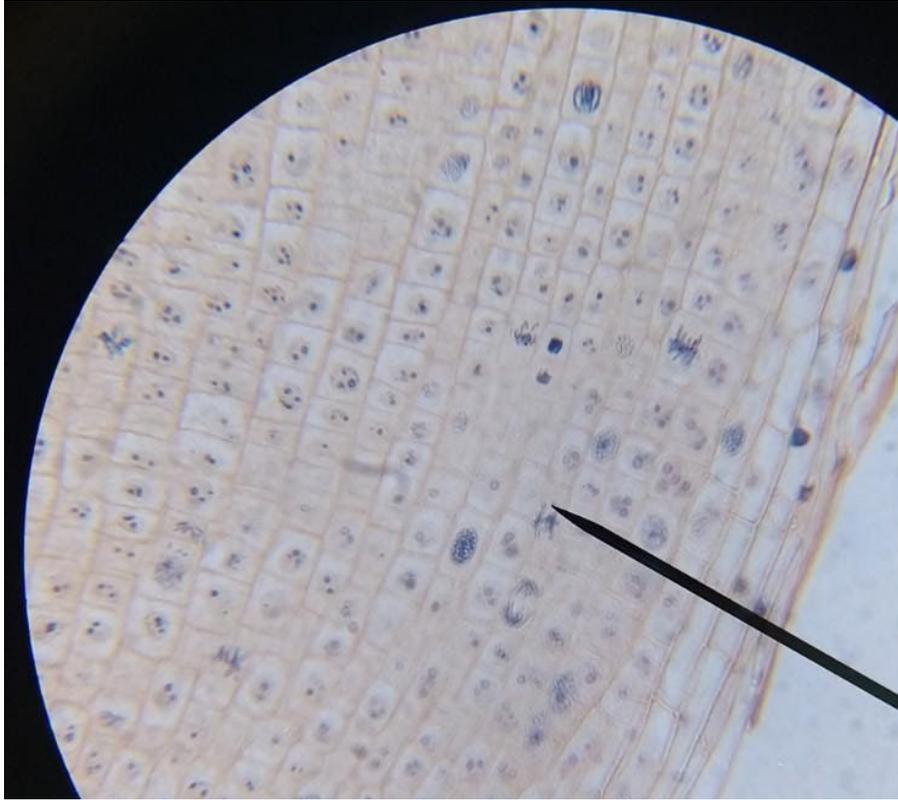
Want a bigger image? Click the image so the “dots” appear around the corners. Then, click and drag a dot to change the size of the image.



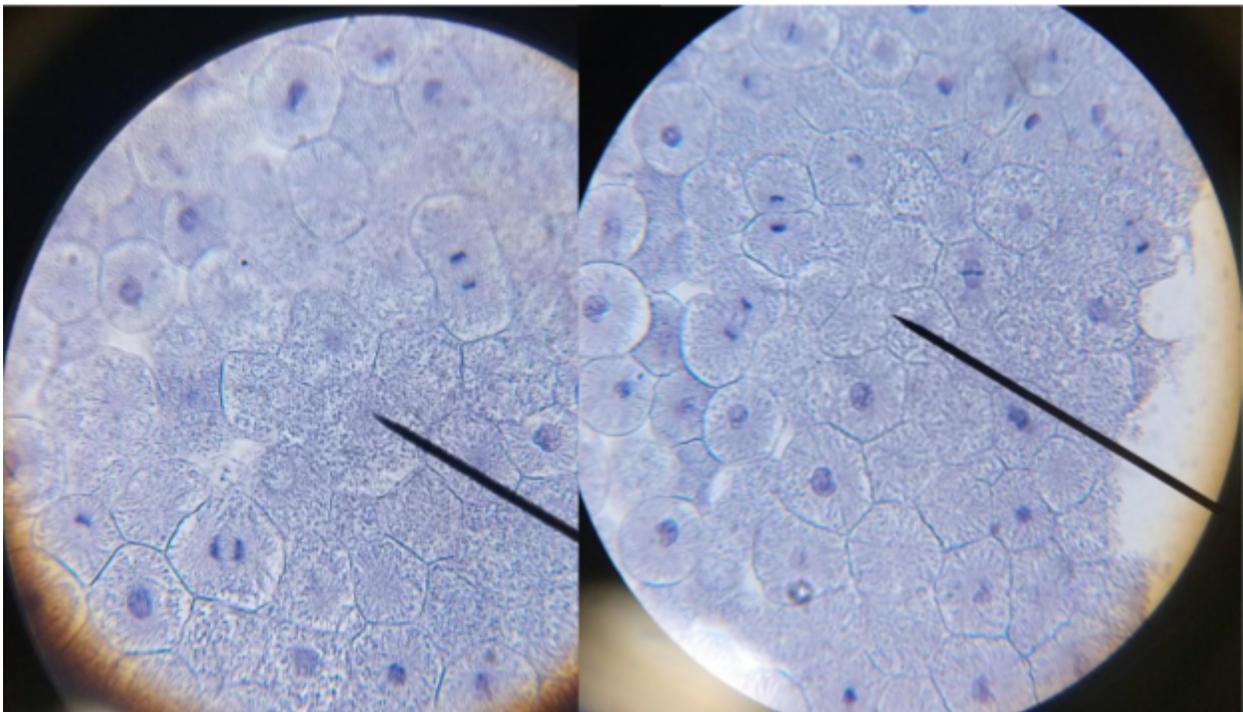
These 2 photos, it looks like interphase and prophase are occurring and there may be a possibility of telophase as well.



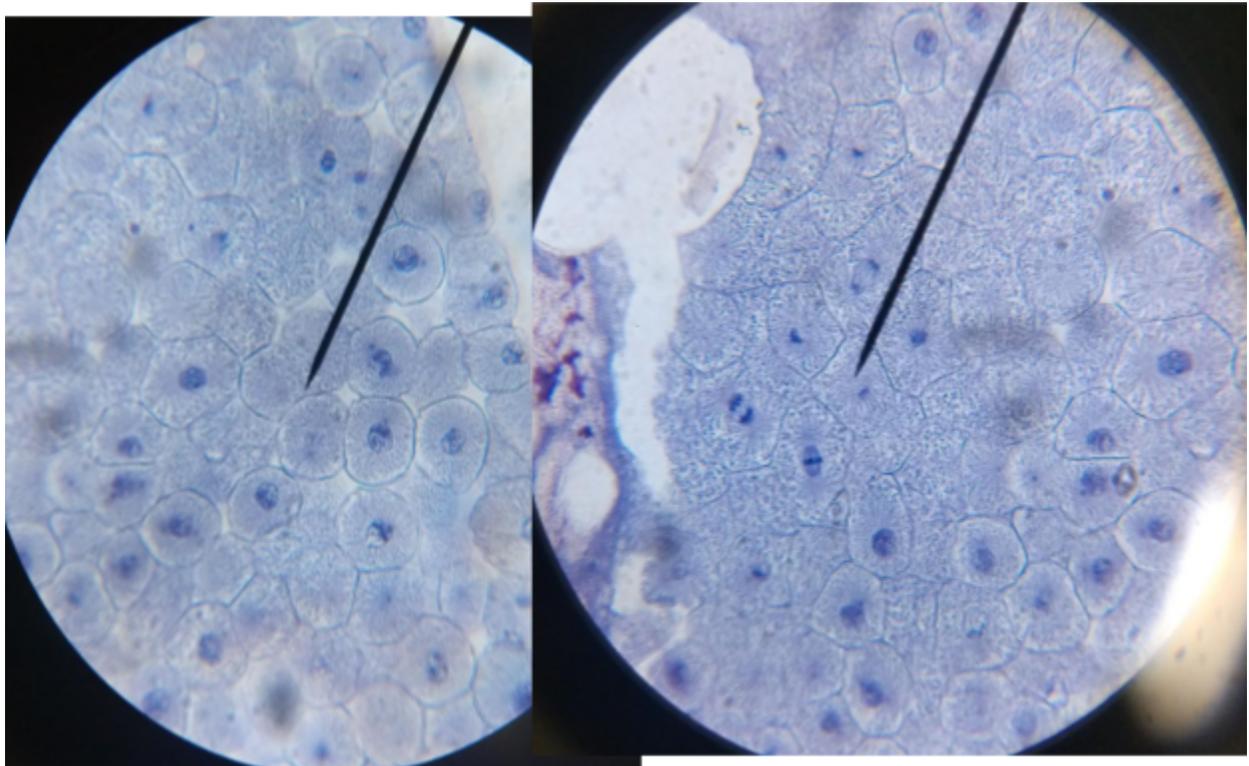
In the first photo, it looks as though I can notice interphase occurring and in the 2nd one it looks like telophase.



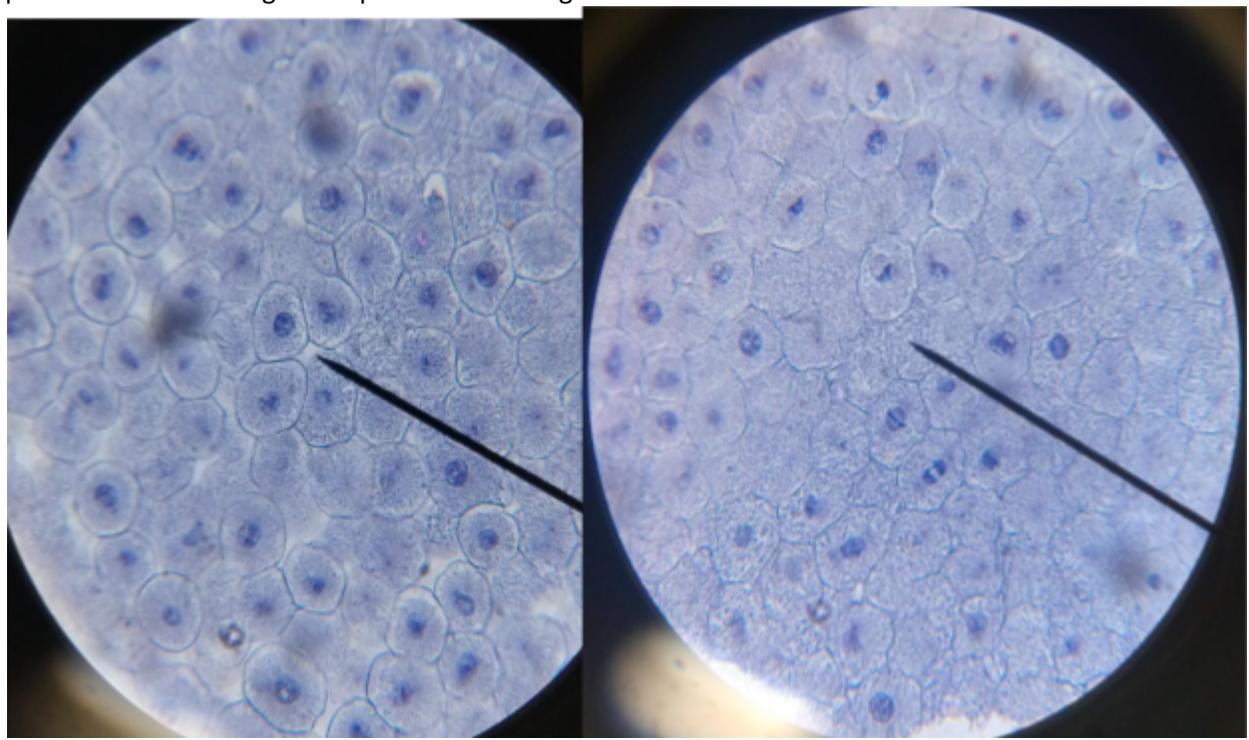
It seems as though prophase is occurring as some chromosomes I can see and other I cannot, as they looked bunched together.



It looks as though the needle is pointing to interphase and for the 2nd photo I can see interphase happening as well.



In the first photo, I would say that the needle is indicating that interphase is occurring but in the 2nd photo it looks as though metaphase is occurring.



In the first photos, I can't really tell what phases are happening but in the second picture it looks as though anaphase is occurring.

It was easier to see the phases in the onion cells rather than the whitefish cells.