

The events of mitosis have resulted in the production of two identical nuclei. The cell may now undergo cytokinesis, in which the cytoplasm of the cell is divided.

In animal cells, the onset of cytokinesis is marked by the presence of a *cleavage furrow*. The cell membrane is drawn inward until the cytoplasm is split into two separate parts, forming two distinct cells. In plant cells cytokinesis results from the formation of a cell plate between the two newly formed nuclei. As the cell wall grows, it separates the nuclei into two distinct cells.

PURPOSE

In this activity you may have to prepare squashes of onion root tips, which have been going through the process of mitosis. Using slides of the onion root tip, you will observe the mitotic stages in actively dividing cells.

SAFETY ALERT!

- » Use proper procedure for carrying and focusing the microscope.

PROCEDURE

1. To prepare your own slide, use forceps to carefully remove an onion root tip from the vial and place the tip on a clean microscope slide.
2. Place the slide on a smooth, flat surface. Add a drop of water and a cover slip to the slide to make a wet mount. Place the wet mount slide between two pieces of paper towel.
3. Use the eraser end of a pencil to press down on the cover slip. Apply only enough pressure to squash the root tip into a single cell layer.
Be careful not to move the cover slip while you are pressing down with the eraser. If you press too hard, you might break the glass slide and tear apart the cells in the onion root tip.
4. Repeat these first three steps to make two additional root tip squashes.
5. View each prepared slide using a compound light microscope.
Begin with the low-power objective (10×) and then switch to the high-power objective (40×). If you prepared a wet mount slide it will be relatively thick, so you will need to take caution when switching to the high-power objective.
Once on high power, use the fine-adjustment knob to bring the image into focus. You will find more mitotic cells in the lower, tip end of the root.
6. While viewing the slide under high power, count the number of cells that you see in the viewing area. Record this number in Table 1. Be sure you are looking at the tip of the onion root.
7. Without moving the slide, count the number of cells that are undergoing mitosis. Record the number that you see in prophase, metaphase, anaphase, and telophase. Record these numbers in Table 1.
8. Move the slide to a completely new viewing area near the one you just observed. Count the total number of cells present, and then count those that are in prophase, metaphase, anaphase, and telophase. Record these numbers in Table 1.
9. In the space provided on your student answer page, prepare a sketch of each stage of mitosis that you observed on your slides. Label each sketch with the appropriate stage name.
10. Dispose of your slides and materials according to your teacher's instructions. Clean up your work area before leaving the lab.

If you are provided with a prepared slide of an onion root tip, skip to Step 5.

DATA AND OBSERVATIONS

Table 1. Cell Counts			
Mitotic Stage	Viewing Area		Total Number of Cells per Stage
	Area 1	Area 2	
Prophase			
Metaphase			
Anaphase			
Telophase			
Non-dividing interphase			
Total cells counted in viewing area			

Table 2. Sketches of Mitotic Stages				
Name of Stage				
Sketch of Stage				

ANALYSIS

1. What percentage of the cells that you observed were undergoing mitosis?
Use the formula provided to calculate your answer. Show your work in the space provided.

$$\% \text{ cells in mitosis} = \frac{\text{total number of cells in all phases of mitosis}}{\text{total number of cells}} \times 100$$

2. Using the data from Table 1 and the formula provided, determine the percent of cells in each of the stages listed in Table 3.

$$\% = \frac{\text{number of cells in stage}}{\text{total number of cells observed}} \times 100$$

Table 3. Percentage of Cells per Stage	
Stages of Mitosis	Percentage of Cells Observed
Prophase	
Metaphase	
Anaphase	
Telophase	

CONCLUSION QUESTIONS

1. What are the stages of the cell cycle? In which stage of the cell cycle were most of the cells that you observed?
2. Explain why the tip of the root was observed in this activity.
3. Based on the number of cells observed in each stage of mitosis, which stage takes the longest amount of time to complete? The shortest amount of time to complete? Explain your reasoning.
4. What is the role of mitosis in the distribution of genetic information to new cells?

CONCLUSION QUESTIONS (CONTINUED)

5. The approximate times it takes a cell to go through the various stages of the cell cycle in a typical mammalian cell are listed here:

- G_1 – 5 to 6 hours
- S – 10 to 12 hours
- G_2 – 4 to 6 hours
- M – 1 to 2 hours

Based on the time frame, create a pie chart that reflects the approximate hours of each stage.

Data and Observations

This section contains your results. Summarize data collected; do not include raw data. Use tables, graphs, and charts.

Discussion

In this section you will discuss and explain your results. Include interpretations and opinions of your data and observations. Discuss any sources of error. Include any unusual circumstances, problems or difficulties that were encountered. In this section you should discuss how the information gathered during the project is useful to society or the individual. If there are questions to answer as a part of your lab report, do so in this section.

Conclusion

This is a judgment of your hypothesis based on your results. It is a statement of whether your hypothesis was supported or not supported. Remember, it is not bad to have made an incorrect hypothesis. There are many successful projects that have made an incorrect hypothesis. If your hypothesis was not supported by the data collected, you may make a brief statement as to why you think this was so.

Bibliography

Properly cite all sources used (APA format). Minimum of two major sources.

*General Guidelines:

- Type your paper double spaced.

Rubric for Lab Reports

Title <ul style="list-style-type: none">• Relates variables• Appropriate for activity	5
Introduction <ul style="list-style-type: none">• Provides adequate background information for reader• States the purpose/objectives• States the hypothesis	15
Procedure <ul style="list-style-type: none">• Specific and clear enough to be reproduced• Includes materials needed	15
Data and Observations <ul style="list-style-type: none">• Summarizes data collected (not raw data)• Uses tables, diagrams &/or charts	15
Discussion <ul style="list-style-type: none">• Discusses the data and observations• Discusses sources of error, unusual circumstances, problems or difficulties as needed• Discusses implications of data• Answers lab questions (if included)	15
Conclusion <ul style="list-style-type: none">• States whether the hypothesis was supported by the data• Draws a valid conclusion to the experiment• <i>use data as evidence</i>	15
Bibliography<ul style="list-style-type: none">• Properly cites sources used in Intro (APA)• Minimum of 2 major sources	10
General <ul style="list-style-type: none">• Typed• Double Spaced• Neat and Organized	10
Total	100

