

## Determining the Time Needed for Mitosis

### Pre-Lab Discussion

Mitosis is the process by which the cell nucleus is divided into two nuclei. Mitosis takes place in four phases: prophase, metaphase, anaphase, and telophase. The period between one mitosis and the next is called interphase. Chromosome replication occurs during interphase.

Organisms such as the common intestinal bacteria *E. coli* can complete mitosis in 30 minutes. Other cells require days. In some cells, such as human muscle cells, mitosis never occurs.

In this investigation, you will determine the time required for plant and animal cells to go through each phase of mitosis.

### Problem

How can the time needed for each phase of mitosis be determined in a plant and an animal cell?

### Materials (per group)

Textbook  
Prepared slide of plant mitosis (onion root tip)  
Prepared slide of animal mitosis (whitefish blastula)  
Microscope

### Safety

Handle all glassware carefully. Always handle the microscope with extreme care. You are responsible for its proper care and use. Use caution when handling glass slides as they can break easily and cut you. Note all safety alert symbols next to the steps in the Procedure and review the meanings of each symbol by referring to the symbol guide on page 10.

## Procedure

1. Review the phases of plant and animal cell mitosis by studying the illustrations and photographs on pages 164 through 171 in your textbook.
2. Place the prepared onion root tip slide on the stage of the microscope. Using the low-power objective, focus on the cells just above the tip of the root. Switch to high power and count the total number of cells in the field of view. Record this information in the appropriate place in Data Table 1.
3. Without changing the field of view, count the number of cells in each phase of mitosis: prophase, metaphase, anaphase, and telophase. Record this information in the appropriate place in Data Table 1.
4. To determine the approximate proportion of time a cell spends in each phase of mitosis, divide the number of cells in each phase by the total number of cells in the field of view. To convert each decimal to a percent, multiply by 100. Record this information in the appropriate place in Data Table 1.
5. Repeat steps 2 through 4 using the prepared animal mitosis slide. Record all of the information in the appropriate places in Data Table 2.

## Observations

Data Table 1	Plant Cell Mitosis		
Phase	Number of Cells in Phase	$\frac{\text{Number of Cells in Phase}}{\text{Total Number of Cells}}$	Percentage of Time Spent in Phase
Prophase			
Metaphase			
Anaphase			
Telophase			
Total number of cells in field of view			

Data Table 2	Animal Cell Mitosis		
Phase	Number of Cells in Phase	$\frac{\text{Number of Cells in Phase}}{\text{Total Number of Cells}}$	Percentage of Time Spent in Phase
Prophase			
Metaphase			
Anaphase			
Telophase			
Total number of cells in field of view			

**Analysis and Conclusions**

1. In which phase of plant cell mitosis is the most time spent? In which phase of animal cell mitosis? \_\_\_\_\_  
\_\_\_\_\_
  
2. In which phase of plant cell mitosis is the least time spent? In which phase of animal cell mitosis? \_\_\_\_\_  
\_\_\_\_\_
  
3. Based on this investigation, what is the total percentage of time the plant and animal cells spend undergoing mitosis? \_\_\_\_\_  
\_\_\_\_\_
  
4. What percentage of the time are the plant and animal cells not undergoing mitosis?  
\_\_\_\_\_  
\_\_\_\_\_
  
5. What are the plant and animal cells doing when they are not undergoing mitosis?  
\_\_\_\_\_

**Critical Thinking and Application**

1. Determine the percentages of time spent in each phase of mitosis for the onion root tip using the total number of cells undergoing mitosis instead of the total number of cells in the field of view.

$$\text{percentage} = \frac{\text{Number of cells in phase}}{\text{Number of cells undergoing mitosis}}$$

prophase \_\_\_\_\_

metaphase \_\_\_\_\_

anaphase \_\_\_\_\_

telophase \_\_\_\_\_

2. In the Pre-Lab Discussion you were told that *E. coli* is capable of undergoing mitosis in 30 minutes. Using the information from the previous problem, determine how long *E. coli* spends in each phase of mitosis.

prophase \_\_\_\_\_

metaphase \_\_\_\_\_

anaphase \_\_\_\_\_

telophase \_\_\_\_\_

### Going Further

Using reference sources, investigate the relationship between mitosis and cancer. What phases of mitosis might you expect to observe most frequently?