

# Observing Mitosis in Onions

## cell division in plants

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Block: \_\_\_\_\_

### Purpose/Objective:

- To examine the dividing root-tip cells of an onion
- To identify the phase of mitosis that different cells in an onion root-tip are undergoing
- To determine the relative length of time each phase of mitosis takes in onion root-tip cells

### Materials:

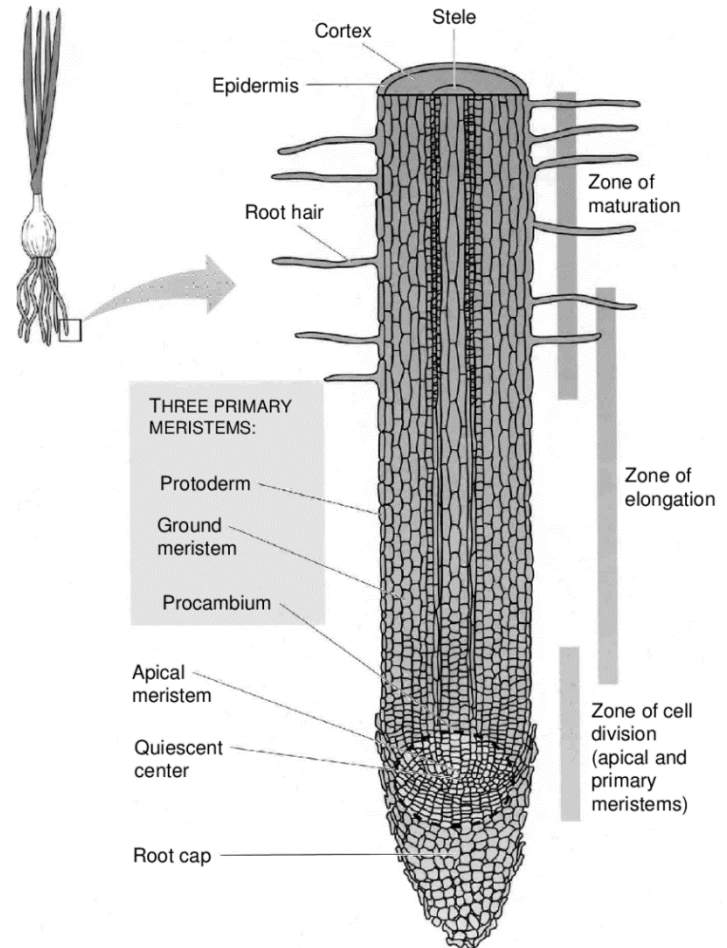
- Compound light microscope/ lab handout
- Prepared microscope slide of a longitudinal section of *Allium* (onion) root-tip

### Background:

Mitosis is divided into four phases: **prophase**, **metaphase**, **anaphase**, and **telophase**. Interphase is not considered a part of mitosis. In many plants, there are growth regions called **meristems** where mitosis is ongoing. Meristems are found in the tips of plant roots and shoots.

### Procedure:

1. Examine the meristem handout carefully (excuse the blurriness). There are **68 different cells** to look at.
2. The 68 cells should appear to be actively dividing at the same time the handout/slide was being made.
3. The cells will appear in rows, so it should be easy to keep track of them. The dark staining bodies are the **nuclei**.
4. For each of the cells in your sample; identify the stage of mitosis in the **"Tally Marks"** column beside the appropriate phase.



### Data Table:

Relative Duration of Each Phase of Mitosis				
Phase of Mitosis	Tally Marks	Count	Percentage	Time (min)
Interphase				
Prophase				
Metaphase				
Anaphase				
Telophase				

5. When you have classified each cell in your sample, count the tally marks for each phase and fill in the **"Count"** column.

For Example:  "Count" is 12

- In which phase of mitosis were the greatest number of cells? \_\_\_\_\_
- In which phase of mitosis were the fewest number of cells? \_\_\_\_\_

6. Calculate the percentage of cells found in each phase. Divide the number of cells in a phase by the total number of cells in your sample (68) and multiply by 100. **Enter this figure under the "Percentage" column of the data table.**

For Example: count is 12 for Prophase.  $\frac{12}{68} \times 100 = 17\%$

7. The percentage of cells found in each phase is a measure of how long each phase lasts. For example, if 25% of the cells are in prophase, then prophase takes 25% of the total time it takes for a cell to undergo mitosis.
- Mitosis in onion cells take about **80 minutes**.

8. Calculate the actual time for each phase using this information and the percentage you have just determined. Use the following equation to find the duration of each phase of mitosis in onion cells. **Enter the time (in minutes) of each phase under the "Time (min)" column on the data table.**

$$\text{Duration of phase (in minutes)} = \frac{\text{percent}}{100} \times 80 \text{ minutes}$$

9. Just as humans increase their number of cells from birth to adulthood, roots grow longer and increase in the number of cells they have. **Fill out the following chart.**

Data Observations of Onion Root Tip Growth in 48 hours				
Root Tip #	Original Length (mm)	Final Length (mm)	Growth of root tip (mm)	Average growth of ALL root tips (mm)
1	10	17		
2	10	15		
3	10	17		
4	10	18		
5	10	13		

10. Return all materials to their designated locations and complete the lab analysis questions.

## Analysis questions: ANSWER IN COMPLETE SENTENCES!

1. What process is happening to the roots so that they grow deeper into the ground? \_\_\_\_\_
2. What evidence do you have that mitosis occurred in the roots?
3. Suppose you found that the **length (chart 2)** of the onion root tip had not changed during the 48-hour period. ***Hypothesize*** about some possible explanations for this lack of growth. [hint: think about what plants would need in order to grow.]
4. According to your data table (chart 1), which phase of mitosis last the longest? \_\_\_\_\_
5. Why might this phase require more time than other phases of mitosis? **Think back to your notes.**
6. According to your data table (chart 1), which phase takes the least amount of time? \_\_\_\_\_
7. Given the rate of mitosis (how long it takes for a cell to divide) in types of animal cells, how could you determine how long each phase of mitosis takes in those cells? **Think about what you did to determine how long each phase took in the onion root tip.**
8. Cancerous tissue is composed of cells undergoing uncontrolled, rapid cell division. How could you develop a procedure to identify cancerous tissue by counting the number of cells undergoing mitosis?
9. What percentage of the onion root tip was NOT undergoing mitosis (**Interphase**) at any given time according to the sample?
10. What is the cell doing during interphase?