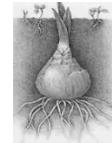


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Observing the Cell Cycle: Onion Root Tip Lab Activity

Adapted from: http://biologyjunction.com/mitosis_activity.htm



Background:

In a growing plant root, the cells at the tip of the root are constantly dividing to allow the root to grow. Because each cell divides independently of the others, a root tip contains cells at different stages of the cell cycle. This makes a root tip an excellent tissue to study the stages of cell division.

Mitosis is division of the nucleus and its chromosomes. It is followed by division of the cytoplasm known as cytokinesis. Both **mitosis** and **cytokinesis** are parts of the Cell Cycle. Most of the life of a cell is spent in a non-dividing phase called **interphase**. Interphase includes G₁ stage in which the newly divided cells grow in size, S stage in which chromosomes are replicated (copied) and appear as chromatin and G₂ stage where the cell makes preparations for mitosis.

Mitosis has 4 major stages --- Prophase, Metaphase, Anaphase, and Telophase. When a living organism needs new cells to repair damage, grow, or just maintain its condition, cells undergo mitosis. Mitosis takes place in somatic (body cells).

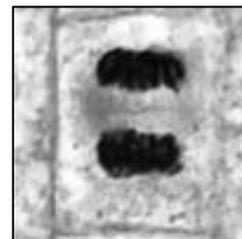
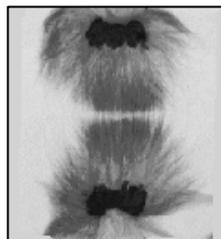
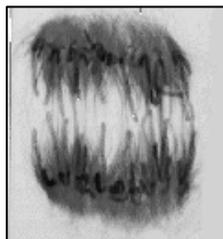
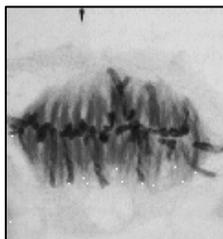
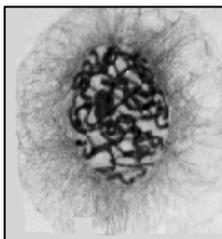
During **prophase**, the DNA and proteins start to condense. The two centrioles move toward the opposite end of the cell in animals or microtubules are assembled in plants to form a spindle. The nuclear envelope starts to break up. During **metaphase**, the spindle apparatus attaches to sister chromatids of each chromosome at the centromere. All the chromosomes line up at the equator of the cell. They are now in their most tightly condensed form (most visible). During **anaphase**, the spindle fibers attached to the two sister chromatids of each chromosome contract and separate chromosomes which move them apart to opposite ends of the cell. In **telophase**, as the 2 new cells pinch in half (animal cells) or a cell plate forms (plant cells), the chromosomes become less condensed again and reappear as chromatin. New nuclear membranes form.

Objective:

In this lab, you will determine the approximate time it takes for a cell to pass through the stages of the cell cycle. You may use your textbook and class notes to help you identify the stages of mitosis as seen under the microscope.

Pre-lab Questions:

1. What are the 3 main stages of the cell cycle? (3 points)
2. What are the 4 stages of mitosis, in order? (5 points)
3. Using the information above, label each of the stages of the cell cycle below. (5 points)



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Hypothesis:

Form a hypothesis about which stage of the cell cycle you think takes the longest. Explain why. (2 points)

Materials:

- Prepared onion root tip slide *or* microscope image of cells
- Lab worksheet
- Pencil

Procedure:

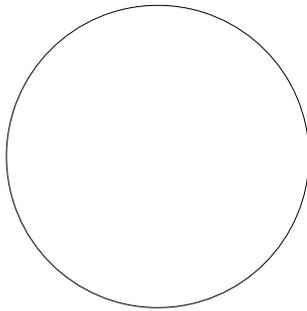
1. Get a microscope and a prepared slide of an onion root tip. If you are using the print out of the cells, get one from your teacher.
2. Observe the cells under low power, and then under high power through your microscope.
3. Using the spaces provided in the Data section, draw each stage of the cell cycle as you observe it. Make sure to include the magnification.
4. Count the number of cells you observe in each phase of the cell cycle. Record this data in Table 1.
5. Calculate the percentage of time cells spend in each stage. Divide the number of each cell by the total number of cells and multiply by 100 to determine the percentage. Record these values in the Table 1.

Data:

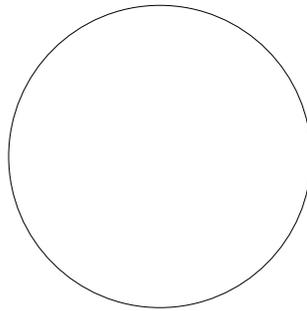
Onion Root Tip Drawings

Draw each phase of the cell cycle in the spaces provided below. (2 points each)

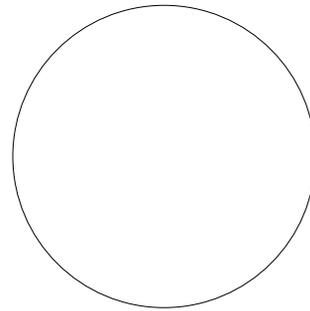
Interphase



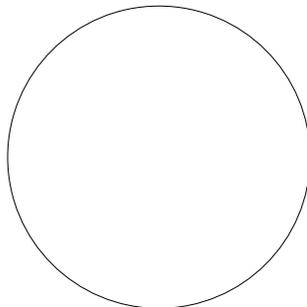
Prophase



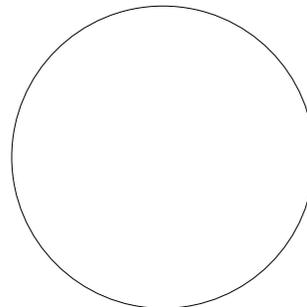
Metaphase



Anaphase



Telophase



Name: _____

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Table 1: Cells in Each Phase of the Cell Cycle (12 points)

Stage of Cell Cycle	Number of Cells in Stage	Percentage of Cells in Stage
Interphase		
Prophase		
Metaphase		
Anaphase		
Telophase		
TOTAL		

Analysis and Discussion:

1. Of the cell cycle stages, which one takes the longest to complete? Explain this using data you have collected (from the table above). Why do you think this is? (3 points)

2. Of the cell cycle stages, which one is the shortest? Explain this using data you have collected (from the table above). Why do you think this is? (3 points)

3. Describe the difference between cells in interphase with cells in prophase. Be sure to include the terms chromosomes & nuclear membrane. (2 points)

4. Compare/contrast metaphase and anaphase. (3 points)

5. Read through the background information at the beginning of this lab. Explain the difference between telophase in plant cells and in animal cells. (2 points)