

Mitosis - Rate of Division

Review the phases of mitosis from the Cell Cycle Notes to make sure you can identify each of the phases. You might have to refer to the diagrams in the textbook to help you. To complete the activity, you will have to be able to look at cells under the microscope and determine which phase they are in. To estimate the relative length of time that a cell spends in the various stages of cell replication, you will examine the meristematic region of a prepared slide of the onion root tip. Remember that cells in the meristem of a plant are actively dividing so it will be easy to find lots of dividing cells. The length of the cell cycle is approximately 24 hours for cells in actively dividing onion root tips.

It is hard to imagine that you can estimate how much time a cell spends in each phase of cell replication from a slide of dead cells. Yet, this is precisely what you will do in this activity. Since you are working with a prepared slide, you cannot get any information about how long it takes a cell to divide, because the cells are dead and no longer dividing. What you can determine is how many cells are in each phase and then, from this, you can infer the percent of time each cell spends in each phase.

Procedure:

1. Observe every cell in one high power field of view (a field of view is the circular lighted area you see when you look through the ocular lens) and determine which phase of the cell cycle it is in. This is best done in pairs. The partner observing the slide calls out the phase of each cell while the other partner records it. Then switch so the recorder becomes the observer and *vice versa*. Count at least two full fields of view. If you have not counted at least 200 cells, then count a third field of view.
2. Record your data in Table 1. See #3 for help in completing the last column.

Table 1

	Field of view 1	Field of view 2	Field of view 3	Total	Percent of Total Cells Counted	Time in each Stage
Interphase						
Prophase						
Metaphase						
Anaphase						
Telophase						

Total Cells Counted:

3. Calculate the percentage of cells in each phase.

Consider that it takes, on average, 24 hours (or 1,440 minutes) for onion root-tip cells to complete the cell cycle. You can calculate the amount of time spent in each phase of the cell cycle from the percent of cells in that stage.

Percent of cells in stage x 1,440 minutes = minutes of cell cycle spent in stage

Questions

1. a) Explain how mitosis leads to two daughter cells, each of which is diploid and genetically identical to the original.
b) Why is it important for the daughter cells to be identical?
2. What activities are going on in the cell during interphase?
3. What clues did you use to identify which phase any particular cell is in?
4. How does plant cell mitosis accommodate a rigid, inflexible cell wall?
5. Based on your data, what can you infer about the relative length of time an onion root-tip cell spends in each stage of cell division?
6. How would your results have been different had you looked at a region of the root tip away from the meristem?