Mitosis

Please bring your textbook to this laboratory session.

A. Objectives

Become familiar with

1. The stages of the cell cycle;
2. Differences between mitosis in animals and plants

B. Before coming to lab

Reading

1. This exercise
2. Campbell et al. *Biology,* pp 221-226 (note: there might be a quiz at the beginning of this lab).

C. During lab

1. Obtain a prepared slide of an onion root tip.
2. Obtain your compound microscope.
3. Look at your slide with the 40X objective in place.
4. In your notebook, draw a table with two columns. In the left column, draw the nuclear region of onion root cells in the different stages of the cell cycle. Your drawing should have a minimum diameter of 7 cm. This time, you do not need to draw your cell in proportion to the field of view. Do not forget to label your drawings.
5. In the right column explain the major processes occurring in the stage depicted in the left column.
6. Starting just above the tip of the root you are studying, work across and examine 60 cells. Record in order the stages of each cell in your lab book (see Note 1). Do not skip any cells and be sure not to overlook early prophase and late telophase. Be careful not to be partial to cells in metaphase or anaphase. Do not count cells in which a nucleus cannot be seen.
7. Using the numbers found in Step 6, estimate the time spent in each phase. Assume that all cells are dividing randomly in the onion root tip and that division proceeds at a uniform rate. Further assume: The total time for the cell cycle is 960 minutes and the number of cells in a given phase is directly proportional to the length of time required for the completion of that stage.
8. Observe prepared slides of whitefish blastulae and draw each of the stages of mitosis (see Note 2).
9. Draw a table in which you contrast mitosis in onions and whitefish.

D. After lab

Enjoy life and think about all your cells currently undergoing mitosis!

E. Background

Note 1: Table for recording number of cells in a certain stage of the cell cycle

	Interphase	Prophase	Metaphase	Anaphase	Telophase	Total
# of cells						60
% of cells						100
Time spent						960

Note 2: Whitefish blastula

A blastula is an early stage of embryonic development of animals. At this stage, the embryo consists of a fluid filled cavity (the blastocoel) surrounded by several layers of cells. Like an onion root tip, cells are actively dividing, so that it is possible to observe the different stages of the cell cycle. Whitefish blastulae are often chosen for mitosis exercises, because microtubules and the spindle apparatus can be observed in great detail.

F. Lab review

1. Define the following terms (you should have used them in your description of the different stages!)
   cell cycle, mitosis, cytokinesis, chromatid, homologous pair, centrioles, centrosome, kinetochore, cell plate, furrow

2. Assuming that a diploid organism has a **haploid** chromosome number of n=4, predict how many chromatids and chromosomes a cell will have in the following stages:

	Number of sister chromatids	Number of chromosomes*
G1		
S		
G2		
Prophase		
Metaphase		
Anaphase		
Telophase after cytokinesis		

*note: a chromosome is called a chromosome even if it is not visible as a morphological entity as in its condensed stage during cell division. What is the function of the centromere region of a chromosome?

3. How are centrioles and centrosomes related?

4. What is the function of spindle fibers?

5. When does a chromosome become a chromatid?

6. Can a haploid cell undergo mitosis?

7. If you need more practice check out the Biology Project of the University of Arizona, which has a tutorial and quiz questions on the cell cycle at:
   http://www.biology.arizona.edu/cell_bio/tutorials/cell_cycle/main.html