

Name _____ Period _____ Date _____

Laboratory Activity #8 – Mitosis in Animal & Plant Cells

Introduction

As part of your pre-lab, you must type up an introduction on Cell Division, Mitosis, and why a scientist purposely stain a slide. Make sure you explain all the events during these major steps in the cell cycle and clearly state the purpose of this activity. A hypothesis is not needed for this lab.

The pre-lab also includes your materials and procedure sections. Your observations section should be included with space for your anticipated observations, but it is "blank" at this point since you have not completed the lab. This is where your pre-lab ends however when writing your formal lab report, you will then include the remaining sections. (Please refer to the "Grading Guidelines for a complete look at the sections of a formal lab report.)

Objectives (not a section in your formal lab report)

In Part I of this activity you will:

1. Observe the phases of mitosis in cells of developing animal embryos.
2. Observe the method of cytoplasmic division during cell reproduction in animal cells.

In Part II of this activity you will:

1. Observe the phases of mitosis in cells of the meristem of onion root tips.
2. Observe the method of cytoplasmic division during cell reproduction in plant cells.

Materials

-prepared slides of whitefish embryo sections -lenspaper
 -prepared slides of onion root tip, longitudinal section -microscope

Procedures and Observations

Part I - Mitosis in Animal Cells

A fertilized whitefish zygote divides into 2, then 4, then 8, then 16 cells, and continues to divide repeatedly until the embryo is in the form of a tiny ball of cells. The tiny ball can be stained and sliced, and the slices mounted on microscope slides. Cells can then be examined to see the phases of mitosis that were occurring when the ball of cells was taken for study.

1. Obtain a prepared slide of whitefish embryo sections from your teacher. If the slide is dirty, carefully hold it by the edges and clean it with a tissue. Do not press on the cover slip. Hold the slide up to the light and look at the sections. (Observe the number of sections on the slide and the color these sections are stained.)

2. Place the slide on the microscope stage and focus on a section under low power.

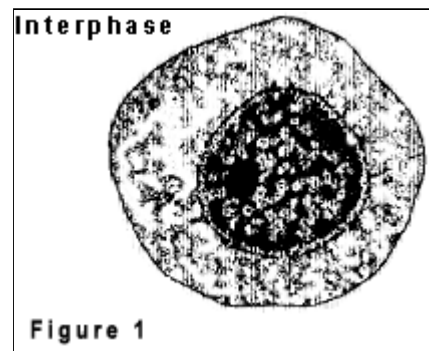
3. Look for individual cells. Try to count the number of cells in the section. (Observe the number of cells in one section.)

(During interphase, the hereditary material is dispersed throughout the nucleus. This material stains darkly, and in the microscope it looks like dark grains, or tangled threads. At this stage the hereditary material is called chromatin.)

4. Look for a cell at interphase. See Figure 1. When you find one, center it. Then switch to high power.

(Observe the structure of the cell you are observing during Interphase)

5. Switch back to low power. Look for a cell at early prophase. See Figure 2. If you do not find one in the section you are using, look at other sections on your slide. When you have found one, center it and switch to high power.



(Observe for the presence of a defined nucleus and nucleolus)

(The rather large star-shaped structures at the two poles of the cell are the asters. The astral rays point out from the centrioles and form a spindle between the centrioles. *Chromosomes*, now condensed, look like very dark, short threads.)

6. Switch back to low power. Look for a cell at metaphase. See Figure 3. When you have found one, center it and switch to high power.

7. Move the fine adjustment knob back and forth a tiny bit in each direction to see the depth of the spindle. Also notice the way the light changes as it passes through the spindle fibers and astral rays. (Observe and in your data section, draw a cell at metaphase. Make it about 4 cm across. Lightly sketch in the spindle. Label the chromosomes, asters, and spindle.)

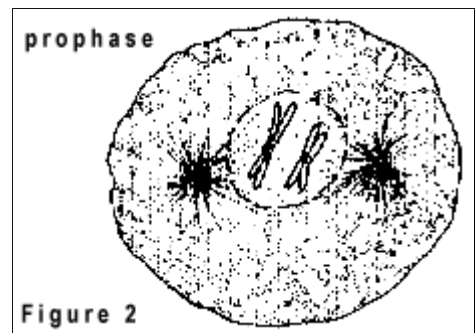


Figure 2

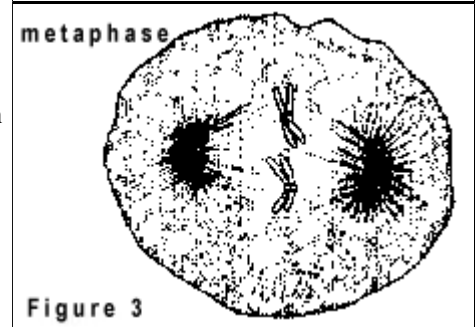


Figure 3

8. Switch back to low power. Look for a cell at anaphase. See Figure 4. When you have found one, center it and switch to high power. (Observe and in your data section, draw a cell at anaphase. Make it about 4 cm across. Label the structures you see.)

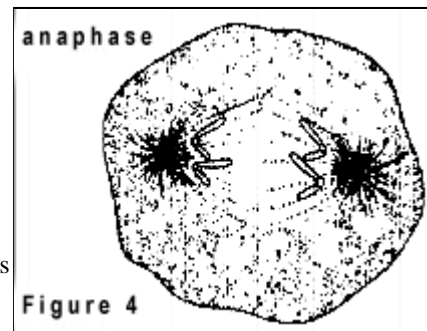


Figure 4

9. Again switch to low power. Look for a cell at telophase. See Figure 5. Examine the cell under high power. (Observe for a nuclear membrane around the nuclei of the new daughter cells and for a nucleolus in the daughter cells)

(In your conclusion, describe what has happened to the cell membrane. and how will the daughter cells compare in size with the parent cell. Also, describe how the nuclei of the daughter cells compare with the parent cell nucleus)

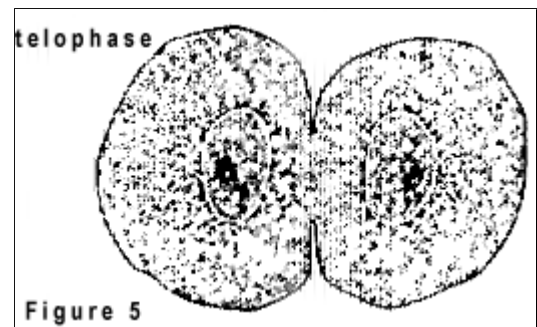


Figure 5

Part II - Mitosis in Plant Cells

Cell division is similar in all organisms. There are, however, differences in the process in plant cells and in animal cells, which can be seen when the phases of mitosis and cytokinesis are studied. In Part I, you observed cell division in animal cells. In this Section, you will observe the process in plant cells.

Actively reproducing cells in onion root tips can be used for the study of mitosis in plant cells. The meristem, near the root tip, is the tissue where new cells are produced.

1. Obtain a prepared slide of longitudinal sections of onion root tips. If the slide is dirty, hold it by the edges and carefully clean it with a moistened tissue. Do not press on the cover slip, you might crush the root tip sections. Hold the slide up to the light and look

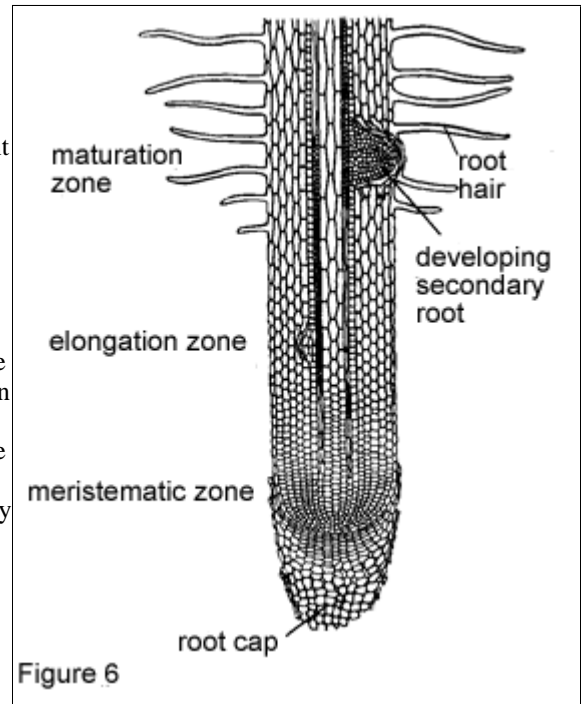
at the sections.

(Observe the number of sections on the slide and in which direction the pointed ends of the sections point; up or down).

*Recall that the microscope inverts the image. It will be important to locate the root cap, in order to find the meristem tissue.

2. Place the slide on the microscope stage and focus on a section at low power. Move the slide until you can see the root cap clearly. Arrange the slide so that the root cap is pointing toward you.

(Observe just above the root cap-- the meristem tissue. See Figure 6. In the meristem region, many of the cells are much smaller than those of the root cap. They are the new cells. They will grow before reproducing. Many of the larger cells of the meristem were in the process of mitosis when the root tip was taken for study. Chromosomes are visible in cells undergoing mitosis because they were stained with a purple stain.)



3. Find the meristem tissue and examine it. Note how it is clearly different from the root cap tissue below it. Move the slide so that you can see the larger cells above the meristem tissue. The differences in the tissues help you to locate the cells of the meristem. Return to the meristem tissue and examine the shape of the cells.

(Observe the shape of the cells)

4. Notice that the cells are in rows. In looking for cells in mitosis, you will find it easy to search up one row and down the next. Look at a number of cells at low power to accustom your eye to the size of the cells and their nuclei. Look for cells containing darkly stained chromosomes.

5. Find a cell at early prophase. The nucleus should be round, but darkly stained, because chromosomes were shortening and thickening as mitosis began in that cell. The nuclear membrane may be breaking down, and the nucleoli may be starting to disintegrate. Center the cell in the low power field and switch to high power. If you cannot find the cell you wished to examine, switch again to low power and center the cell more carefully. Examine the nuclei of several cells at high power. Look for darkly staining nucleoli.

(Observe the number of nucleoli present in each nucleus and in your conclusion section, explain why there would be multiple nucleoli)

(One of the ways in which plant cells differ from animal cells is that plant cells lack centrioles, and do not form asters during mitosis. A spindle forms however, and the chromosomes undergo the same kinds of activities as occur in animal cells)

6. Switch back to low power. Look for a cell at metaphase. See Figure 7. When you have found one, center it and switch to high power.

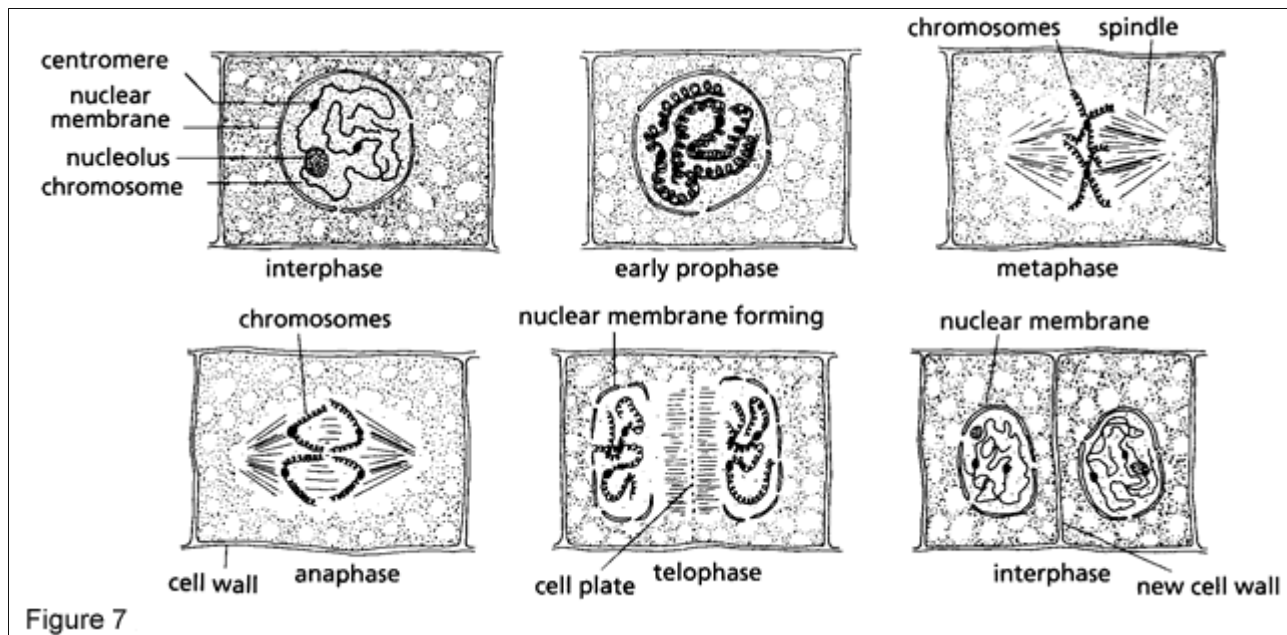


Figure 7

7. Move the fine adjustment knob back and forth a tiny bit in each direction to try to see the depth of the spindle. Also observe the way the light changes as it passes through the spindle fibers.

8. Switch back to low power. Look for a cell at anaphase. See Figure 7. When you have found one, center it and switch to high power.

In the telophase stage of mitosis in plant cells, locate the cell plate and explain the purpose and function of the cell plate in your conclusion.)

9. Again switch to low power. Look for a cell at telophase. See Figure 7. Examine the cell under high power. (Observe the nuclei of the new daughter cells and look for a nuclear membrane/envelope and for the presence of nucleoli.)

(In your conclusion, make sure you include a discussion on the size comparison between the new daughter cells and the parent cell. Also, include a comparison between the size and content of the nuclei between parent and daughter cells.)

Conclusions and Analysis

1. Why is interphase considered a "resting phase?"
2. What becomes visible during prophase that is not visible before?
3. What happens to the chromosomes during metaphase?
4. What is cytokinesis?
5. What is the difference between cytokinesis in plant and animal cells?
6. What is the longest phase of cell division?

(The explanation of answers to these questions should be included in your conclusion section. This should be done in paragraph form. Also, in your data section, make sure you include a copy of the excel spreadsheet to compare the relative time spent in each stage. Hint: You would compare the number of cells found in each stage to accomplish this)