

## Assignment 7

### Cells of Multicellular organisms

#### 1. File upload (3 points)

View this [electron micrograph of spinach leaf cells](#). The central cell has a thin cell wall; it is difficult to distinguish primary and secondary cell wall layers. Note the places where this cell touches three adjacent cells. Locate and magnify a region where the cell wall and middle lamella are clearly visible and capture the image. Label the plasma membrane, cell wall, and middle lamella. Submit your labeled image to WebAssign as a .jpg or .png file.

#### 2. Multiple-choice (1 point)

The function of plasmodesmata in plant cells is to

- assist in synthesis of the primary cell wall
- secrete pectins to form the middle lamella
- provide cellulose for construction of the secondary cell wall
- hold adjacent cells tightly together
- allow direct communication between adjacent cells

#### 3-5. File upload (1 point each)

Think about the basic structure of each of the following animal tissues, then capture an image at appropriate magnification and label several cells and the ECM of each.

[slide of liver](#) - These cells are held tightly together and have a very thin layer of ECM between them. Most of the tissue is composed of liver cells. Label cells and ECM, then submit the image to WebAssign for question 3.

[slide of connective tissue](#) - This slide is a section of pancreas. Running through the pancreas is a broad region of connective tissue. This connective tissue is composed of widely spaced cells that are very small. They are surrounded by densely packed collagen fibers. Most of the connective tissue is composed of ECM. Label cells and ECM of the connective tissue and submit the image to WebAssign for question 4. **Note: the purple stained cells secrete enzymes and are not connective tissue.**

[slide of cartilage](#) - This slide is a section of the trachea. It contains several types of tissue, including cartilage. The cartilage region contains large, round cells with clear cytoplasm and dark nuclei. The cells are surrounded by a hard ECM. There are many cells, but the bulk of the tissue is ECM. Label cells and ECM and submit for question 5.

#### 6. Essay (2 points)

Write a short essay that answers the question “What holds the cells together in a multicellular organism?” Use examples from both plant and animal tissues.

7. File upload (2 points)

View this [slide of a cannabis stem](#). The slide contains both a cross section and a longitudinal section of the stem. Note that this stem is thick and contains much more xylem than the stem shown previously. Also look for purple starch grains which are stored in some of the parenchyma cells at the edge of the pith. Magnify an appropriate region of the cross section, capture the image, and label a xylem cell and a parenchyma cell that contains starch. Submit the labeled image to WebAssign for question 7, using .jpg or .png format.

8. File upload (2points)

Now return to the previous slide and capture a region of the longitudinal section. Magnify an appropriate region of the longitudinal section, capture the image, and label a xylem vessel and a phloem vessel. Note the spiral thickenings in some of the xylem vessels. Submit the labeled image to WebAssign for question 8. Submit your labeled image to WebAssign in .jpg or .png format.

9. File upload (1 point)

View this slide, which is a [cross section of a trachea](#), and locate the epithelial cells which line one surface. Although this image is viewed by light microscopy, the cilia are visible at high magnification. Capture an image of a small region of epithelium and label cilia. Submit your labeled image to WebAssign in .jpg or .png format.

10. File upload (1 point)

Examine this [slide of a spinal cord cross section](#). It contains neurons which are very large and have several processes protruding from the cell. These processes extend into thin fibers that are very long (although only a short portion is visible). The neuronal fibers conduct electrical impulses as you will learn later in the course. Magnify the spinal cord image and locate the neurons. Capture an image and label a neuron. Submit your labeled image to WebAssign in .jpg or .png format.

11. File upload (1 point)

In this [slide of skeletal muscle](#), several muscle fibers have been teased apart for ease in viewing. Magnify the image and locate a fiber in which the striations are clearly visible. Capture an image and label a nucleus within the fiber. Submit your labeled image to WebAssign in .jpg or .png format.

12. Matching (3 points)

Examine the electron micrographs below and note the type and number of organelles in each. To test your ability to relate cell structure to function, match the cell images with one of these functions: absorption, nutrient storage, protein secretion, contraction. You will learn the names of these three cells later, from the WebAssign key.

[Cell A](#)

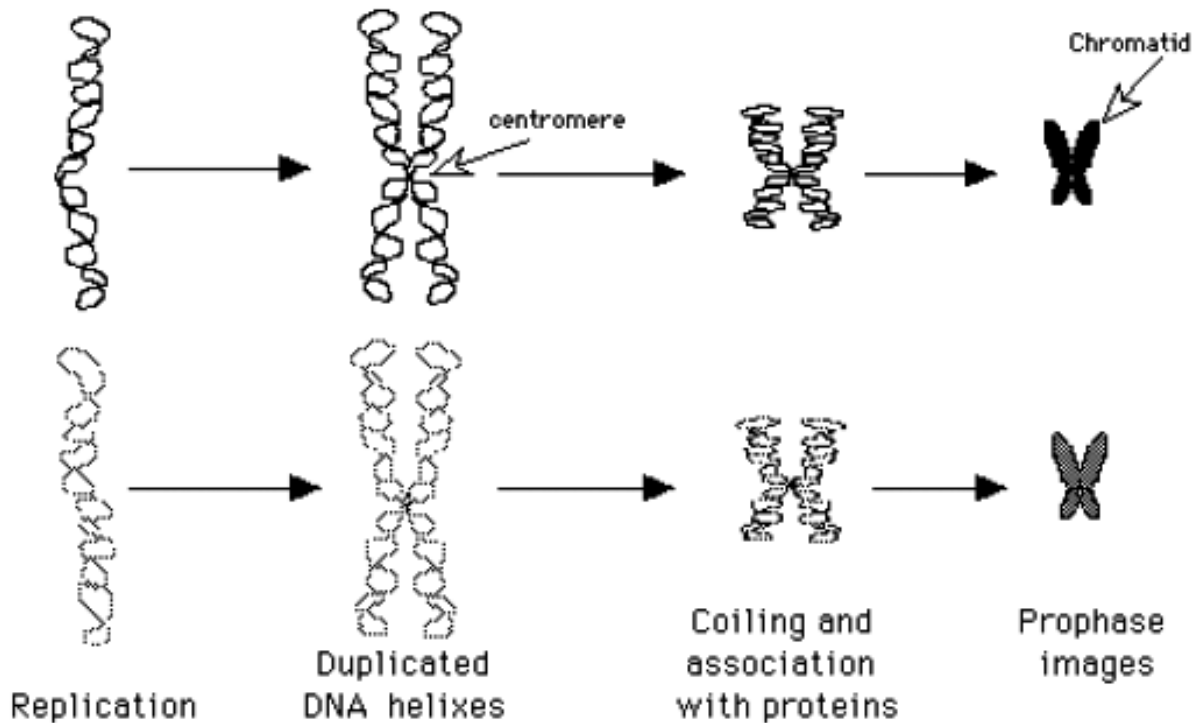
[Cell B](#)

[Cell C](#)

For question 13:

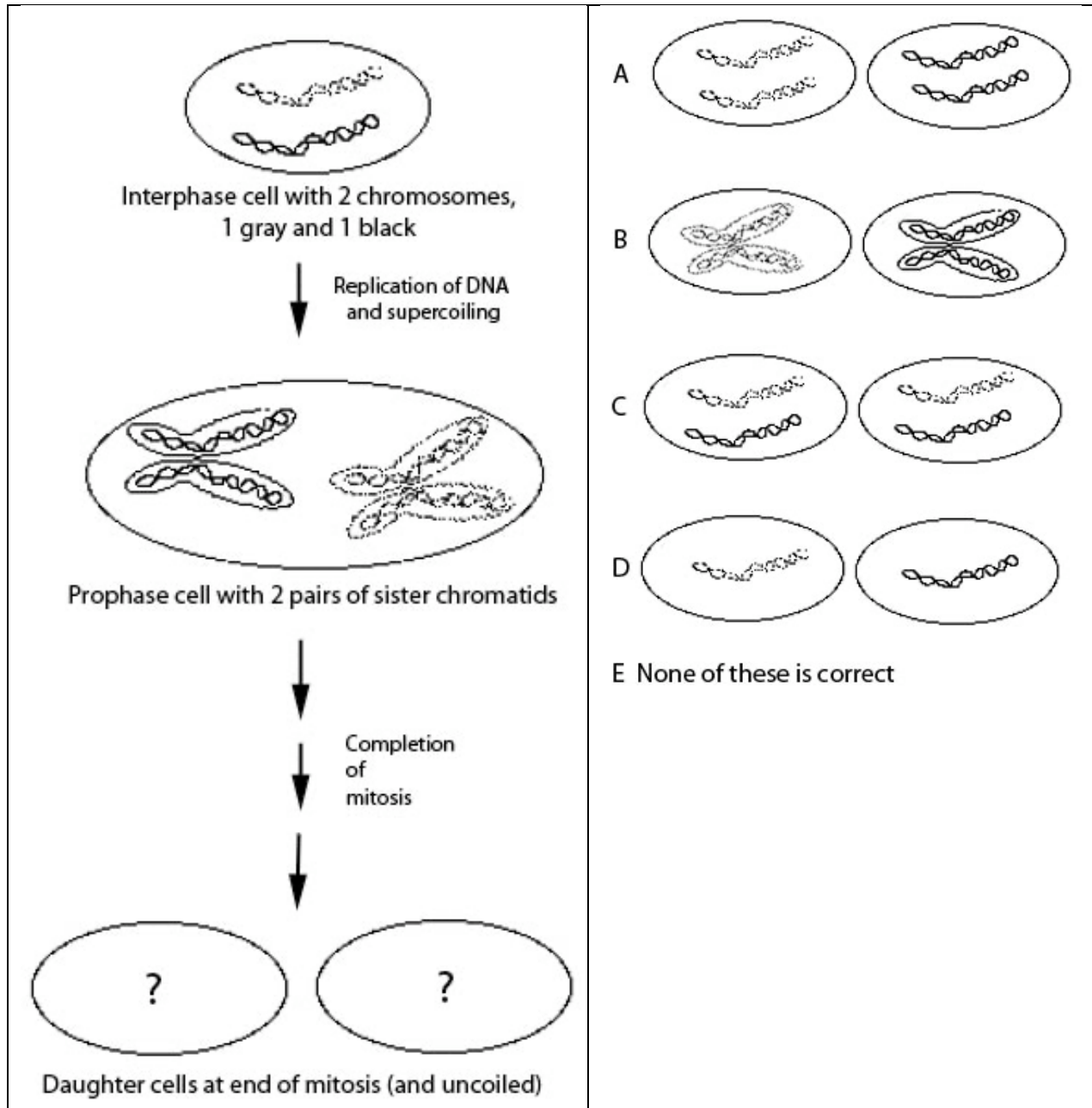
Review of the relationship between DNA and chromosomes:

Remember that DNA helices are replicated in the S phase of the cell cycle (i.e. during interphase). This occurs well before mitosis or meiosis begins. Supercoiling of the replicated helices is one of the first signs that the M phase of the cell cycle has begun. Keep in mind the relationship between the DNA helix and a chromosome (DNA helix plus associated proteins).



13. Multiple-choice (1 point)

A stylized diagram of mitosis is shown below. Choose the contents of the daughter cells from the accompanying diagrams (right-hand column), then record your answer in WebAssign.



14. File upload (3 points)

View this [slide of the onion root tip](#) by virtual microscopy. Magnify the mitotic zone until you can see the cell nuclei (or chromosomes) clearly. Find a region that contains both a metaphase and an anaphase stage of mitosis. Perform a screen capture of the image and label cells in these 3 mitotic stages: interphase, metaphase, anaphase. Submit your image to WebAssign in .jpg or .png format.

15. Essay (2 points)

Count all cells within the square of [this onion root tip](#), except for those that appear to contain no nucleus or chromosomes. (In these cells, the plane of section is above or below the nucleus and the cell cycle stage cannot be determined). Then determine how many of the counted cells are undergoing mitosis (all cells not in interphase). The following calculation indicates the percent of cells in mitosis and is a good approximation of the % of the cell cycle taken up by mitosis.

**mitotic cells/ total cells counted x 100 = mitotic period as a percent of the cell cycle**

Record your data and note what stages of mitosis were seen within the square.

Write a short essay that answers the following questions:

- a) What mitotic stages were visible within the square on the root tip?
- b) Based on your data, what percent of the cell cycle is occupied by mitosis in the onion root tip? Is this finding expected given the information you learned about the cell cycle?

16. True or False (3 points—0.5 points each)

Determine whether each of the following statements is true or false, then enter this information in WebAssign.

\_\_\_\_\_ Meiosis results in identical daughter cells.

\_\_\_\_\_ Synapsis occurs in both mitosis and meiosis.

\_\_\_\_\_ Mitosis produces diploid products.

\_\_\_\_\_ DNA replication occurs prior to mitosis, but not meiosis.

\_\_\_\_\_ A reduction in chromosome number occurs during meiosis.

\_\_\_\_\_ A cell that has completed mitosis has produced more daughter cells than a cell that has completed meiosis.