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*In the space provided, write the letter of the description that best matches the term or phrase.*

- |                                            |                                                                                             |
|--------------------------------------------|---------------------------------------------------------------------------------------------|
| _____ 11. chromatids                       | a. egg cells and sperm cells                                                                |
| _____ 12. centromere                       | b. a mutation that occurs when a chromosome fragment breaks off and is lost                 |
| _____ 13. homologous chromosomes           | c. cytoplasm divides                                                                        |
| _____ 14. diploid                          | d. two chromatids move to opposite poles of the cell                                        |
| _____ 15. gametes                          | e. supplies information that directs a cell's activities and determines its characteristics |
| _____ 16. haploid                          | f. the point at which two chromatids are attached                                           |
| _____ 17. zygote                           | g. determines whether a cell will divide                                                    |
| _____ 18. DNA                              | h. the two copies of DNA on each chromosome that form just before cell division             |
| _____ 19. karyotype                        | i. a cell that contains one set of chromosomes                                              |
| _____ 20. cytokinesis                      | j. chromosomes that are similar in shape and size and have similar genetic information      |
| _____ 21. mutations                        | k. the nuclear membrane dissolves and chromosomes become visible                            |
| _____ 22. deletion                         | l. changes in an organism's genetic material                                                |
| _____ 23. cell growth ( $G_1$ ) checkpoint | m. a diploid cell that results from the fusion of two haploid gametes                       |
| _____ 24. anaphase                         | n. a cell that contains two sets of chromosomes                                             |
| _____ 25. prophase                         | o. a picture of the chromosomes found in an individual's cells                              |

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*Complete each statement by writing the correct term or phrase in the space provided.*

26. A(n) \_\_\_\_\_ is a segment of DNA that transmits information from parent to offspring.
27. An individual with an extra copy of chromosome 21 demonstrates traits collectively known as \_\_\_\_\_ .
28. The 22 pairs of chromosomes in human somatic cells that are the same in males and females are called \_\_\_\_\_ .
29. The human chromosomes that determine an individual's sex are called the \_\_\_\_\_ .

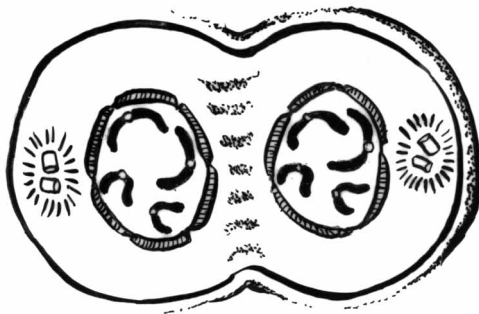
Questions 30–32 refer to the sequence below.

$G_1 \longrightarrow S \longrightarrow G_2 \longrightarrow M \longrightarrow C$

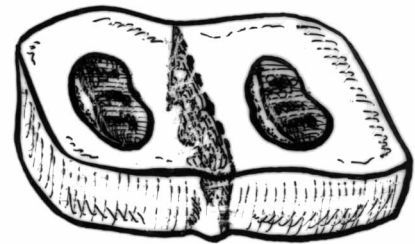
30. The sequence above represents the \_\_\_\_\_  
\_\_\_\_\_.
31. The *C* in the sequence represents the phase in which \_\_\_\_\_  
occurs.
32. Phases  $G_1$ , *S*, and  $G_2$  in the sequence above are collectively called  
\_\_\_\_\_.
33. Each individual protein structure that helps to move the chromosomes apart  
during mitosis is called a(n) \_\_\_\_\_.
34. \_\_\_\_\_ is a disease caused by uncontrolled cell division.
35. In the first stage of binary fission, the DNA is \_\_\_\_\_.
36. The microtubules that form centrioles and spindle fibers are made of hollow  
tubes of \_\_\_\_\_.

Questions 37–40 refer to the figures below.

Animal cell



Plant cell



37. The process shown in the figures above is \_\_\_\_\_.
38. The structure in the center of the animal cell that pinches the cell in half is  
composed of \_\_\_\_\_.
39. The process shown above occurs at the end of \_\_\_\_\_.
40. The end result of the process shown above is the formation of two new  
\_\_\_\_\_.

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Read each question, and write your answer in the space provided.

41. What happens to the structure of DNA in your cells prior to cell division?

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42. Explain the difference in the number of chromosomes between a frog somatic cell and a frog egg cell.

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43. What happens when nondisjunction takes place during cell division?

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44. Briefly describe what happens at each checkpoint during the cell cycle.

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45. Briefly explain the five phases of the cell cycle.

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46. What are the four stages of mitosis, in the correct order?

a. \_\_\_\_\_ c. \_\_\_\_\_

b. \_\_\_\_\_ d. \_\_\_\_\_

47. Explain the importance of mitosis and cytokinesis to multicellular organisms.

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## ESSAY

- When the bonds between the phosphate groups of an ATP molecule are broken, energy is released. This energy can be used by the cell.
- Excited electrons lose some energy as they pass through electron transport chains. This energy is used to pump hydrogen ions, produced when water molecules are split, into the thylakoid. Special carrier proteins that function as both ion channels and as enzymes transport the now-concentrated hydrogen ions out of the thylakoid. As hydrogen ions pass through the ion channel part of the carrier protein, a phosphate group is added to a molecule of ADP, making ATP.
- The rate of photosynthesis increases as light intensity increases, until the light saturation point is reached. Likewise, the rate of photosynthesis increases as the concentration of carbon dioxide increases, until a certain concentration of that gas is reached. In addition, photosynthesis operates best within a certain range of temperatures.
- Fermentation enables cells to continue making ATP, though in limited amounts, through glycolysis when oxygen is no longer available. Lactic acid fermentation is used in the production of foods such as yogurt and some cheeses. Alcoholic fermentation is used commercially in the preparation of bread, wine, and beer.

## CHAPTER 6

### Chromosomes and Cell Reproduction

#### MULTIPLE CHOICE

- c
- b
- c
- b
- d
- a
- b
- c
- b
- d

#### VOCABULARY

- h
- f
- j
- n
- a
- i
- m
- e
- o
- c
- l
- b

- g
- d
- k

#### COMPLETION

- gene
- Down syndrome
- autosomes
- sex chromosomes
- cell cycle
- cytokinesis
- interphase
- microtubule
- Cancer
- copied
- protein
- cytokinesis
- protein threads
- mitosis
- cells

#### ESSAY

- Prior to cell division the DNA and proteins associated with the DNA coil into structures called chromosomes.
- A frog somatic cell has twice the number of chromosomes of a frog egg cell.
- When one or more chromosomes fail to separate properly during cell division in gamete production, one new cell will receive both chromosomes and the other new cell will receive none. As a result, one gamete will be produced that has one extra chromosome, and another gamete will be produced that is missing one chromosome.
- If conditions are favorable for cell division during the first growth phase, certain proteins will stimulate the cell to begin the synthesis phase, during which DNA is duplicated. During the second growth phase, the DNA replication is checked by DNA repair enzymes. If everything is in order, proteins then initiate the beginning of mitosis. At the final checkpoint, the cell is prompted to exit from the mitosis phase and to begin the first growth phase again.
- The  $G_1$  phase is the growth phase of a cell when the cell grows rapidly and carries out its routine functions. DNA is copied during the S phase. In the  $G_2$  phase, preparations are made for nuclear division. Proteins needed for cell division are synthesized. Mitosis is the fourth phase. The nucleus of the cell is divided into two nuclei, each with the same number and kinds of chromosomes. Finally, the cytoplasm divides during the process of cytokinesis.
- a—prophase; b—metaphase; c—anaphase; d—telophase
- Mitosis and cytokinesis allow multicellular organisms to grow larger, replace worn out or damaged tissues, and in some cases, reproduce asexually.