Chapter 10 Review

READING TOOLBOX

1. **Word Parts** Find out the meaning of the prefixes *ana-*, *meta-*, *pro-*, and *telo-*.
2. **Concept Map** Make a concept map that shows the events in the cell cycle. Try to include the following words in your map: *cell cycle, interphase, synthesis phase, chromosomes, cytokinesis, mitosis, second gap phase,* and *first gap phase.*

Using Key Terms

3. Explain the relationship between *gene* and *chromosome.*
4. Use the following terms in the same sentence: *tumor* and *cancer.*

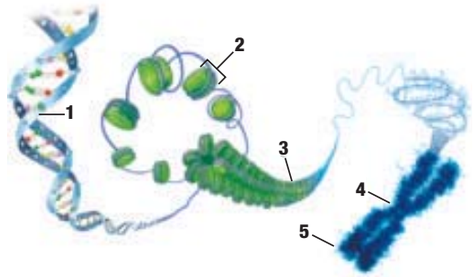
For each pair of terms, explain how the meanings of the terms differ.

5. *chromatin* and *chromatid*
6. *centromere* and *centrosome*

Understanding Key Ideas

7. Which of the following is a reason that the size of a cell is limited?
   - **a.** Larger cells are easier for an organism to produce than smaller cells.
   - **b.** The cell's ability to exchange substances is limited by its surface area–to-volume ratio.
   - **c.** The larger the cell becomes, the easier it is for substances to reach where they are needed.
   - **d.** The size of a cell has no relationship to the cell's function in a multicellular organism.
8. What is a gene?
   - **a.** a large molecule of chromosomes
   - **b.** a protein that directs the activity of a cell
   - **c.** a segment of DNA that codes for RNA and protein
   - **d.** a segment of RNA that moves from the nucleus to the cytoplasm
9. During which stage of mitosis do the chromosomes line up along the equator?
   - **a.** anaphase
   - **b.** metaphase
   - **c.** prophase
   - **d.** telophase
10. What factors can cause cells to divide in a culture medium?
    - **a.** protein signals
    - **b.** lack of nutrients
    - **c.** contact with other cells
    - **d.** contact with the edge of the dish
11. What is the importance of feedback signals at key checkpoints within the cell cycle?
    - **a.** to indicate the end of the cycle
    - **b.** to indicate the presence of proteins
    - **c.** to identify the meiosis and mitosis indicators
    - **d.** to delay or trigger the next phase of the cycle

Use this diagram to answer the following question(s).



12. Which structure is a nucleosome?
    - **a.** Structure 1
    - **b.** Structure 2
    - **c.** Structure 3
    - **d.** Structure 4
13. What is Structure 5 called?
    - **a.** histone
    - **b.** spindle
    - **c.** chromatid
    - **d.** scaffold protein

Explaining Key Ideas

14. **Propose** why a new cell would need an entire copy of the old cell's DNA.
15. **Define** the importance of mitosis and cytokinesis in the life cycle of a eukaryotic cell.
16. **Contrast** cytokinesis in animal and plant cells.
17. **Identify** the events that occur at the G_2 checkpoint.
18. **Summarize** how normal cells can become cancerous.

Assignment Guide

Section	Questions
1	2, 3, 5, 6, 7, 8, 12, 13, 14, 21, 23
2	1, 2, 6, 9, 15, 16, 19, 20, 21, 22, 28
3	4, 10, 11, 17, 18, 23, 24, 25, 26, 27

Review

Reading Toolbox

1. ***ana-*** up/back/again/throughout; ***meta-*** wih/after/beyond; ***pro-*** before; ***telo-*** end
2. See previous page for answers to concept map.

Using Key Terms

3. *Genes* are segments of DNA that code for RNA and protein. *Chromosomes* are structures of DNA wrapped around proteins. Many genes are located on a chromosome.
4. *Tumor* cells that have metastasized form *cancer.*
5. *Chromatin* describes a substance of DNA and proteins. A *chromatid* is one of two copies of a chromosome and is made of chromatin.
6. The *centromere* is the region where sister chromatids are held together. The *centrosome* is the organelle that helps assemble the spindle during mitosis.

Understanding Key Ideas

7. b 8. c 9. b 10. a
11. d 12. b 13. c

Explaining Key Ideas

14. A new cell would need the exact instructions of the cell it is replacing to continue functioning in the same manner to keep the body healthy.
15. Each daughter cell requires a nucleus and organelles. Mitosis divides the parent cell's nucleus; cytokinesis divides the parent cell's cytoplasm and organelles.
16. Animal cells do not have cell walls, so the cell is pinched in half by a belt of protein threads. In plant cells that have rigid cell walls, a cell plate is formed across the middle of the plant cell. When completed, the cell plate fuses with the original cell wall, and completely separates the original cell into two daughter cells.
17. The cell checks for mistakes in the copied DNA. Enzymes correct mistakes that are found. Proteins check that the cell has enough cytoplasm to divide into two cells. If these conditions are met, the cell releases proteins that help trigger mitosis.

18. Normal cells can become cancer cells if a genetic mutation impairs a cell's ability to regulate cell growth and division. The mutation leads to cancer, or uncontrolled cell growth.

Using Science Graphics

19. c

20. d

Critical Thinking

21. Most nerve cells are permanently resting in interphase G_1. They do not undergo mitosis, so most damaged nerve cells are not replaced.

22. The plant spindle forms without centrioles and mitosis continues successfully.

Writing Skills

23. Cells from large tumors often have unusually short telomeres. Telomerase, an enzyme that catalyzes the lengthening of telomeres, stabilizes telomere length, especially in cancer cells. Researchers are focusing on telomerase as a target for cancer diagnosis and chemotherapy.

Methods of Science

24. d

25. c

26. The vertical axis (*y* axis) is the yeast colonies, and the horizontal axis (*x* axis) is the length of exposure.

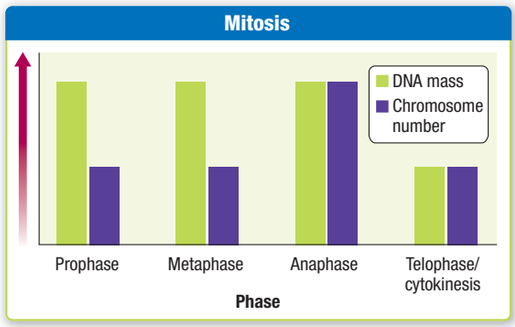
27. Colonies exposed longer to the UV light had fewer surviving yeast cells.

Math Skills

28. Nine chromosomes (The number of chromosomes doubles after anaphase. If cell B has six chromosomes after mitosis, cell B began with three chromosomes. If cell A has three times as many chromosomes as cell B, then cell A should have nine chromosomes.)

Using Science Graphics

The graph shows the relative mass of DNA and chromosome number for a cell undergoing mitosis. Use the graph to answer the following questions.



19. In which phase of mitosis do chromatids separate and become individual chromosomes?

a. prophase **c.** anaphase
b. metaphase **d.** telophase/cytokinesis

20. What process occurs that leads to the decrease in the cell's DNA mass?

a. prophase **c.** anaphase
b. metaphase **d.** telophase/cytokinesis

Critical Thinking

21. Evaluating Conclusions Damage to the brain or spinal cord is usually permanent. Use your knowledge of the cell cycle to explain why damaged cells in the brain or spinal cord are not replaced.

22. Analyzing Information Mitosis is similar in plants and animals, although plants lack centrioles. How might the absence of centrioles in plant cells have influenced scientists' thinking about the function of centrioles in mitosis?

Writing for Science

23. Communicating Information Scientists have determined that telomeres (the tips of chromosomes) are shaved down slightly every time a cell divides. When its telomeres become too short, a cell may lose its ability to divide. Find out what scientists have recently discovered about the relationship between telomere length, cell division and cancer. Prepare a written report to share with your class.

Methods of Science

Yeast cells are frequently used to study how cancer cells can form. Exposing cells to ultraviolet light during formation of new cells can affect new cell growth. Use the data in the table to answer the questions that follow.

Yeast colony identification code	Length of exposure to UV light (min)	Surviving yeast colonies
A	2	18
B	10	10
C	15	11
D	30	9
E	40	5
F	50	2
G	60	0

24. Identify the independent variable in this experiment.

a. length of darkness (time)
b. light intensity (brightness)
c. yeast cell colonies (number)
d. length of exposure to light (time)

25. Identify the dependent variable in this experiment.

a. length of darkness (time)
b. light intensity (brightness)
c. yeast cell colonies (number)
d. length of exposure to light (time)

26. Using the data in the table, construct a graph that plots surviving yeast colonies versus length of exposure.

27. Describe what happens to the yeast cell colonies when they are exposed to UV light.

Math Skills

28. Cell A has 3 times as many chromosomes as cell B has. Cell B undergoes mitosis, and has 6 chromosomes before cytokinesis is completed. How many chromosomes does cell A have?