

3

Chapter Review

the **BIG** idea

Organisms grow, reproduce, and maintain themselves through cell division.

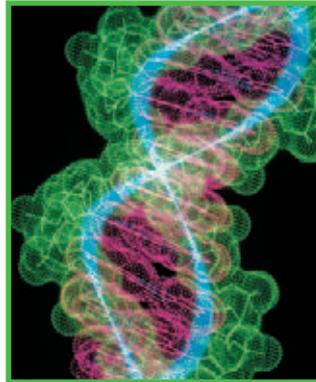


CONTENT REVIEW
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KEY CONCEPTS SUMMARY

3.1 Cell division occurs in all organisms.

- In unicellular organisms functions of cell division include reproduction
- In multicellular organisms functions of cell division include growth, development, and repair.

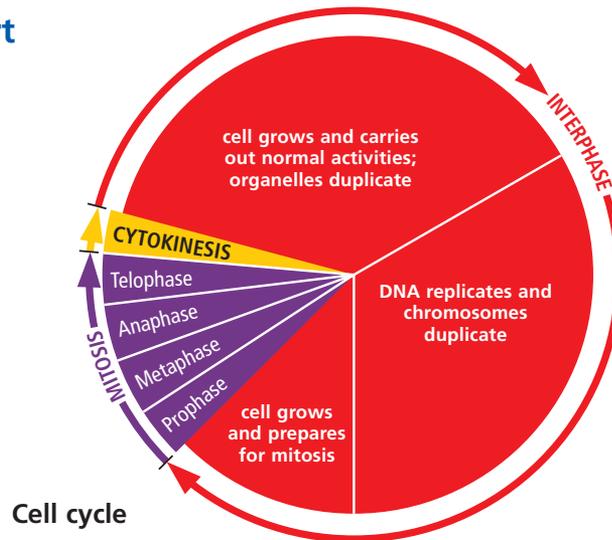


VOCABULARY

DNA p. 74
chromosome p. 75

3.2 Cell division is part of a cell cycle.

The **cell cycle** has two main phases, **interphase** and **mitosis**. Most of the life cycle of a cell is spent in interphase. During mitosis, cells divide.



VOCABULARY

cell cycle p. 80
interphase p. 81
mitosis p. 81
cytokinesis p. 81

3.3 Both sexual and asexual reproduction involve cell division.

Some organisms reproduce asexually. Both asexual and sexual reproduction involve cell division.

Comparing Asexual and Sexual Reproduction

Asexual Reproduction	Sexual Reproduction
Cell Division	Cell division and other processes
One parent organism	Two parent organisms
Rate of reproduction is rapid	Rate of reproduction is slower than rate for asexual reproduction
Offspring identical to parents	Offspring have genetic information from two parents

VOCABULARY

asexual reproduction p. 88
binary fission p. 89
regeneration p. 90

Reviewing Vocabulary

On a separate sheet of paper, write a sentence describing the relationship between the two vocabulary words in each pair.

1. cell cycle, interphase
2. mitosis, cytokinesis
3. chromosome, DNA
4. parent, offspring

Reviewing Key Concepts

Multiple Choice Choose the letter of the best answer.

5. Most of the growth in your body occurs because your cells
 - a. grow larger
 - b. take in oxygen
 - c. make proteins
 - d. divide
6. The stage in a cell's life when it is not in the process of dividing is called
 - a. interphase
 - b. the cell cycle
 - c. mitosis
 - d. cell division
7. What material in the cell makes up DNA?
 - a. carbohydrates
 - b. chromatids
 - c. the nucleus
 - d. nucleic acid
8. What increases when a cell divides into two smaller cells?
 - a. volume
 - b. length
 - c. surface area
 - d. width
9. The process of mitosis results in
 - a. two daughter cells that are different from one another
 - b. two genetically identical daughter cells
 - c. identical pairs of chromosomes
 - d. identical pairs of chromatids
10. What is the step that follows mitosis, in which the cytoplasm divides?
 - a. prophase
 - b. synthesis
 - c. anaphase
 - d. cytokinesis
11. A cell's chromosomes must be duplicated before mitosis occurs so that
 - a. they can form chromatids
 - b. they can attach to the spindle
 - c. each daughter cell gets a full number of chromosomes
 - d. each daughter cell does not have to duplicate its own chromosomes
12. Binary fission differs from mitosis because the new cells
 - a. cannot function without the parent
 - b. grow from missing limbs
 - c. have half the normal number of chromosomes
 - d. live independently of the parent cell
13. If a starfish is cut in half, it can regenerate its missing body through
 - a. binary fission
 - b. budding
 - c. healing
 - d. regeneration
14. Which is an example of reproduction?
 - a. binary fission in unicellular organisms
 - b. cell division in a multicellular organism
 - c. cell division around a broken bone
 - d. division of cytoplasm
15. Which sequence is correct for mitosis?
 - a. chromosomes form, chromosomes separate, chromosomes line up, nuclei form
 - b. chromosomes form, chromosomes line up, chromosomes separate, nuclei form
 - c. chromosomes line up, nuclei form, chromosomes separate, chromosomes form
 - d. chromosomes separate, chromosomes form, nuclei form, chromosomes line up

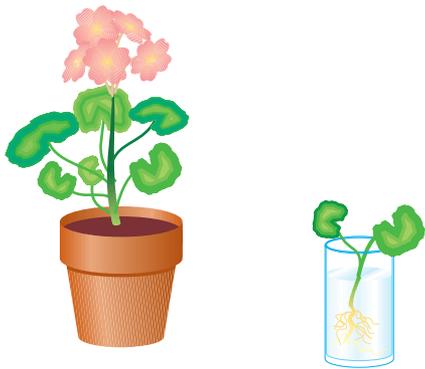
Short Answer Write a short answer to each question.

16. What is the difference between mitosis in plant and animal cells?
17. Describe what happens in a cell during interphase. Your answer should mention DNA.
18. Describe the functions of cell division in both unicellular and multicellular organisms.

Thinking Critically

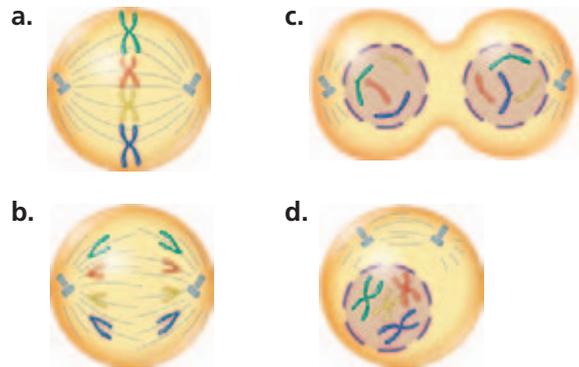
- 19. IDENTIFY CAUSE** Describe some of the reasons that cells reproduce.

This illustration shows a plant and the cutting that was taken from it, which is growing in a container of water. Use the illustration to answer the next six questions.



- 20. OBSERVE** From which part of the plant was the cutting taken?
- 21. INFER** Where did the cutting get the genetic information that controls its development?
- 22. INFER** What is the genetic relationship between the original plant and the cutting?
- 23. SYNTHESIZE** What process causes both the cutting and the original plant to grow?
- 24. SUMMARIZE** Write a brief summary of the process that causes growth in both plants.
- 25. PREDICT** These plants also reproduce when seeds form when a different plant fertilizes them. How is the cutting the same as the plant that would grow from a seed? How is the cutting different?
- 26. CALCULATE** A single bacterium enters your body at 10:00 A.M. These type of bacteria reproduce at a rate of one generation every 30 minutes. How many bacteria will be in your body by 8:00 P.M. that evening?

The diagrams below show 4 parts of a process. Use them to answer the following two questions.



- 27. SEQUENCE** What is the correct order of the four diagrams above?
- 28. SYNTHESIZE** Draw two diagrams, one showing what you would see before the process shown above begins, and one showing what you would see after the conclusion of the process.
- 29. MODEL** On a separate sheet of paper, draw your own simple model of the process of mitosis.

the BIG idea

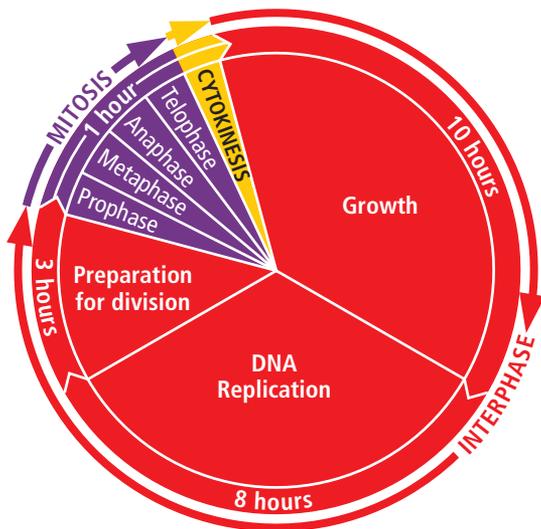
- 30. SUMMARIZE** Look again at the question on the photograph on pages 132–133. Now that you have studied this chapter, how would you change your answer to the question?
- 31. SYNTHESIZE** How do the concepts in this chapter relate to the concepts in the cell theory?

UNIT PROJECTS

If you need to do an experiment for your unit project, gather the materials. Be sure to allow enough time to observe results before the project is due.

Analyzing Data

This diagram shows the length of the cell cycle for a typical skin cell in the human body.



Use the diagram to answer the questions below.

- How long does the growth phase of the cell cycle take?
 - 1 hour
 - 3 hours
 - 8 hours
 - 10 hours
- How much time does the cell cycle spend in interphase?
 - 1 hour
 - 10 hours
 - 21 hours
 - 22 hours
- What is the total length of time it takes for the skin cell to complete one full cell cycle?
 - 10 hours
 - 18 hours
 - 21 hours
 - 22 hours
- What phase of the cell cycle takes about 8 hours?
 - DNA replication
 - mitosis
 - growth
 - preparation for cell division
- Suppose another type of skin cell takes 44 hours to complete one cell cycle. If all of the phases are proportional to the length of time shown in the diagram, how long will the preparation for cell division phase last?
 - 3 hours
 - 6 hours
 - 10 hours
 - 20 hours
- According to the diagram, what is the second stage in mitosis?
 - prophase
 - metaphase
 - telophase
 - cytokinesis

Extended Response

Answer the two questions. Include some of the terms shown in the word box. Underline each term you use in your answers.

cell cycle	metaphase	mitosis
anaphase	prophase	telophase

- A scientist is studying the stages of cell division in the cells of an onion root. The scientist counts 100 cells and identifies which stage of cell division each cell is in at a given moment. He counts a total of 85 cells in interphase, 8 cells in prophase, 3 cells in metaphase, and 2 cells each in anaphase and telophase. A typical onion cell takes about 12 hours to complete the cell cycle. Using the information in the diagram and the data given here, how can you account for these numbers?
- Your science class is investigating the effect of temperature on the rate of mitosis in onion plants. You hypothesize that the higher the temperature, the faster cells undergo mitosis. How could you set up an experiment to support your hypothesis? Describe the materials you would use and the steps you would take in your procedure.