

**GRADE 12 BIOLOGY**  
**UNIT A - HEREDITY AND GENETICS**  
**READING REFERENCE STUDY GUIDE**  
**CHAPTER 10 - SECTIONS 10.1 AND 10.2**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Chapter 10 Study Guide**

**Summary:**

**Growth, Development, and Reproduction.** Cells undergo cell division to produce new cells. In eukaryotic cells, cell division is part of a highly regulated cycle known as the cell cycle.

**10.1 Cell Growth, Division, and Reproduction**

**Summary:**

- The larger a cell becomes, the more demands the cell places on its DNA. In addition, a larger cell is less efficient in moving nutrients and waste materials across the cell membrane.
- Asexual reproduction is the production of genetically identical offspring from a single parent.
- Offspring produced by sexual reproduction inherit some of their genetic information from each parent.

**Vocabulary:** cell division   asexual reproduction   sexual reproduction

## 10.2 The Process of Cell Division

### Summary:

- Chromosomes make it possible to separate DNA precisely during cell division.
- During the cell cycle, a cell grows, prepares for division, and divides to form two daughter cells. During prophase, the genetic material inside the nucleus condenses.
- During metaphase, the chromosomes line up across the center of the cell. During anaphase, the chromosomes separate and move along spindle fibers to opposite ends of the cell. During telophase, the chromosomes, which were distinct and condensed, begin to spread out into a tangle of chromatin.
- Cytokinesis completes the process of cell division—it splits one cell into two.

### Vocabulary:

chromosome; centromere; chromatin; chromatid; cell cycle; centriole; interphase; metaphase; mitosis; anaphase; cytokinesis; telophase; prophase

## Chapter 10 Assessment

### 10.1 Cell Growth, Division, and Reproduction

#### Understand Key Concepts

1. The rate at which materials enter and leave the cell depends on the cell's
  - a. volume.
  - b. weight.
  - c. speciation.
  - d. surface area.
2. In order for a cell to divide successfully, the cell must first:
  - a. duplicate its genetic information.
  - b. decrease its volume.
  - c. increase its number of chromosomes.
  - d. decrease its number of organelles.

3. The process that increases genetic diversity within a population is:

- a. asexual reproduction.
- b. sexual reproduction.
- c. cell division.
- d. binary fission.

4. Describe what is meant by each of the following terms: cell volume, cell surface area, ratio of surface area to volume.

5. Describe asexual and sexual reproduction as survival strategies. (We will study this idea a lot more in evolution too!)

### **Understand Key Concepts**

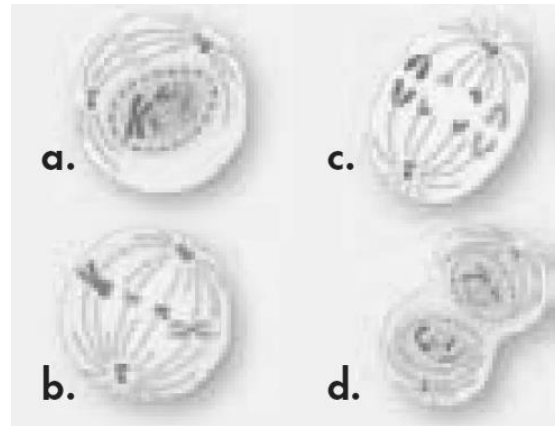
8. Sister chromatids are attached to each other at an area called the

- a. centriole.
- b. spindle.
- c. centromere.
- d. chromosome.

9. If a cell has 12 chromosomes, how many chromosomes will each of its daughter cells have after mitosis and cytokinesis?

- a. 4
- b. 6
- c. 12
- d. 24

10. Which of the illustrations here best represents metaphase of mitosis?



11. In plant cells, what forms midway between the divided nuclei during cytokinesis?

- |                     |               |
|---------------------|---------------|
| a. nuclear membrane | b. centromere |
| c. cell membrane    | d. cell plate |

12. Describe how a eukaryotic cell's chromosomes change as a cell prepares to divide. [Use complete sentence(s)]

13. What is the relationship between interphase and cell division? [Complete sentence(s)]

14. List the following stages of **mitosis** in the correct sequence, and describe what happens during each stage: Anaphase, Metaphase, Prophase, and Telophase. (Bullet form is ok)

### **Think Critically**

15. **Compare and Contrast** How is the process of cell division in prokaryotes different from cell division in eukaryotes?

16. **Form a Hypothesis** Pretend you are a biologist. Some cells have several nuclei within their cytoplasm. Considering the events in a typical cell cycle, which phase of the cell cycle is not operating when such cells form?

17. **Compare and Contrast** Describe the differences between cell division in an animal cell and cell division in a plant cell.

18. **Relate Cause and Effect** The nerve cells in the human nervous system seldom undergo mitosis. Based on this information, explain why complete recovery from injuries to the nervous system usually does not occur.

19. **Apply Concepts** A scientist treats cells with a chemical that prevents DNA synthesis. In which stage of the cell cycle will these cells remain?

20. **Interpret Visuals** The diagram shows a phase of mitosis. Use the diagram to answer the following questions.

a. Identify the phase of mitosis shown in the diagram.



b. **Explain.** Is this a plant or animal cell? How do you know?

c. The four chromosomes shown in the center of the cell each have two connected strands. Explain how the two strands on the same chromosome compare with regard to the genetic information they carry. In your answer, be sure to explain why this is important to the cell.

### ANALYZING SCIENTIFIC DATA

A scientist performed an experiment to determine the effect of temperature on the length of the cell cycle in onion cells. His data are summarized in the table.

Effect of Temperature on Length of Onion Cell Cycle	
Temperature (°C)	Length of Cell Cycle (hours)
10	54.6
15	29.8
20	18.8
25	13.3

38. **Interpret Tables** On the basis of the data in the table, how long would you expect the cell cycle to be at 5°C?

- a. less than 13.3 hours
- b. more than 54.6 hours
- c. between 29.8 and 54.6 hours
- d. about 20 hours

39. **Draw Conclusions** Given this set of data, what is one valid conclusion the scientist could state as a hypothesis?

## Standardized Test Prep

### Multiple Choice

1. Which statement is true regarding a cell's surface area-to-volume ratio?
  - A. As the size of a cell increases, its volume decreases.
  - B. As the size of a cell decreases, its volume increases.
  - C. Larger cells will have a greater surface area-to-volume ratio.
  - D. Smaller cells will have a greater surface area-to-volume ratio.
2. Which of the following is NOT an advantage of asexual reproduction?
  - A. simple and efficient
  - B. produces large number of offspring quickly
  - C. increases genetic diversity
  - D. requires one parent
3. At the beginning of cell division, a chromosome consists of two
  - A. centromeres.
  - C. chromatids.
  - B. centrioles.
  - D. spindles.
4. ~~What regulates the timing of the cell cycle in eukaryotes?~~
  - ~~A. chromosomes~~
  - ~~B. cyclins~~
  - ~~C. nutrients~~
  - ~~D. DNA and RNA~~
5. The period between cell divisions is called
  - A. interphase.
  - B. prophase.
  - C. G3 phase.
  - D. cytokinesis.