SYNTHESIZE THE UNIT

In your Evidence Notebook, make a concept map, graphic organizer, or outline using the Study Guides you made for each lesson in this unit. Be sure to use evidence to support your claims.

When synthesizing individual information, remember to follow these general steps:

- Find the central idea of each piece of information.
- Think about the relationships between the central ideas.
- Combine the ideas to come up with a new understanding.

DRIVING QUESTIONS

Look back to the Driving Questions from the opening section of this unit. In your Evidence Notebook, review and revise your previous answers to those questions. Use the evidence you gathered and other observations you made throughout the unit to support your claims.

PRACTICE AND REVIEW

1. In adults, the liver does not normally grow larger or regenerate cells. Based on this knowledge, most adult liver cells would be expected to:

a. regularly undergo mitosis

b. have highly condensed chromosomes

c. often replicate the cells' DNA

d. be in the interphase, or resting phase

2. As cells grow larger, what happens to the surface area-to-volume ratio? How does this affect the cell's ability to grow further?

3. Apoptosis, or programmed cell death, is triggered during which biological processes? Select all correct answers.

a. DNA damage suffered by a cell

b. a lymphocyte responding to an active infection

c. differentiation of a stem cell into a specialized cell

d. removal of certain tissues during embryonic development

4. Explain the connection between the cell cycle and cancer development.

5. Cyclins are proteins produced in cells only briefly, at specific stages of the cell cycle. These cyclins regulate the activity of kinase proteins, which help to move the cell to the next cell cycle phase. If regulation of cyclins or kinases is disrupted, the cell division process can go awry. In your Evidence Notebook, predict what might happen if cyclins were produced constantly throughout the cell cycle.

6. Telomeres are strings of repeating nucleotides that provide a "cap" on the ends of chromosomes. Though telomere sequences do not contain genes, why might they be important during an organism's life span?

a. Telomeres allow sister chromatids to join together.

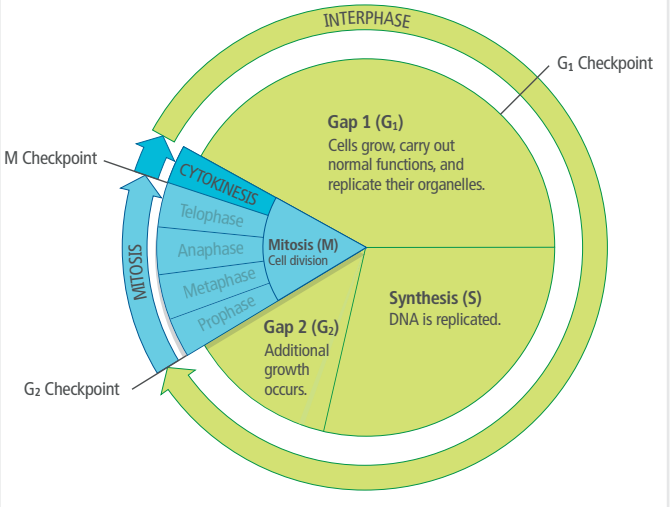
b. Telomeres prevent loss of genes when chromosomes are replicated.

c. Telomeres regulate the expression of other genes on the chromosome.

d. Telomeres increase the rate of cell division.

Use Figure 4 to answer question 7.

FIGURE 4: The Cell Cycle



7. Must the cell cycle always proceed in the same direction, or is it possible for the cycle to proceed in the opposite direction? Explain your reasoning.

8. Which of these best explains why stem cells can be used to treat some diseases such as leukemia, a cancer of white blood cells?

a. Stem cells do not age, and they can divide indefinitely.

b. Stem cells can differentiate into any type of cell.

c. Stem cells are able to adhere to damaged cells and initiate a repair sequence.

d. Stem cells contain a full set of chromosomes, unlike other cells in the body.

9. What are some of the advantages for organisms that undergo mitotic reproduction, as opposed to sexual reproduction? Select all correct answers.

a. Mitotic reproduction can occur without a partner.

b. Mitotic reproduction leads to offspring with greater genetic diversity.

c. Mitotic reproduction is faster than sexual reproduction.

d. Mitotic reproduction can allow a new organism to grow from a fragment of another.

10. Suppose an organism normally has 24 chromosomes. If a cell in this organism divides by mitosis, how many chromosomes should each daughter cell have after cell division occurs? Explain your answer.

11. Unlike stem cells, most body cells cannot form different types of cells. For example, skin cells can only make skin cells, and nerve cells only make nerve cells. Which statement best explains why skin cells would not become nerve cells?

a. Each type of cell gets a different message from the central DNA, which is stored in DNA cells.

b. Each type of cell has only the part of the DNA necessary for making that type of cell.

c. Each cell type is determined by messages sent from the brain, which directs development.

d. Both types of cells have the same DNA, but each cell uses only part of the DNA message.

12. Use the terms below to complete this statement explaining how mitosis produces two genetically identical cells.

condenses, spindle fibers, nuclear membrane, chromatin, cytokinesis, duplicated

During interphase, DNA is in a loosely arranged form called _____. Before a cell divides, each chromosome is _____ so that each daughter cell will have a complete set of DNA. As a cell progresses into prophase, the cell's DNA _____ to form tightly coiled chromosomes. In addition, the _____ breaks down, and centrioles begin to move to opposite poles of the cell. In metaphase, chromosomes align along the cell equator, and _____ attach to each chromosome. The chromosomes are separated in anaphase. In telophase, chromosomes begin to uncoil, and nuclear membranes begin to form. Finally, _____ divides the cytoplasm, producing two genetically identical daughter cells.

UNIT PROJECT

Return to your unit project. Prepare your research and materials into a presentation to share with the class. In your final presentation, evaluate the strength of your hypothesis, data, analysis, and conclusions.

Remember these tips while evaluating:

- Was your hypothesis supported by your data?
- Look at the empirical evidence—evidence based on observations and data. Does the evidence support your claim regarding the processes involved in the formation of a new plant?
- Consider if the explanation is logical. Does your research contradict any evidence you have seen?