Section 9.1 Cellular Growth (continued)

**Main Idea**

**Cell Size Limitations**
I found this information on page __________
SE, pp. 244–246
RE, pp. 93–94

**Details**

Analyze movement of nutrients and wastes as cell size increases. Accept all reasonable responses.

| If a cell gets too large | transport of nutrients and wastes by diffusion slows down. | Therefore, cells divide before they become too large |

Describe how surface area-to-volume ratio relates to cell size by completing the sentence.

As a cell grows larger, its __________ increases more rapidly than its __________, thus surface area-to-volume ratio __________.

The Cell Cycle
I found this information on page __________
SE, pp. 246–247
RE, pp. 94–95

Complete the diagram of the cell cycle. Describe the main events in each stage.

- Chromosomes to opposite poles of the cell. Nucleus divides.
- Cytoplasm divides. Two daughter cells are formed.
- Cell makes microtubules in preparation for cell division.
- Mitosis
- Cytokinesis
- The Cell Cycle
- Cell replicates its DNA.
- Cell is growing and performing normal functions.
Section 9.1 Cellular Growth (continued)

Main Idea

I found this information on page ________
SE, pp. 246-247
RE, pp. 94-95

Details

Organize information about chromosomes in the concept web.
Accept all reasonable responses.

- are the carriers of the genetic material that is copied and passed from generation to generation.
- contain DNA
- For most of the cell’s lifetime, they exist as chromatin.
- Just before cells divide, they appear as several short, stringy structures in the nucleus.
- Without the proper amount of DNA the cell cannot survive. Therefore, chromosomes must be accurately passed on to new cells.

Identify four events that occur in a cell during interphase.

1. cell grows
2. cell carries on metabolism
3. cell duplicates chromosomes
4. cell prepares for division

Summarize

Analyze the relationship between cell size and the stages of the cell cycle.

Cells must stay small to function properly. Cells use the cell cycle to stay small. Actively growing cells are in interphase. When a growing cell reaches its maximum size, it keeps itself small by entering mitosis and cytokinesis and dividing into two smaller daughter cells.
Cellular Reproduction
Section 9.2 Mitosis and Cytokinesis

Main Idea
Scan Section 2 of the chapter. From the headings and illustrations list the four stages of mitosis.
1. prophase
2. metaphase
3. anaphase
4. telophase

Review Vocabulary
Use your book or dictionary to define life cycle.
life cycle: the sequence growth and development stages that an organism goes through during its life

New Vocabulary
Use your book or dictionary to define the following terms.
anaphase: the third stage of mitosis, during which the centromeres separate and the chromatids are pulled apart
centromere: structure at the center of the chromosome to which the sister chromatids attach
metaphase: the second stage of mitosis, during which the sister chromatids line up along the equator of the cell
prophase: the first stage of mitosis, during which the chromatid condenses into chromosomes
sister chromatid: structures in a chromosome containing identical copies of the DNA
spindle apparatus: structure that helps move and organize the chromosomes during mitosis; made of spindle fibers, centrioles, and aster fibers
telophase: the final stage of mitosis, during which the chromosomes migrate to the poles of the cell and then decondense
### Main Idea

#### Mitosis

I found this information on page

- SE, p. 248
- RE, p. 96

#### The Stages of Mitosis

I found this information on page

- SE, pp. 248–251
- RE, pp. 96–98

### Details

- **Identify two functions of mitosis in animals.**
  - Function of mitosis in animals:
    - wound repair
    - growth of organism to adult size

- **Model the stages of mitosis and the process of cytokinesis.** Draw and label a cell in each stage, name each stage, and describe what is happening. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>Name of Phase</th>
<th>Sketch of Cell</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>prophase</td>
<td></td>
<td>chromatin coils to form chromosomes</td>
</tr>
<tr>
<td>metaphase</td>
<td></td>
<td>chromosomes move to the center of the cell</td>
</tr>
<tr>
<td>anaphase</td>
<td></td>
<td>centromeres split and sister chromatids are pulled to the opposite sides of the cell</td>
</tr>
<tr>
<td>telophase</td>
<td></td>
<td>two new nuclei are formed and a double membrane begins to form between them</td>
</tr>
<tr>
<td>cytokinesis</td>
<td></td>
<td>cell's cytoplasm divides and separates into two new identical cells</td>
</tr>
</tbody>
</table>

### Summarize the similarities and differences of any two phases of mitosis.

Accept all reasonable responses.

---

92 Cellular Reproduction
Section 9.2 Mitosis and Cytokinesis (continued)

Main Idea
I found this information on page ________
SE, pp. 248-251
RE, pp. 66-98

Details

**Summarize** the function of each structure in mitosis:
- **Centromere**: part of chromosome to which spindle apparatus attaches
- **Microtubules**: tube-like structures that shorten and pull the chromosomes to opposite poles of the cell
- **Motor proteins**: help microtubules pull chromosomes to poles of the cell
- **Spindle apparatus**: attaches to and moves the chromosomes

**Cytokinesis**
I found this information on page ________
SE, p. 252
RE, p. 99

**Compare and contrast** cytokinesis in plant and animal cells.

<table>
<thead>
<tr>
<th>Cytokinesis in Plant Cells</th>
<th>Cytokinesis in Animal Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>cell plate and new cell walls form between the daughter cells</td>
<td>results in genetically identical daughter cells</td>
</tr>
<tr>
<td>Both</td>
<td>Occurs by microfilaments constricting the dividing cell and pinching it into two daughter cells</td>
</tr>
</tbody>
</table>

**Summarize**
Create a concept map describing the stages of the cell cycle.

Accept all reasonable responses.

1. interphase
2. mitosis
3. cytokinesis
   - 1. prophase
   - 2. metaphase
   - 3. anaphase
   - 4. telophase

*Cellular Reproduction*
Cellular Reproduction
Section 9.3 Cell Cycle Regulation

Main Idea

Scan the illustrations and read the captions in Section 3 of the chapter. Write three facts you discovered about stem cells:

1. Accept all reasonable responses.

2. __________________________________________________________________________

3. __________________________________________________________________________

Review Vocabulary

Use your book or dictionary to define nucleotide.

nucleotide
subunit that makes up RNA and DNA

New Vocabulary

Use your book or dictionary to define the following term.

apoptosis
process of programmed cell death

cancer
uncontrolled growth and division of cells; results from a failure of

    cell cycle regulation

carcinogen
substance known to cause cancer

cyclin
protein that binds to cyclin-dependent kinases to regulate the

    activities of the cell cycle

cyclin-dependent kinase
enzymes that are activated by cyclins and serve to regulate the

    activities of the cell cycle

stem cell
unspecialized cells that have the potential to develop into

    specialized cells
Section 9.3 Cell Cycle Regulation (continued)

Main Idea

Normal Cell Cycle
I found this information on page ____________

SE, pp. 253–254
RE, pp. 100–101

Summarize how cells regulate the cell cycle. Choose from the list of words to complete the paragraph.
- checkpoints
- cyclin/CDK
- G1 stage
- G2 stage
- cytokinesis
- mitosis
- cyclins

Cells use ______ cyclins _______ and _______ cyclin-dependent kinases _______ to control the cell cycle. Different combinations of ______ cyclin/CDK _______ checkpoints _______ start the cell cycle at different _______. The cell also uses ______ cyclin/CDK _______ to monitor the cycle for quality control. In ______ G2 stage _______, the cell checks the DNA for damage. If there is any damage, the cycle won’t proceed to ______ S stage _______. In ______ mitosis _______, if the spindle apparatus is malfunctioning, the cycle won’t proceed to ______ cytokinesis _______.

Abnormal Cell Cycle
I found this information on page ____________

SE, pp. 254–255
RE, pp. 101–102

Sequence: the causes and effects of cancer by completing the flow chart below.

1. Cancer is the uncontrolled growth and division of cells.
2. Cancer is the result of a failure in regulation of the cell cycle.
3. Cells lose control when genes that regulate the cell cycle are damaged.
4. Cancer cells cause damage by crowding out normal cells, leading to organ failure.

Identify four environmental factors that cause cancer.
1. cigarette smoke
2. asbestos
3. X rays
4. ultraviolet radiation
Section 9.3 Cell Cycle Regulation (continued)

**Main Idea**

**Apoptosis**

I found this information on page

- SE, p. 256
- RE, p. 102

Summarize information about apoptosis.

<table>
<thead>
<tr>
<th>Apoptosis is</th>
<th>Organisms use apoptosis to</th>
<th>Two processes that use apoptosis:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a process of programmed cell death.</td>
<td>destroy cells that are no longer needed.</td>
<td>1. trees losing their leaves in autumn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. development of hands and feet</td>
</tr>
</tbody>
</table>

**Stem Cells**

I found this information on page

- SE, pp. 256-257
- RE, p. 102

Compare and contrast adult and embryonic stem cells by writing characteristics in the Venn diagram.

**CONNECT**

A classmate thinks that cancer and apoptosis are both harmful to organisms. Do you agree or disagree? Explain your reasoning.

Accept all reasonable responses. Only cancer is harmful to an organism. Apoptosis is a normal process in which cells that are not needed by an organism die in a controlled process.