Name:_____Class: _____ Date: _____

Regulation of the Cell Cycle

Reinforcement

KEY CONCEPT Cell cycle regulation is necessary for healthy growth.

The cell cycle is regulated by both external and internal factors. External factors come from outside the cell. These include cell–cell contact, which prevents further growth of normal cells, and chemical signals called growth factors. **Growth factors** stimulate cells to divide. Most cells respond to a combination of growth factors, not just one. Some growth factors affect many different types of cells. Others specifically affect one cell type. Internal factors come from inside the cell. Very often, an external factor triggers the activation of an internal factor. A cyclin is a type of internal factor. It activates kinases, which in turn, add a phosphate group to other molecules that help drive the cell cycle forward.

Cells not only regulate growth, but also death. **Apoptosis** is programmed cell death. Apoptosis plays important roles in development and metamorphosis.

When a cell loses control over its cycle of growth and division, **cancer** may result. Cancer cells can continue to divide despite cell–cell contact or a lack of growth factors. Cancer cells form disorganized clumps of cells called tumors. **Benign** tumors tend to remain clumped together and may be cured by removal. **Malignant** tumors have cells that break away, or **metastasize,** and spread to other parts of the body, forming new tumors. Malignant tumors are more difficult to treat than benign tumors. Radiation therapy and chemotherapy are common treatments for cancer. However, both treatments kill healthy cells as well as cancer cells.

Cancer cells can arise from normal cells that have experienced damage to their genes involved in cell cycle regulation. Damage may arise from inherited errors in genes, from mutations carried by viruses, and from carcinogens. **Carcinogens** are substances known to produce or promote the development of cancer. These include substances such as tobacco smoke and other air pollutants.

1. List two examples of external factors that influence the cell cycle.

_____

2. What is apoptosis?

_____

_____

3. How does a benign tumor differ from a malignant tumor?

_____

_____

_____

Name:_____Class: _____ Date: _____

REGULATION OF THE CELL CYCLE

Gene Expression in Development and Cell Division

Read the passage below, which covers topics from your textbook. Answer the questions that follow.

A **tumor** is an abnormal proliferation of cells that results from uncontrolled, abnormal cell division. The cells of a *benign tumor* remain within a mass. Examples of benign tumors are the fibroid cysts that occur in a woman's breasts or uterus. Most benign tumors can be removed by surgery.

In a *malignant tumor*, the uncontrolled dividing cells may invade and destroy healthy tissues elsewhere in the body. Malignant tumors are more commonly known as **cancer. Metastasis** is the spread of cancer cells beyond their original site. When metastasis occurs, the cancer cells break away from the malignant tumor and travel to other parts of the body, where they invade healthy tissue and begin forming new tumors. Malignant tumors can be categorized according to the types of tissues they affect. **Carcinomas** grow in the skin and the tissues that line the organs of the body. **Sarcomas** grow in bone and muscle tissue. **Lymphomas** are solid tumors that grow in tissues that form blood cells.

Read each question and write your answer in the space provided.

SKILL: Forming Analogies

In an analogy, one must analyze the relationship between two words and then identify another pair of words that have the same relationship. In the analogy "Glove is to hand as sock is to foot," the relationship is article of clothing to part of the body where worn.

1. Complete the following analogy: "Skin is to carcinoma as bone is to _____ ."
2. What relationship was used to form the analogy in question 1?

_____

Circle the letter of the word or phrase that best completes the analogy.

3. Sarcomas are to muscle tissue as lymphomas are to

a. uterus.
b. lungs.
c. tissues that form blood cells.
d. Both (a) and (b)