Measuring Up Workbook - Lesson 7 - Cell Cycle

**You will learn that a cell passes through a cell cycle, which has several phases. These phases include processes known as mitosis and growth.**

The **cell cycle** is a sequence of several phases through which a cell passes as it grows, prepares for division, and divides.

**Mitosis** is the process in which the nucleus of a cell divides to produce two nuclei.

**Interphase** is the phase of the cell cycle in which the cell is not dividing to produce new cells.

**Growth** is the process in which energy is used to produce an increase in size.

Guided instruction – Guided Questions

**Directions** – Read the following information and answer the questions.

You may have observed children or animals growing up and changing. All living things have a distinct life cycle – a pattern of growth in which the organism changes over a lifetime. For example, the life cycle of an oak tree begins when an acorn germinates and grows into a small plant. Over many years, the plant grows into a very large tree that in turn produces more acorns that become new trees.

Just like all living things, cells also go through a life cycle, called the cell cycle. A **cell cycle** is a repeated pattern of cellular growth, preparation for division, and division. The cell cycle begins when a cell forms. The cycle ends when the cell divides to produce two new cells. These new cells can then begin the cycle all over again.

The cell cycle consists of two phases. One phase is called the M phase. The *M* stands for mitosis. **Mitosis** is the process in which a nucleus divided to form two nuclei. Mitosis is followed by the division of the cell cytoplasm. Together, the divisions of the cell nucleus and cell cytoplasm make up the M phase of the cell cycle. The other phase of the cell cycle is called interphase. The illustration at right (see book page 45) shows that cells spend most of their time in interphase.

1. What is a cell cycle?
2. What are the two phases of the cell cycle?

Before taking a closer look at what happens during the cell cycle, recall that the nucleus directs the activities of the cell. The nucleus contains the organism’s genetic information. This genetic information is stored in structures called chromosomes. The chromosomes are made from deoxyribonucleic acid, which is abbreviated DNA. In effect, the DNA contains the genetic information. This information is passed from the original cell to the new cells during mitosis.

Before mitosis begins, an exact copy of the genetic information must be made. The copying of the genetic information occurs during the part of the cell cycle called **interphase**. Interphase is divided into three phases: G1, S, and G2.

* *First growth (G1) phase*. During this phase, the cell undergoes rapid growth. It is carrying on all the processes needed for life, such as homeostasis, energy conversions, transport of materials, and synthesis of new materials.
* *Synthesis (S) phase*. The copying of the genetic information occurs during the S phase. A copy of each chromosome is made. As a result, there are two complete sets of genetic information. One complete set can be given to one nucleus that forms as a result of mitosis. The other complete set can be given to the other nucleus.
* *Second Growth (G2) phase*. During this phase, the cell prepares for mitosis. This is usually the shortest phase, but it is when most of the molecules needed for cell division are produced. At the end of this phase, the copies of the chromosomes are clearly seen under a microscope.

These three phases are summarized in the illustration below (see book page 46).

3. What happens during interphase?

1. What happens during the G1 phase?
2. What happens during the S phase?
3. What happens during the G2 phase?

Once interphase is complete, the cell is ready to enter the M phase. Like interphase, the M phase is subdivided. In the first phase, mitosis, the cell’s nucleus divides into two nuclei.

* First, the chromosomes line up along the middle of the cell.
* Each member of a chromosome pair then moves to the opposite end of the cell
* The nucleus then divides. Each nucleus ends up with the same kind and number of chromosomes as the original cell.

Finally, the cell cytoplasm divided to form into new cells. This process during cell division in which the cytoplasm divided is called cytokinesis. It marks the end of the M phase of the cell cycle. The illustration below (see book page 47) shows what happens during the S, G2, and M phases of the cell cycle.

After cytokinesis, each new cell enters the G1 phase. During the G1 phase, the cell grows to reach its mature sixe. Growth is the process by which energy is used to produce an increase in size.

During the G1 phase, the two cells produced by mitosis can follow one of two paths. In one path, cells can enter the S phase and go through another cell cycle. In fact, this is how an organism continues to grow. Growth depends on the formation of new cells. The cell cycle is responsible for forming these new cells.

In a second path a cell exits the cell cycle. If this happens, the cells do not prepare for a cell division. Instead, they become specialized cells. These cells include most of the cells in the human body, such as brain cells and heart cells.

1. What happens as a result of **mitosis**?
2. What is *cytokinesis?*

Short Answer Questions: **Directions:** Answer the following questions

1. What happens during the M phase of the cell cycle?
2. Describe what happens during each of the 3 phases that make up interphase in the cell cycle.
3. Why must each chromosome make a copy of itself before the M phase begins.
4. Why is the cell cycle important to the growth of an organism?

Apply the TEKS: **Directions:** Read the paragraph, study the diagram, (page 49) and answer the questions.

The cell cycle begins when a cell is formed, and it ends when the cell divides. The illustration below (page 49) shows the various phases that make up the cell cycle. Assume that you are asked to change this illustration so that is describes what happens during the cell cycle.

1. What description would you add beneath the label *S phase*?
2. What description would you add beneath the label *G2*?
3. What description would you add beneath the label *M*?
4. What description would you add beneath the label *G1*?
5. What are the two types of cells that you would include under the label *Cells that cease division*?

STAAR Practice: **Directions**: Read each question and choose the best answer. Then choose the letter for the correct answer.

1. The cell cycle includes mitosis. What happens during mitosis?
   1. Each chromosome makes a copy of itself.
   2. The cell cytoplasm divides to produce two cells.
   3. The cell prepares to divide.
   4. The nucleus divides so that each cell will receive a complete set of genetic information.
2. During which phase does a cell usually leave the cell cycle?
   1. G1
   2. S
   3. G2
   4. M
3. A student wishes to examine the behavior of chromosomes as a cell divided to produce two cells. Which part of the cell cycle should this student select to study?
   1. 1
   2. S
   3. G
   4. M
4. A yeast cell can complete a cell cycle every 90 minutes. Starting with just a single yeast cell, how many yeast cells should be present after 6 hours?
   1. 16
   2. 8
   3. 4
   4. 2
5. During the very early stages of a person’s life cycle, the rate of cell division proceeds rapidly. During this time, cells shows little growth. What can you conclude from this information about the cell cycle during these very early stages of development?
   1. The cell cycle consists mainly of a long G1 phase.
   2. The cell cycle consists mainly of short M and S phases.
   3. Most cells exit the cell cycle.
   4. Most cells will not undergo mitosis.

Cumulative Review: **Directions**: Read each questions and choose the best answer. Then choose the letter for the correct answer.

1. During the cell cycle, DNA is copied. Which type of biomolecule does DNA represent?
   1. Carbohydrate
   2. Lipid
   3. Protein
   4. Nucleic Acid
2. The cell cycle involves the division of the nucleus. Which term describes what the nucleus represents in a cell?
   1. Prokaryote
   2. Organelle
   3. Catalyst
   4. Eukaryote
3. The cell cycle requires energy. Which process supplies this energy so that the cell cycle can take place in all living things?
   1. Respiration
   2. Transport
   3. Homeostasis
   4. Fermentation
4. Part of the cell cycle involves growth. Growth involves assembling smaller molecules to make large ones. Which process is responsible for making these larger molecules from smaller ones?
   1. Synthesis
   2. Homeostasis
   3. Transport
   4. Respiration