Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_KEY\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Unit 5: Cellular Reproduction***-Lesson 4*

***Mitosis and Cytokinesis***

*Notes*

* **Key Point 1:** The purpose of mitosis is to **divide the cell’s nucleus and genetic material** (DNA) among the two new daughter cells
  + Each cell must have a copy of the same DNA
* There are four phases of mitosis
  + **Prophase** 🡪 **Metaphase** 🡪 **Anaphase** 🡪 **Telophase**

*Prophase*

* **Key Point 2:** During prophase:
  + **Chromatin condenses into chromosomes**
    - Each chromosome looks like an X
  + The nuclear membrane **disintegrates** (breaks down and disappears)
    - Nuclear membrane= **outer layer of nucleus**
  + **Spindle fibers** form

*Metaphase*

* **Key Point 3:** During metaphase:
  + Spindle fibers connect the **centrioles to the centromeres** of each chromosome
  + **Chromosomes line up along the middle of the cell**
    - Meta= **middle**

*Anaphase*

* **Key Point 4:** During anaphase:
  + Spindle fibers shorten, pulling the sister chromatids apart
  + **Sister chromatids move towards opposite ends of the cell**
    - Ana=**opposite**

*Telophase*

* **Key Point 5:** During telophase:
  + **Chromosomes relax back into chromatin**
  + The **nuclear membrane reforms** around the chromatin at each end of the cell

*Cytokinesis*

* **Key Point 6:** During cytokinesis:
  + Proteins pinch the middle of the cell at each end, forming a **furrow**
  + The furrow divides the **cytoplasm**, splitting the cell into **two new identical cells**
  + Plant cells form a **cell plate** instead of a furrow

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Unit 4: Cellular Reproduction***-Lesson 4*

***Mitosis and Cytokinesis***

*Notes*

* **Key Point 1:** The purpose of mitosis is to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (DNA) among the two new daughter cells
  + Each cell must have a copy of the same DNA
* There are four phases of mitosis
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** 🡪 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** 🡪 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** 🡪 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*Prophase*

* **Key Point 2:** During prophase:



* + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
    - Each chromosome looks like one part of an X
  + The nuclear membrane **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (breaks down and disappears)
    - Nuclear membrane= **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** form

*Metaphase*



* **Key Point 3:** During metaphase:
  + Spindle fibers connect the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of each chromosome

* + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* + - Meta= **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*Anaphase*



* **Key Point 4:** During anaphase:
  + Spindle fibers shorten, pulling the sister chromatids apart
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* + - Ana=**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*Telophase*

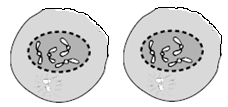


* **Key Point 5:** During telophase:
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + The **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**around the chromatin

at each end of the cell

*Cytokinesis*

* **Key Point 6:** During cytokinesis:



* + Proteins pinch the middle of the cell at each end, forming a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + The furrow divides the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, splitting the cell into

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* + Plant cells form a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**instead of a furrow

*Matching:*

1. \_\_\_\_\_\_\_ Prophase
2. \_\_\_\_\_\_\_ Metaphase
3. \_\_\_\_\_\_\_ Anaphase
4. \_\_\_\_\_\_\_ Telophase
5. \_\_\_\_\_\_\_ Cytokinesis
6. The nucleus reforms in both cells and chromosomes relax back into chromatin
7. Spindle fibers attach to centromeres and chromosomes line up in the middle of the cell
8. The cytoplasm divides and two new daughter cells are formed
9. The nuclear membrane disappears and chromatin condenses into chromosomes
10. Sister chromatids are pulled to opposite ends of the cell by spindle fibers

*Review Questions*

1. The picture below is of an onion root tip, which contains very fast-growing cells. List the numbers of the cells that are shown in each of the phases below.

Interphase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Prophase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Metaphase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Anaphase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Telophase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is happening during the phase of mitosis shown in cell #7?
2. What is happening during the phase of mitosis shown in cell #11?
3. What is happening during the phase of mitosis shown in cell #2?
4. What is happening during the phase of mitosis shown in cell #12?