**Chapter 10 Cell Growth, Division, & Reproduction page 274**

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**Cell size limitations**

2 main reasons why cells divide

1. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a cell becomes the more demands the cell places on its \_\_\_\_\_\_\_\_\_
2. Larger cells are \_\_\_\_\_\_\_\_\_ efficient in moving \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_ across the cell membrane

**Ratio of surface area to volume**

**Surface Area:** this is the area covered by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How is it calculated? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Volume:** the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ taken up by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ contents of the cell

How is it calculated? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Practice

Considerations with surface area to volume ratio

|  |  |
| --- | --- |
| Small Cell | Large Cell |
| * Surface area greater than the volume * Can get nutrients \_\_\_\_\_\_\_\_\_\_ easily * Can get wastes \_\_\_\_\_\_\_\_\_ easily * Cytoskeleton only has to transport nutrients \_\_\_\_\_\_\_\_\_\_ distances within cell * Signal proteins can communicate instructions for cell functions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ since only have to travel \_\_\_\_\_\_\_\_\_\_\_\_\_ distances | * Volume greater than the surface area * Will have trouble with bringing \_\_\_\_\_\_\_\_\_\_\_ in since not as much \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Hard to get all wastes out * Cytoskeleton has to transport nutrients \_\_\_\_\_\_\_\_\_\_\_\_\_\_ distances within cell * Signal proteins must travel \_\_\_\_\_\_\_\_\_\_\_ distances and may not get there in time |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: the process by which a cell divides into 2 new daughter cells

* Before the cell can divide the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ must be copied first
* This solves the issue of having information \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ since its \_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells gets one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ copy of genetic information

2 main types of Cell Division and Reproduction

|  |  |
| --- | --- |
| Asexual Reproduction | Sexual Reproduction |
| * Used mostly in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organisms * Very \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Efficient * Populations will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ quickly * Each cell is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * When conditions are just perfect, the \_\_\_\_\_\_\_\_\_\_ they can reproduce and increase \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Disadvantage: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | * Used mostly in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organisms * More \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Fusion of \_\_\_\_\_\_ separate \_\_\_\_\_\_\_\_\_\_\_\_ cells * Each cell has \_\_\_\_\_\_\_\_\_\_\_ of the genetic info from the parent (thus not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) * Requires more \_\_\_\_\_\_\_\_\_\_\_\_ * Must have \_\_\_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_\_\_\_\_ * Provides \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ diversity |

**THE PROCESS OF CELL DIVISION**  Page 79

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Genetic information is bundled into packages of DNA

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: one of the 2 “sister” parts of a duplicated chromosome

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: region of a chromosome where the 2 sister chromatids are attached

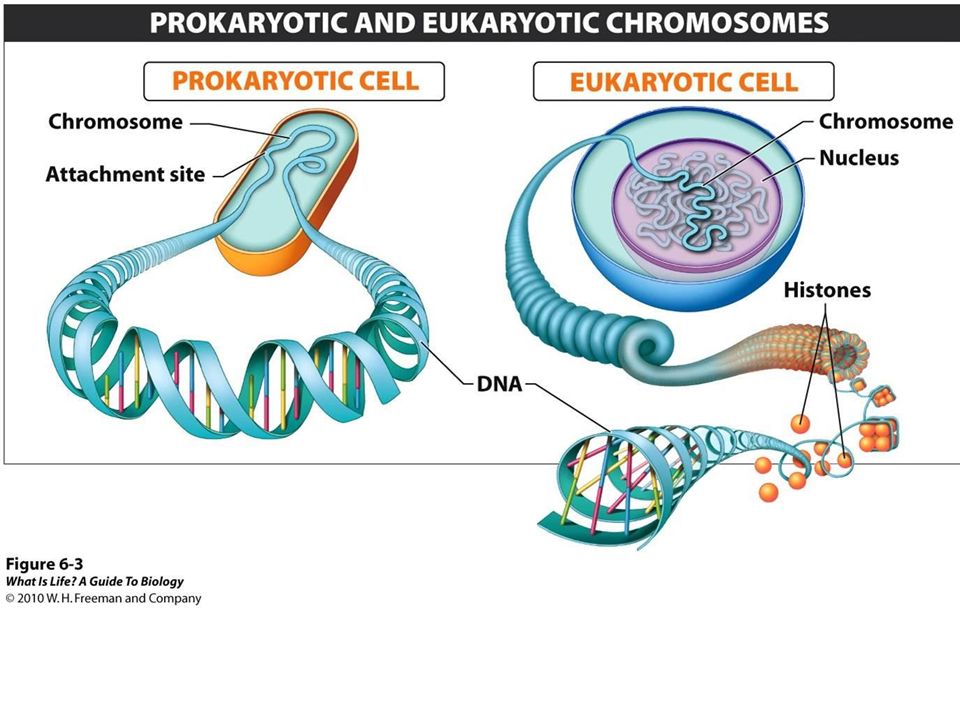
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Chromosomes are found in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Chromosomes do NOT have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Found in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In the shape of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Go though \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



Chromosomes make it possible to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DNA precisely during \_\_\_\_\_\_\_\_\_ division

**THE CELL CYCLE** *(journal book pic)*

Cells reproduce for 2 reasons

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**There are 3 stages of the Cell Cycle:**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: the “in-between” period of growth

Broken into 3 steps

**Step #1** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step #2** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step #3** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: The division of the nucleus

Broken into 4 steps

**Step #1** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step #2** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step #3** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step #4** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ : division of the cytoplasm

**Stage #1: INTERPHASE** *(the in-between period of growth)*

**G1 Phase** OR \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Cell Growth

* Cells do most of their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Cells \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in size
* Make new \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**S Phase** OR \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: DNA Replication

- \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is synthesized when the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are replicated

- The cell at the end of S phase will contain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as much DNA as it did in the beginning

**G2 Phase** OR \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Preparing for Cell Division

- Shortest of the parts of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

- Many of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are produced

**Stage #2/3: Mitosis and Cytokinesis**

**Mitosis**: **is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**There are 4 parts (PMAT)**

**PROPHASE**

* First phase of mitosis
* This is usually the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ part of mitosis
* The genetic material in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ condenses
* The chromosomes (duplicated) are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The nucleus and nuclear membrane \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Centrioles \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fibers begin to form

METAPHASE

* Second phase of mitosis
* This is usually the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ part of mitosis
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the duplicated \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ line up across the center of the cell
* Each \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is connected to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fibers at its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ANAPHASE

Third phase of mitosis

The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ separate into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chromosomes and are moved \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The individual \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ moves along the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fibers to the opposite end of the cell

TELOPHASE

* Fourth phase of mitosis
* Chromosomes gather at \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ends of the cell and lose their shape becoming a tangle of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ membrane \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ around each cluster of chromosomes
* Spindles fibers \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Nucleolus becomes visible

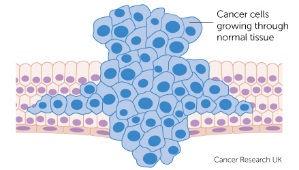
**STAGE #3: CYTOKINESIS**

* Usually occurs at the same time as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pinches in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Each \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cell has an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ set of duplicated chromosomes
* This completes the process of cell division by splitting \_\_\_\_\_\_\_\_\_\_\_\_ cell into \_\_\_\_\_\_\_\_\_

***Cytokinesis differences***

**Plant cells**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Animal cells**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



**Section 3 Regulating the Cell Cycle**

* How does a cell know \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to divide?
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells do not divide once they have been developed
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and digestive tract cells all grow rapidly throughout life
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ regulates the cell cycle
    - These \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the cell it is time to go through the cell cycle
    - The cell is controlled by
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ regulators
        + These allow the cell cycle to proceed only when certain events have occurred

inside of the cell

* + - * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ regulators
        + Direct the cell to speed up or slow down during the cell cycle

Example: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

These stimulate growth and cell division

* **Sometimes cells are bad**
  + they may die by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (in an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or just \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
  + they may be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to die called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**CANCER**

* a disorder in which body cells \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ their ability to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ growth
* cancer cells do not respond to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that regulate growth
* results in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + this can cause \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to form
    - a mass of cell
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ tumor
        + These are non-cancerous and do \_\_\_\_\_\_\_\_\_\_\_ spread
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ tumor
        + These are cancerous and do \_\_\_\_\_\_\_\_\_\_\_\_\_\_
        + They invade and destroy the surrounding healthy tissue blocking and preventing

Organs from functioning properly