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

SOL.BIO.5afg.7b

**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