NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_UNIT 6-Cells Mrs. Weimer

A. Types of cells

 1. Prokaryotic\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2. Eukaryotic\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B. Cell size comparison

 1. **most bacteria**-**1-10 microns**

**2. eukaryotic cells** -**10-100 microns**

C. Why study cells? Cells → Tissues → Organs → Bodies

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D. The Work of Life

What jobs do cells have to do for an organism to live…

1. “breathe” -\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. eat-take in & digest food

3. make energy-ATP

4. build molecules-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. remove wastes

6. control internal conditions-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. respond to external environment

8. build more cells-growth, repair, reproduction & development

E. Cells have 3 main jobs

1. \_\_\_\_\_\_\_\_\_\_\_\_-need energy for all activities,need to clean up waste produced, while making energy

2. \_\_\_\_\_\_\_\_\_\_\_\_-proteins do all the work in a cell, so we need lots of them

3. \_\_\_\_\_\_\_\_\_\_\_\_-for growth, to replace damaged or diseased cells

F. Organelles

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ do the work of cells, each structure has a job to do, keeps the cell alive; keeps you alive

G. Cells need power*!*

1. Making energy

organelles that do this work…

1.

2.

3.

4.

-to fuel daily life & growth, the cell must…

1. take in food & digest it

2. take in oxygen (O2)

3. make ATP

4. remove waste

 2. Cell Organelle Table

|  |  |  |
| --- | --- | --- |
| Organelle | Function | Structure |
| Cell Membrane |  |  |
| Vacuoles |  |  |
| Lysosome |  |  |
| Mitochondria |  |  |
| Chloroplast |  |  |

H. Cells need workers = proteins*!*

1. Making proteins

-to run daily life & growth, the cell must…

1. read genes (DNA)

organelles that do this work…

1.

2.

3.

4.

2. build proteins

3. structural proteins (muscle fibers, hair, skin, claws)

4. enzymes (speed up chemical reactions)

5. signals (hormones) & receptors

2. Cell Organelle Table

|  |  |  |
| --- | --- | --- |
| Organelle | Function | Structure |
| Nucleus |  |  |
| Ribosomes |  |  |
| Endoplasmic Reticulum |  |  |
| Golgi Apparatus |  |  |

I. Cells need to make more cells*!*

1. Making more cells

organelles that do this work…

1.

2.

-to replace, repair & grow, the cell must…

1. copy their DNA

2. make extra organelles

3. divide the new DNA & new organelles between 2 new “daughter” cells

 2. Cell Organelle Table

|  |  |  |
| --- | --- | --- |
| Organelle | Function | Structure |
| Centrioles |  |  |



Cells Part 2-***Osmosis and Diffusion*Passive Transport**

A. Osmosis and Diffusion

1.Diffusion - the process by which molecules spread from areas of \_\_\_\_\_ concentration, to areas of \_\_\_\_\_ concentration

 -eventually spreading out evenly into the available space

-Several factors can affect the rate the diffusion……

a. One such factor is temperature

 -**Higher temperatures tend to \_\_\_\_\_\_\_\_\_\_\_ the rate of diffusion**

**2.Solutes**- a substance \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in fluid

a. Ex: *Salt* is a solute, when it is concentrated inside or outside the cell, it will draw the water in its direction

b. This is also why you get thirsty after eating something salty

**3.Solvent** -is a liquid, solid, or gas that dissolves another solid, liquid, or gaseous solute resulting in a [solution](http://en.wikipedia.org/wiki/Solution)

4.Osmosis-**A specialized type of diffusion**-is the movement of a solvent (frequently water) through a

[semi-permeable membrane](http://en.wikipedia.org/wiki/Semipermeable_membrane)

**5.Tonicity** is a measure of the *osmotic pressure gradient* when comparing the concentration of solutes in different solutions & the following terms are used:

a. **Hypotonic Solutions:** contain a low concentration of solute (more water)

-When a cell is placed in a hypotonic solution, the water diffuses into the cell, causing the cell to **swell**

b. **Hypertonic Solutions:** contain a high concentration of solute (less water)

-When a cell is placed in a hypertonic solution, the water diffuses out of the cell, causing the cell to shrivel

c. **Isotonic Solutions:** contain the same concentration of solute (equal amounts of water)

-When a cell is placed in an isotonic solution, the water diffuses into and out of the cell at the same rate

-The fluid that surrounds the body cells is isotonic

6. . In the real world……….

**1. In humans**, osmosis occurs in the kidneys to recover the water form waste materials of the body. The kidneys regulate the concentration of water in the blood **plasma**.

2. Kidney dialysis

7. In the real world

 1. **In plants**, osmosis occurs for example at root hairs, allowing the uptake of water from the soil.

B. ACTIVE TRANSPORT

1. the movement of molecules across a cell membrane in the direction against their concentration gradient, i.e. moving from an area of lower concentration to an area of higher concentration.

2. ENDOCYTOSIS and EXOCYTOSIS

a. Endocytosis is the movement of materials **into** a cell via membranous vesicles.

b. Exocytosis is the movement of materials **out of** a cell via membranous vesicles.

Part 3-Cellular Energy

A. **Cell Energy (Photosynthesis and Respiration) Notes**

**Energy:**

* Energy for living things comes from **\_\_\_\_\_\_\_\_\_\_\_\_**. Originally, the energy in food comes from the **\_\_\_\_\_\_**.
* Organisms that use **\_\_\_\_\_\_\_\_\_\_\_\_** from the sun to produce food—**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (auto = self)

 Ex: **\_\_\_\_\_\_\_\_\_\_**and some microorganisms (some bacteria and protists)

* Organisms that **\_\_\_\_\_\_\_\_\_\_**use the sun’s energy to make food—**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

 Ex: **\_\_\_\_\_\_\_\_\_\_\_\_\_** and most microorganisms

* Cells usable source of **\_\_\_\_\_\_\_\_\_\_\_\_** is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ ATP stands for **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ ADP stands for **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* All energy is stored in the **\_\_\_\_\_\_\_\_** of compounds—**\_\_\_\_\_\_\_\_\_\_\_\_** the bond **\_\_\_\_\_\_\_\_\_\_** the energy
* When the cell has energy available it can store this energy by adding a **\_\_\_\_\_\_\_\_\_\_\_\_\_** to ADP, producing **\_\_\_\_\_**
* ATP is converted into ADP by breaking the **\_\_\_\_\_\_** between the second and third phosphate groups and releasing **\_\_\_\_\_\_\_\_\_\_** for cellular processes.

**Photosynthesis:**

* Photosynthesis is the process by which the energy of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** into the energy of **\_\_\_\_\_\_\_\_\_\_\_**
* Photosynthesis occurs in the **\_\_\_\_\_\_\_\_\_\_\_\_** of plants
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**is the pigment inside the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the absorbs light for photosynthesis
* Formula for photosynthesis:

**Cellular Respiration: (2 kinds—Aerobic and Anaerobic)**

* Cellular respiration is the process by which the energy of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in the cell to be used for life processes (**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, etc…)
* Cells require a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** for life processes but keep only a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** on hand. Cells can regenerate ATP as needed by using the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** like glucose.
* The energy stored in glucose by photosynthesis is released by **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and repackaged into the energy of ATP.
* Respiration occurs in **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and can take place either **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** present.

**Aerobic Respiration:** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* Occurs in the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**of the cell
* Total of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** molecules produced
* General formula for aerobic respiration:

**Anaerobic Respiration:** occurs when **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is available to the cell (2 kinds: Alcoholic and Lactic Acid)

* Also called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** than in aerobic respiration
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** fermentation—occurs in **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Process used in the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** industry—yeast produces CO2 **\_\_\_\_\_\_\_\_**during fermentation to make dough **rise** and give bread its holes

* **Lactic acid** fermentation—occurs in **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Lactic acid is produced in the muscles during rapid \_\_\_\_\_\_\_\_when the body **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**supply enough **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**—causes **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in muscles

Part 4-Cell Cycle and Reproduction

A. Cell Reproduction

* Prokaryotes-Bacteria
*  Eukaryotes-Plants & animals

B. Prokaryotes

* Lack a nucleus
* Have a single chromosome
* Reproduce by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Include bacteria

C. Steps in Binary Fission

* Used by bacteria
* Cells increase their cell mass slightly
* DNA & cell components are replicated
* Each cell divides into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D. Eukaryotes

* Contain a nucleus & membrane bound organelles
* Asexually reproduce cells by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

E. Cell Cycle (Overview)

* Stages in growth & division
* G1 Phase
* S Phase
* G2 Phase
* M Phase
* Cytokinesis

F. G1 Phase

* First \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Cell increases in size
* Cell prepares to copy its DNA

G. Synthesis Phase

* Copying of all of DNA’s instructions
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

H. G2 Phase

* Time between DNA synthesis & mitosis
* Cell \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Needed proteins produced

I. M Phase

* Cell growth & protein production stop
* Cell’s energy used to make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Called mitosis or karyokinesis (nuclear division)

J. Interphase – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Cells carrying on normal activities
* Chromosomes aren’t visible
* Cell metabolism is occurring
* Occurs before mitosis

K. Interphase

Stages of Mitosis (Overview)

* Prophase
* Metaphase
* Anaphase
* Telophase

L. Cells Undergoing Mitosis

Steps in Prophase

* DNA coils tightly & becomes visible as chromosomes
* Nuclear \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Nucleolus disappears
* Centrioles \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Spindle begins to form

Steps in Metaphase

* Spindle fibers from centrioles attach to each chromosome
* Cell \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ its chromosomes
* Cell aligns its chromosomes in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Steps in Anaphase

* Cell chromosomes are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Spindle fibers shorten so chromosomes pulled to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Steps in Telophase

* Separation of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Cell Plate forms (plants)
* Cleavage furrow forms(animals)
* Nucleus & nucleolus reform
* Chromosomes uncoil

Cytokinesis

* Occurs \_\_\_\_\_\_\_\_\_\_\_ chromosomes separate
* Forms two, identical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CYCLE: G1, S, G2, M-IPMATC