Keystone Lesson 1 notes

* Earth is home to a variety of organisms, from single cell bacteria to complex animals and plants
* All organisms are composed of one or more cells.
* Cell- the smallest living unit of an organism
* Organisms can be unicellular (one cell) or multicellular (many cells)
* Obtain and use energy- all organisms obtain energy.
* Plants obtain energy from the sun
* Animals ingest other organisms to gain energy stored in their molecules.
* Organisms and their cells function best at certain temperatures, pH levels, solute concentrations.
* They must keep levels from falling too low or rising too high.

This process of maintaining a stable internal environment is called HOMEOSTASIS.

The ability to GROW and REPRODUCE

* Even single cells grow larger and multicellular organisms grow by dividing, that is, duplicating, their cells many times over.
* Almost all organisms in a species are able to reproduce. For unicellular organisms, reproduction consists of cell division.

Respond to STIMULI in the environment

* A STIMULUS is a change that an organism can detect.
* Responses can take different forms.
* Ex. A rabbit may run from a predator.
* Some plants move their leaves to face incoming light.
* Other responses do not involve movement.
* Some plants produce toxins to stop insects.
* Ex. In low light conditions, the pupils of the eye dilate to allow more light to pass into the eye.
* Pupil dilation is a response to a stimulus, low light.
* This response requires the use of energy.
* Pupil dilation is an example of homeostasis, as constant light levels in the eye are maintained.
* Organism – is a living thing, such as an animal, plant, fungus, protist, or bacteria.
* Cell – basic unit of life
* A unicellular organism- such as bacteria has a single cell to carry out all of life functions.
* Multicellular organisms such as plants and animals have trillions of cells with specialized functions within the organism’s life cycle.
* Homeostasis- process of maintaining a stable internal environment.

Characteristics of cells

* Plasma membrane - also called cell membrane forms the outside layer of the cell.
* It separates the cell from its environment and regulates the exchange of material into and out of the cell.
* Cytoplasm – is the substance that fills the cell’s internal volume. It is composed mostly of water.
* DNA – is the molecule that stores genetic information, which allows the cell to pass it on to future generations. Genes are temporarily copied as RNA and brought to ribosomes.
* Ribosomes – are the smallest organelles within the cell and many of them are found throughout the cytoplasm. They decode the genetic information in mRNA and assemble amino acids into proteins.

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* Which Structure is NOT present in all organisms?
* A) A cell wall
* B) a plasma membrane
* C) genetic material
* D) cytoplasm
* **All cells contain a plasma membrane, cytoplasm, and some form of genetic material.**
* **B,C,D are incorrect. Cell walls are found in plants, fungi, and bacteria but not in animals**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Prokaryotes

* Unicellular
* Lack membrane-bound organelles.
* No Nucleus, so DNA is found in cytoplasm.
* Oldest type of cell, originating 3.5 billion years ago.
* Include common bacteria, bacterial-like cells (archaea) that are found in extreme environments.

Eukaryotes

* More complex cells
* Larger than prokaryotes
* Originated 1.5 billion years ago
* Have membrane bound organelles in cytoplasm
* DNA is in a Nucleus
* Cytoskeleton or protein scaffold helps to maintain the structure of these large cells.
* Include protists, fungi, animals, and plants
* Maybe be either unicellular or multicellular.

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|  | **Prokaryotic Cell** | **Eukaryotic Cell** |
| Nucleus | NO | Yes |
| Cell Number | Unicellular | Unicellular or multicellular |
| DNA | Circular chromosome found in cytoplasm | Linear chromosomes found in nucleus |
| Plasma Membrane | YES | YES |
| Membrane bound organelles | NO | YES |
| Ribosomes | Yes, small | Yes, LARGE |
| Cell Wall | Yes | Present in plants and fungi |
| Examples | Bacteria | Plants, animals, fungi, protists |
| Cell Diameter | 1-10 micrometers | 10-100 micrometers |

Organelles of the Eukaryotic Cells

* **Contain membrane bound organelles**
* **Nucleus- contains the cell’s genetic material DNA packaged as chromosomes.**
* **Mitochondria – powerhouses of the cell. These organelles synthesize energy rich ATP molecules required to carry out life processes.**
* **Contain ribosomes, some float in cytoplasm, others are attached to Endoplasmic reticulum (ER) that is found surrounding the nucleus.**
* **Endoplasmic Reticulum – Membrane rich organelle, that surrounds the nucleus.**
* **The ER wraps “packages” of these proteins into membrane vesicles and releases them.**
* **The Golgi Apparatus absorbs and tags these vesicles with an “address” so they can be secreted by the cell for use elsewhere in the organism.**
* **A eukaryotic cell produces and secretes a protein. Trace the path of the protein through the cell’s organelles.**
* **The genetic information for the protein is stored in the nucleus. It is transported to the ribosomes attached to the rough ER ( where proteins bound for “export” are assembled). Once made the protein is packed into a vesicle that travels to the Golgi apparatus. Then it is tagged and sent to the plasma membrane where it leaves the cell.**

**Animal and Plant Cells**

* **Animal and Plant cells have many of the same organelles.**
* **Chloroplasts are plant organelles that capture energy of sunlight and transform it into chemical energy, like simple sugars.**
* **Chloroplasts contain the pigment *Chlorophyll*, which absorbs the energy of sunlight much like a solar panel.**

**Plant cell**

* **Surrounding the plasma membrane of the plant cell is a *rigid cell wall* which supports and gives structure to plant bodies.**
* **The large *central vacuole* is an organelle that stores water and nutrients, wastes, and other material.**
* **When filled with liquid, the plant’s cell’s vacuole exerts pressure against the cell wall making the plant rigid.**