

NOTES: GEORGIA HIGH SCHOOL SCIENCE TEST

**Cell Structure Information**

**Two Famous Scientists Who Originated Cell Science**

**Robert Hooke – 1665**

- \* Used a “microscope” / magnifying glass to look at cork
- \* From England
- \* Discovered what a cell was by looking at a piece of cork

**Anot Van Leeuwenhook – 1673**

- \* Dutch inventor who created the microscope that we recognize today
- \* First person to discover a single celled protozoa
  - o Protozoa is like pond scum
- \* He also looked at blood cells

*some definitions:* **CELL INFORMATION**

**Cell:** The smallest unit of life that can perform all life processes.

**Cell Theory** (Really important - Know This!)

- \* All organisms are made of one or more cells
- \* The cell is the basic unit of all living things
- \* All cells come from existing cells

**Protoplasm:** All the living material found in a cell capable of carrying on all the life processes.

**Proteins:** The basic chemicals that make up the structure of cells and direct their activities.

(More complicated definition)

protein /pro-teín/ (pro´ten) any of a group of complex organic compounds containing carbon, hydrogen, oxygen, nitrogen, and sulfur. Proteins, the principal constituents of the protoplasm of all cells, are of high molecular weight and consist of a-amino acids joined by peptide linkages. Twenty different amino acids are commonly found in proteins, each protein having a unique, genetically defined amino acid sequence that determines its specific shape and function. Their roles include enzymatic catalysis, transport and storage, coordinated motion, nerve impulse generation and transmission, control of growth and differentiation, immunity, and mechanical support.

**Amino acid**

One of the 20 building blocks of protein. The sequence of amino acids in a protein and, hence, the function of that protein are determined by the genetic code in the DNA.

**Amino acids** are molecules that (in technical terms) contain a basic amino ( $\text{NH}_2$ ) group, an acidic carboxyl ( $\text{COOH}$ ) group and a side chain attached to an alpha carbon atom.

**Homeostasis**

Homeostasis is a term that is used to both describe the survival of organisms in an ecosystem and to describe the successful survival of cells inside of an organism.

Organisms and populations can maintain homeostasis in an environment when they have a steady level of births and deaths. It is similar to the idea of equilibrium.

When discussing the internal workings of an organism, homeostasis describes an environment that supports the survival of cells. All of your body's systems work together maintain homeostasis inside of your body. Homeostasis is achieved by making sure the temperature, pH (acidity), and oxygen levels (and many other factors) are set just right for your cells to survive. Homeostasis levels are different for each species.

Homeostasis literally means same state and it refers to the process of keeping the internal body environment in a steady state.

## **The Two Major Kinds of Cells:**

### **Prokaryote Cell: (1st Major Kind of Cell)**

Cells that DO NOT have a cell membrane around their nucleus.

Example – Bacteria

\* Prokaryotes are molecules surrounded by a membrane and cell wall. Prokaryotic cells lack characteristic Eukaryotic sub cellular membrane enclosed “organelles”, but may contain membrane systems inside a cell wall.

Second kind of Prokaryotes:

Archaeobacteria

\* SAME As bacteria since they lack a nucleus and don't have membrane bound organelles.

\* DIFFERENT in that they have ribosomes that are more like a Eukaryotic cell.

### **Eukaryotic Cell (2nd Major Kind of Cell)**

Cells that have a membrane around their nucleus.

**Example** – Plant and Animal Cells Eukaryotic

Cells usually are 10 times larger than Prokaryote cells.

#### **The basic Eukaryotic cell contains the following:**

1. **Plasma membrane** around their nucleus
2. **Cytoplasm** (the semi fluid substance inside the membrane).
3. Has a **cytoskeleton** – the microfilaments and microtubules that suspend organelles, this gives it shape, and allow for the cells motion.
4. Has membrane enclosed **subcellular organelles**.

# Parts of the Cell:

## Organelles:

The things or structures (PARTS) inside of a cell that perform the functions necessary for the cell to survive.

\* Example: Think about your heart, lungs and liver... They are all organs or organelles inside of your body. The cell has parts like this inside of its cell.

## Cell Membrane:

Is the protective layer that covers the cell's surface.

It acts like the fence around a yard. It is like the skin on your body. It keeps some things out and lets some thing in.

**Location:** \* Found in all cells

### Description

- \* Plant - inside cell wall
- \* Animal - outer layer; cholesterol
- \* Double layer of phospholipids with proteins
- \* Selectively permeable

### Function

- \* Support
- \* Protection
- \* Controls movement of materials in/out of cell
- \* Barrier between cell and its environment
- \* Maintains homeostasis

## Cell Wall:

- \* Found only in PLANT cells
- \* Gives support to the cell
- \* Is a second layer or "fence" like the cell membrane.

**Location:** \* Plant, Fungi, & Bacteria, but not animal cells

### Description

- \* Outer layer
- \* Rigid & strong
- \* Made of cellulose

### Function

- \* Support (grow tall)
- \* Protection
- \* allows H<sub>2</sub>O, O<sub>2</sub>, CO<sub>2</sub> to diffuse in & out of cell

## **Nucleus:**

- \* An organelle inside of the cell that directs the activity in the cell.
- \* It holds the DNA (Deoxyribonucleic acid)
  - o This is the blueprint material (directions) for the cell.
  - o It tells how to reproduce and perform all of the cells jobs.

**Location:** \* All cells except prokaryotes

### **Description**

- \* Large, oval
- \* May contain 1 or more nucleoli
- \* Holds DNA

### **Function**

- \* Controls cell activities
- \* Contains the hereditary material of the cell

## **Nucleolus**

**Location:** \* All cells except prokaryotes

### **Description**

- \* Found inside the cell's nucleus
- \* May have more than one
- \* Disappear during cell division

**Function** \* Make ribosomes

## **Nuclear Membrane**

**Location:** \* All cells except prokaryotes

### **Description**

- \* Surrounds nucleus
- \* Double membrane
- \* Selectively permeable

**Function** \* Controls movement of materials in/out of nucleus

## **Endoplasmic Reticulum: (ER)**

- \* A folded membrane that moves material in the cell
- \* ER (Endoplasmic Reticulum) is part of the internal delivery system and uses tubes for passageways.
- \* ER is additionally responsible for moving proteins and other carbohydrates to the Golgi Body.

**Location:** \* All cells except prokaryotes

### **Description**

- \* Network of tubes or membranes
- \* Smooth w/o ribosomes
- \* Rough with embedded ribosomes
- \* Connects to nuclear envelope & cell membra

### **Function**

- \* Carries materials through cell
- \* Aids in making proteins

## **Golgi Body (Apparatus)**

- \* consisting of flat, disk-shaped sacs, tubules, and vesicles
- \* Stacks of sacs that package and move proteins around in the cell.

**Location:** \* All cells except prokaryotes

**Description** \* Stacks of flattened sacs

### **Function**

- \* Modify proteins made by the cells
- \* Package & export proteins

## **Mitochondria**

- \* The organelle that releases energy in the cell. (The powerhouse of the cell)
- \* Only found in ANIMAL cells.
- \* Mitochondria produce ATP using energy stored in food molecules.

**Location:** \* All cells except prokaryotes

### **Description**

- \* Peanut shaped
- \* Double membrane
- \* Outer membrane smooth
- \* Inner membrane folded into cristae

### **Function**

- \* Breaks down sugar (glucose) molecules to release energy
- \* Site of aerobic cellular respiration

## **Chloroplasts**

\* Organelle that produces chlorophyll. ( The chemical of photosynthesis) to power the plant cell.

o Chlorophyll traps the energy of sunlight, which is then used by the plant cell to make sugar for energy.

\* Only found in PLANT cells.

**Location:** \* Plants and algae

### **Description**

\* Green, oval containing chlorophyll (green pigment)

\* Double membrane with inner membrane modified into sacs called thylakoids

\* Stacks of thylakoids called grana & interconnected

\* Gel like innermost substance called stroma

### **Function**

\* Uses energy from sun to make food (glucose) for the plant

\* Process called photosynthesis

\* Release oxygen

**Ribosome:** Organelle that makes protein for the cell.

**Location:** \* All cells

### **Description**

\* Small bodies free or attached to ER

\* Made of rRNA & protein

**Function** \* Synthesizes proteins

**Vesicle / Vacuole** Small sack that moves material in and out of the cell.

### **Location:**

\* Plant cells have a single, large vacuole

\* Animal cells have small vacuoles

### **Description**

\* Fluid-filled sacs

\* Largest organelle in plant cells

### **Function**

\* Store food, water, metabolic & toxic wastes

\* Store large amounts of food or sugars in plants

**Lysosome:**

- \* Organelle that eats worn out cell parts.
- \* It contains digestive enzymes.
- \* Lysosomes are round membrane surrounded structures that can be found anywhere in the cytoplasm.
- \* Sometimes they are called suicide bags because they encase the worn out part that is to be digested.

**Location:** \* Animal as well as plant cells

**Description**

- \* Small and round with a single membrane

**Function**

- \* Breaks down larger food molecules into smaller molecules
- \* Digests old cell parts

**Cytoplasm**

- \* The gel-like material inside of the cell membrane.
- \* Keeps organelles in place

**Location:** \* All cells

**Description**

- \* Clear, thick, jellylike material (cytosol)
- \* Organelles found inside cell membrane
- \* Contains the cytoskeleton fibers

**Function** \* Supports and protects cell organelles

**Cytoskeleton:**

**Location:** \* All cells

**Description** \* Made of microtubules - microfilaments

**Function**

- \* Strengthen cell & maintains the shape
- \* Moves organelles within the cell

## **Centrioles**

### **Description**

- \* Paired structures near the nucleus
- \* Made of a cylinder of microtubule pairs

### **Function**

- \* Separate chromosome pairs during mitosis

**Location:** \* Bacterial cells & Protozoans

## **Flagella**

### **Description**

- \* Arrangement of microtubules
- \* Long, but few in number

**Function** \* Movement

## **Cilia**

**Location:** \* Animal cells, Protozoans

### **Description**

- \* Arrangement of microtubules
- \* Short, but numerous

### **Function**

- \* Movement
- \* Cells lining the human upper respiratory tract are ciliated (have cilia). The cilia move mucous and debris upward to the mouth where it is swallowed

**NOTE: Cilia and flagella are projections from the cell. They are made up of microtubules. They are motile and designed either to move the cell itself or to move substances over or around the cell. The primary purpose of cilia in mammalian cells is to move fluid, mucous, or cells over their surface. Cilia and flagella have the same internal structure. The major difference is in their length.**