

Cell Theory and Structure

**SUMMARY OF THE CELL THEORY** 

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1. All organelles are made up of one or more \_\_\_\_\_.
2. All cells carry on their own \_\_\_\_\_.
3. New cells arise from other \_\_\_\_\_.
4. Cells are the basic units of \_\_\_\_\_ and \_\_\_\_\_ in all organisms.

**CELL STRUCTURE** 

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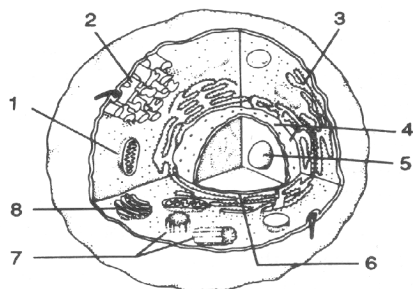
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Every cell is enclosed by a cell membrane. Within the membrane are the *nucleus* and the *cytoplasm*. The cytoplasm consists of all the material outside the nucleus and inside the cell membrane. Within the cytoplasm are organized structures called organelles, which perform specific functions.

**The Generalized Cell**

Cells vary greatly in details of their form and in the special functions they perform. However, most cells have certain features in common. The diagram below represents a “generalized” animal cell. It is not a drawing of any particular type of cell, but it does show the organelles that are usually present in the cells of animals. Plant cells are somewhat different from animal cells. ( See last page in assignment)

1. Label the parts indicated in the drawing of a generalized animal cell.



**Figure 5-1** A Typical Animal Cell

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

## Cell Wall

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The *cell wall* is a structure found just outside the cell membrane in plant cells. It is considered to be a “nonliving” part of the cell, since it does not take part in any of the life functions of the cell. The cell wall is made up chiefly of cellulose, it is relatively rigid, and provides support for the cell.

1. What are the functions of the cell wall? \_\_\_\_\_  
\_\_\_\_\_
2. What are cell walls composed of? \_\_\_\_\_  
\_\_\_\_\_

## Cell Membrane

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The *cell, or plasma membrane* surrounds the cell. It plays an active role in determining which substances can enter and which substances leave the cell. Because some substances can pass freely through the cell membrane and others can not, the membrane is said to be *selectively permeable, or semipermeable*. The permeability of the plasma membrane varies from one cell type to another and from time to time in the same type of cell, depending on the state of metabolic activity.

The cell membrane is composed of lipids and proteins. The lipids form two layers of molecules. The lipid molecules are arranged tail to tail. Protein molecules are embedded in the lipid structure.

1. Describe the functions of the cell membrane. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. The cell membrane is composed of \_\_\_\_\_ and \_\_\_\_\_.
3. Protein molecules are \_\_\_\_\_ in the lipid structure.
4. Why is the cell membrane described as “semipermeable”? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
5. Small particles that can not pass through the cell membrane may be taken into a cell by \_\_\_\_\_ and \_\_\_\_\_. (Refer to text)

## **Nucleus**

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The **nucleus** is the control center for cell functions. It is surrounded by a semipermeable membrane. Within the nucleus are the chromatin threads and at least one **nucleolus**. Nucleoli are involved in the production of ribosomes.

1. The control center of the cell is the \_\_\_\_\_.
2. The \_\_\_\_\_ is involved in the production of ribosomes.
3. During cell division chromatin threads form the \_\_\_\_\_. (Refer to text)

## **Cytoplasm**

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The material in the cell outside the nucleus is called the **cytoplasm**. Although it contains thousands of substances, it consists mainly of water. Within the cytoplasm are the various organelles of the cell. The cytoplasm provides the environment in which the organelles carry on the life processes of the cell and the place where all metabolic activities take place.

1. What is the main function of the cytoplasm? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. The cytoplasm consists mainly of \_\_\_\_\_.

## **Endoplasmic Reticulum**

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The **endoplasmic reticulum** is a membrane-bounded system of fluid-filled channels or tubes through which materials are transported within the cell. The membranes of the endoplasmic reticulum may also serve as sites of biochemical reactions. There are two types of endoplasmic reticulum - smooth and rough. The rough, or granular, appearance of some endoplasmic reticulum is due to the presence of **ribosomes** on the endoplasmic reticulum membranes. Rough endoplasmic reticulum is found mainly in cells involved in protein synthesis. Smooth endoplasmic reticulum, which has no ribosomes on its membranes, is found mainly in cells involved in synthesis of nonprotein substances.

1. What are the functions of the endoplasmic reticulum? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. The two types of endoplasmic reticulum are \_\_\_\_\_ and \_\_\_\_\_.

3. In what types of cells are each found? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### **Golgi Bodies** --- ---

A *Golgi body* is made up of membrane-enclosed sacs. It is usually found near the nucleus. This organelle is associated with the packaging and processing of cell products to be secreted by the cell. As portions of endoplasmic reticulum become filled with products, small sections break off, forming small spherical sacs called vesicles. The vesicles become part of a Golgi body's complex of membranes. The vesicles eventually move toward the cell membrane and release their products outside the cell.

1. What are the functions of the Golgi bodies? \_\_\_\_\_  
\_\_\_\_\_

2. Where is a Golgi body generally located in a cell? \_\_\_\_\_

### **Lysosomes** --- ---

*Lysosomes* are "packages", or sacs, of digestive enzymes. They keep the enzymes separated from the rest of the cell contents until they are needed. Lysosomes which are found mainly in animal cells, are egg-shaped structures enclosed by a membrane. They are thought to be produced by the Golgi bodies.

1. What are the function of lysosomes? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. Where in the cell are lysosomes produced? \_\_\_\_\_

### **Mitochondria** --- ---

*Mitochondria* are slipper-shaped organelles found in the cytoplasm. They are enclosed by a double membrane, whose inner layer is highly folded so that it has a large surface area. Most stages of cellular respiration occur in the mitochondria.

1. What is the function of mitochondria? \_\_\_\_\_  
\_\_\_\_\_

2. What is the advantage of the folding of the inner membrane of the mitochondria?

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### **Microtubules and Microfilaments**

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**Microtubules** are composed of the protein tubulin. They are long, hollow structures that form a skeletal network for the cell. Microtubules are also found in cilia, flagella, and centrioles. The protein actin forms the long threadlike organelles called **microfilaments**. They are thought to be associated with **cyclosis**, the movement of cytoplasm within a cell.

1. The microtubules are tiny hollow tubes that form a \_\_\_\_\_ for the cell.
2. Microfilaments are associated with \_\_\_\_\_, the movement of cytoplasm.

### **Centrioles**

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The **centrioles** are a pair of small cylindrical organelles found near the nucleus in animal cells. They are involved in cell division. Each centriole contains nine groups of three microtubules arranged in a ring.

1. Centrioles are found in \_\_\_\_\_ cells.
2. What are the function of centrioles? \_\_\_\_\_

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### **Cilia and Flagella**

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**Cilia** and **flagella** are thread-like organelles that can move. Their whip-like movements can cause locomotion in one-celled organisms or can push substances over the cell surface in multicellular organisms. Cilia usually occur in large numbers on a cell surface. Only a few flagella are found on a cell.

1. In one-celled organisms cilia and flagella can cause \_\_\_\_\_.
2. In multicellular organisms cilia may push substances over the \_\_\_\_\_.

## Vacuoles

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**Vacuoles** are membrane-enclosed structures that are generally filled with water containing various dissolved substances. Vacuoles in animal cells are usually small. Large vacuoles are often present in plant cells. In simple organisms, such as the amoeba, there are **food vacuoles** in which food is digested so that it can be used by the cell. In some fresh-water organisms, such as the paramecium, there are **contractile vacuoles** that remove excess water from the cell and discharge it back into the environment. Much of the inside of a typical green plant is filled with a large central vacuole. The pressure created by the vacuole helps to maintain the rigid structure of the cell and of the plant.

1. In simple organisms, such as the amoeba, digestion occurs within \_\_\_\_\_.
2. How is excess water removed from fresh-water organisms like the paramecium?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. What is the function of the large central vacuole present in the cells of green plants?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Chloroplasts, Leucoplasts, and Chromoplasts

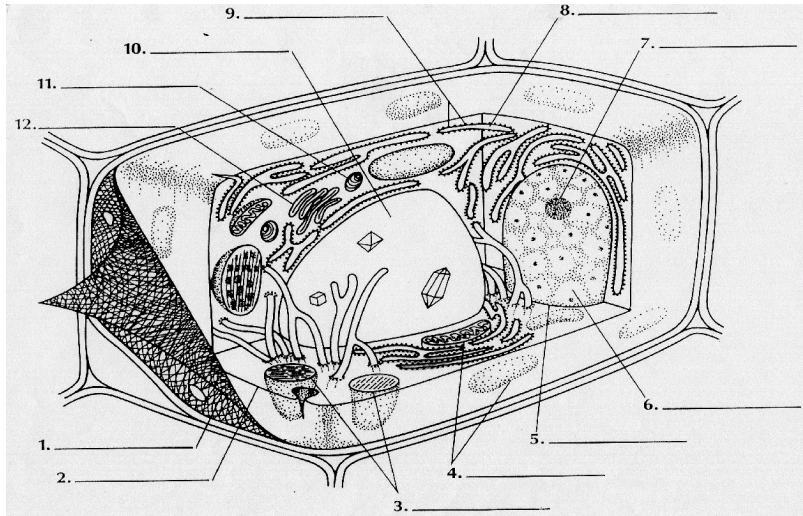
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**Plastids** are membrane-enclosed organelles found in plant cells and in some single-celled organisms. The colorless **leucoplasts** store starch. **Chromoplasts** contain the pigments that color flowers, fruits, and leaves. **Chloroplasts** contain the green pigment **chlorophyll**, which carries on the process of photosynthesis. In photosynthesis, light energy is used for the manufacture of food.

1. The petals of a flower contain pigments in organelles called \_\_\_\_\_.
2. The source of energy for photosynthesis is \_\_\_\_\_.
3. The most important pigment in chloroplasts is \_\_\_\_\_.

4. Label the parts indicated in the following drawing of a generalized plant cell.



5. What are the structural differences between a typical animal cell and a typical green plant cell?

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## **The Cell as a Factory**

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Review the following information....

<b>The Cell as a Factory</b>		
<b>Factory Part</b>	<b>Function</b>	<b>Organelle</b>
central office	manages activities, initiates production	nucleus
assembly line	assembles raw materials to manufacture products	ribosome
shipping	packs products for distribution	endoplasmic reticulum, Golgi body
cart	transports raw material and finished products within the factory	transport vesicle
generator	provides energy for activities	mitochondrion
storage area	stores material for later use	vacuole
collector center	recycles used parts	lysosome
door	provides passage in and out	plasma membrane