

# Chapter 3

## Cells

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### ❖ Introduction:

- A. The human body consists of 75 trillion cells that vary in shape and size.
- B. Differences in cell shape make different functions possible.
- C. Within the cytoplasm are specialized **organelles** that perform specific functions for the cell.

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### ❖ A Composite Cell:

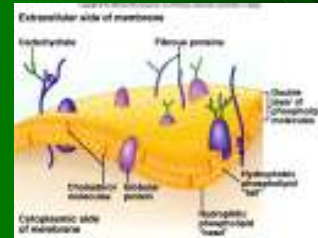


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### 1. Cell Membrane:

regulates the movement of substances in and out of the cell



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- 2. **Cytoplasm:** consists of a clear liquid (cytosol) and provides an environment for organelles



- 3. **Nucleus:** stores genetic information and controls cellular activities

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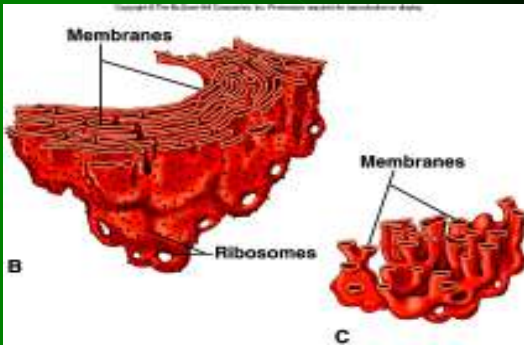
- 4. **Endoplasmic reticulum (ER):** provides a transport system for substances via vesicles inside the cell.

- i. Rough ER contains ribosomes and functions in protein synthesis.
- ii. Smooth ER has no ribosomes and functions in lipid synthesis.

- 5. **Ribosomes:** involved in protein synthesis; found in cytoplasm and rough ER

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## Rough ER vs. Smooth ER



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## 6. Golgi apparatus:

packages, modifies, and distributes substances, such as proteins.



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## 7. Nucleolus:

place inside the nucleus where ribosomes are formed.



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## 8. Mitochondria:

the powerhouses of the cell and contain enzymes needed for aerobic respiration.



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## 9. Lysosomes:

the "garbage disposals" of the cell and contain digestive enzymes to break up old cell components and bacteria.

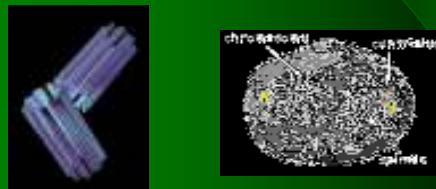


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## 10. Centrioles:

two hollow cylinders that function in the separation of chromosomes during cell division.



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- 11. **Vacuole:**  
stores substances



- 12. **Cilia and flagella:**  
provide movement
  - ⊖ short cilia are abundant on the free surfaces of certain epithelial cells
  - ⊖ long flagellum can be found on sperm cells.



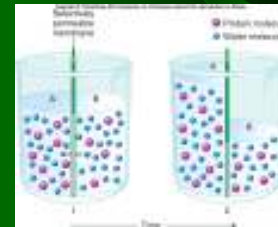
❖ **Movements Through Cell Membranes**

A. Substances move through cell membrane via:

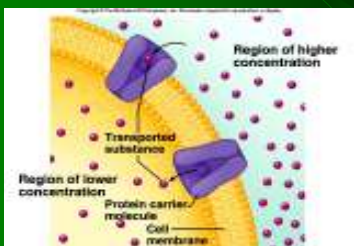
1. **Passive transport:** requires no energy from the cell
2. **Active transport:** requires cellular energy.

**B. Passive Mechanisms**

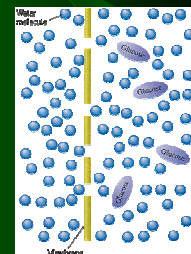
1. **Diffusion** = random motion of molecules from an area of greater concentration to an area of lesser concentration until equilibrium is reached.



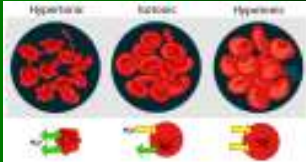
2. **Facilitated Diffusion** = uses membrane proteins that function as carriers to move molecules across the cell membrane.



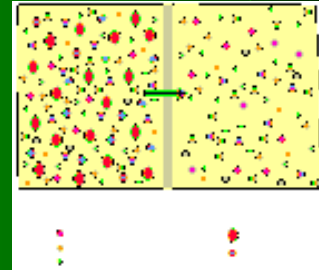
3. **Osmosis** = diffusion of water from an area of greater water concentration across a selectively permeable membrane to an area of lower water concentration.



- a. **Isotonic** = solution with the same osmotic pressure as body fluids; (cell stays same)
- b. **Hypertonic** = solution with higher osmotic pressure than body fluids; (cell shrinks)
- c. **Hypotonic** = solution with lower osmotic pressure than body fluids; (cell swells)

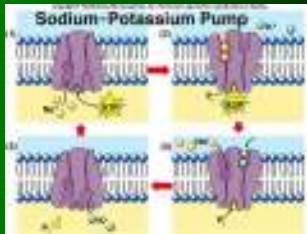


- 4. **Filtration** = molecules are forced through membrane because of hydrostatic pressure.

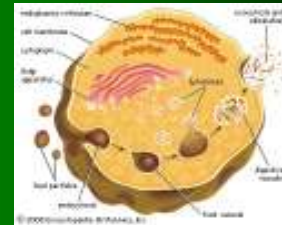


### C. Active Mechanisms

- 1. **Active Transport** = uses ATP to move molecules from areas of low concentration to areas of high concentration through carrier molecules in cell membranes.



- 2. **Endocytosis** = large molecules are engulfed by an invagination of the cell membrane and carried into the cell surrounded by a vesicle.
- 3. **Exocytosis** = is the reverse of endocytosis.



- i. **Pinocytosis** = engulfing liquids.
- ii. **Phagocytosis** = engulfing large particles (white blood cell engulfing a bacterium).
- iii. **Receptor-mediated endocytosis** = taking in very specific molecules (ligands) that pair up with specific receptors on the cell surface.

### Types of Endocytosis

