

Chapter 1: Introduction to Cells

Lesson 1: Discovering Cells

What Are Cells?

- **CELLS**: the basic units of structure and function in living things.
 - o Structure: what it is made of and how its parts are put together
 - o Function: how it works – processes that enable it to live, grow, and reproduce.



What is the Cell Theory?

- **MICROSCOPE**: an instrument that makes small objects look larger.
- **CELL THEORY**: a widely accepted explanation of the relationship between cells and living things.
- Robert Hooke invented the first microscope in 1663 – looked at cork and gave CELLS their name!
- Anton van Leewenhoek was the first person to see LIVING THINGS with a microscope.
- Schleiden, Schwann, and Virchow – each came up with a part of the CELL THEORY



What the Cell Theory Says:

- 1) All living things are composed of cells.
- 2) Cells are the basic units of structure and function in living things.
- 3) All cells are produced from other cells.

How Do Microscopes Work?

- Microscopes must combine two important properties to be useful – **MAGNIFICATION & RESOLUTION**
 - o Magnification: making objects look larger than they are.
 - o Resolution: the degree to which two separate structures that are close together can be distinguished – how clear an object appears!

Lesson 2: Looking Inside Cells

How Do the Parts of a Cell Work?

* Each kind of cell structure has a different function within a cell! *

- **CELL WALL**: a rigid layer that surrounds the cells of plants and some other organisms.
- **CELL MEMBRANE**: controls which substances pass into and out of a cell.
- **NUCLEUS**: control center of cell, directing all of the cell's activities.
 - Chromatin: fills the nucleus and contains information for directing a cell's function.
 - Nucleolus: small, round structure in the nucleus where ribosomes are made.
- **ORGANELLES**: tiny cell structures (cell organs)
- **RIBOSOMES**: small-grain shaped organelles that produce proteins.
- **CYTOPLASM**: gel-like fluid that fills the region between the cell membrane and the nucleus.
- **MITOCHONDRIA**: convert energy stored in food to energy the cell can use to live and function (cell powerhouse)

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- **ENDOPLASMIC RETICULUM** (ER): network of membranes that make many substances. Can be covered with ribosomes to help make proteins. Substances leave ER for other organelles.
- **GOLGI APPARATUS**: receives proteins and other newly formed materials from the ER, packages them, and distributes them to other parts of the cell or to the outside of the cell.
- **VACUOLE**: stores water, food, or other materials needed by the cell. (Mostly in plants, found in some animals)
- **CHLOROPLAST**: captures energy from sunlight and changes it to a form of energy cells can use in making food. (ONLY IN PLANTS)
- **LYSOSOMES**: contain substances that break down large food particles into smaller ones. (recycling center)

How Do Cells Work Together in an Organism?

- **MULTICELLULAR**: made of many cells.
- **UNICELLULAR**: made of only one cell.

Specialized Cells

- All cells in a multicellular organism have a specific job to do – division of labor.
- Organized into tissues, organs, and organ systems.
 - o Cell
 - o **TISSUE**: group of similar cells.
 - o **ORGAN**: made of different kinds of tissues that function together.
 - o **ORGAN SYSTEM**: group of organs that work together to perform a major function.

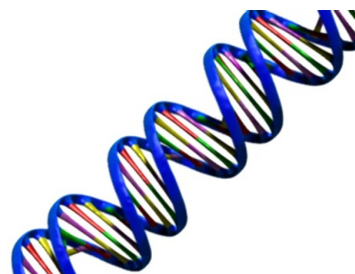
Lesson 3: Chemical Compounds in Cells

What Are Elements and Compounds?

- **ELEMENT**: any substance that cannot be broken down into simpler substances. (oxygen)
- **COMPOUNDS**: formed when two or more elements combine chemically (water, CO₂)

What Compounds Do Cells Need?

- Most compounds in living things contain carbon – organic compound.
- Compounds without carbon – inorganic compound.
- **CARBOHYDRATES**: energy-rich organic compounds (starch, sugar)
- **LIPIDS**: fats, oils, and waxes. Used by cells to make cell membranes, stored energy, & waterproof coverings.
- **PROTEINS**: cell structure and function depend on proteins – for cell membrane, make up organelle parts, enzymes
 - o **ENZYME**: speed up chemical reactions in living things.
- **NUCLEIC ACIDS**: contain the instructions that cells need to carry out all the functions of life.
 - o **DNA**: genetic material that carries information about an organism and is passed from parent to offspring.
 - o **DOUBLE HELIX**: shape of a DNA molecule.



Water and Living Things

- Water is important for...
 - Chemical Reactions inside cells
 - Help cell keep its shape
 - Keep temperature steady within body
 - Carrying substances into and out of cells



Lesson 4: The Cell and Its Environment

How Do Materials Move Into and Out of Cells?

- Cell membrane controls how materials move into or out of a cell.
 - Like a gate keeper

Importance of the Cell Membrane

- Every cell is surrounded by cell membrane.
 - Double layer of lipid molecules lined up side by side.
 - Proteins, some with carb chains, are in the layer.
- **SELECTIVELY PERMEABLE**: some substances can cross the membrane while others cannot.

PASSIVE TRANSPORT: the movement of dissolved materials across a cell membrane without using the cell's energy.

- 1) **DIFFUSION**: molecules move from an area of higher concentration to an area of lower concentration
 - a. Caused by collisions of molecules in a substance
 - b. Will eventually spread out evenly throughout the substance.
- 2) **OSMOSIS**: diffusion of water molecules across a selectively permeable membrane.
- 3) **Facilitated Diffusion**: proteins in the cell membrane form a channel to help move sugars through the membrane.

ACTIVE TRANSPORT: the movement of materials across a cell membrane using cellular energy.

- Moves from a region of lower concentration to a region of higher concentration.
 - Uses cell energy to "pick up" substances and carry them across the membrane.
- **ENDOCYTOSIS**: the cell membrane changes shape and engulfs the particle.
- **EXOCYTOSIS**: a vacuole fuses with the cell membrane, then the membrane forms an opening to the outside and spits out the contents of the vacuole.

***BOTH ENDOCYTOSIS & EXOCYTOSIS REQUIRE ENERGY!**

