

Name: KEY
Date: _____

Cell Structure and Function

Cell Theory

- Place an "X" by any of the statements below that describe the cell theory.
 Mitochondria in eukaryotic cells were derived from aerobic heterotrophic bacteria.
 Growth of animals and plants depends upon a type of cell division called mitosis.
 All organisms are composed of cells.
 Cells come only from preexisting cells.

Eukaryotic Cells

- The outer boundary of plant and animal cells that contains a phospholipid bilayer embedded with protein and functions to regulate the entrance and exit of molecules is called the cell membrane. The semifluid medium inside the plasma membrane is called cytoplasm. p. 49
- The primary cell wall in plants is composed of cellulose, whereas the secondary cell walls contain lignin. Small bodies that have a specific structure and function within the cell are called organelles.

Nucleus p. 52

- Genes in the nucleus contain DNA, which works with RNA to bring about synthesis of protein. The proteins of a cell determine its structure and how it functions.
- The threadlike material that undergoes coiling to form rodlike chromosomes is called Chromatin. Chromatin is immersed in a semifluid medium called nucleoplasm.
- What structure will produce ribosomal RNA and form ribosomal subunits? nucleoli. Is the nuclear envelope a single or double membrane? double. What structures permits the passage of proteins into the nucleus and ribosomal subunits out of the nucleus? nuclear pores.
- Ribosomes contain two subunits, each containing rRNA and protein and are the site of protein synthesis. The functional group of several ribosomes making the same protein is called a polyribosome.

Membranous Canals and Vacuoles p. 53-54

- If ribosomes are attached to the endoplasmic reticulum, it is called rough ER and specializes in the synthesis of glycoprotein, which will be exported from the cell.
- Smooth ER in the testes and adrenal cortex produces sex hormones. Vesicles, which are special vacuoles, contain enzymes capable of detoxifying drugs.
- The Golgi apparatus has an inner face, directed toward the ER and the ER, and an outer face directed toward the plasma membrane. The Golgi apparatus functions in modifying, packaging, storing, and distributing proteins produced by the ER.
- Large membrane-enclosed sacs are called vacuoles and are prominent in plant cells. A small vacuole is called a vesicle and is found in animal cells.
- Which organelle is formed by the Golgi apparatus and contains hydrolytic enzymes? lysosome

6. Trace the adventures of A1 (named for the amino acid alanine) as he enters and leaves a liver cell in the human body.
- A1 first encountered a slight resistance upon entering the liver cell at the cell/plasma membrane, a phospholipid bilayer structure. Upon entering the cell, A1 joined hands with other friends of his in a granule called a ribosome, which had two subunits. He and his friends were then ushered into a long dark channel called the E.R.. After a few minutes, they came out into a region that resembled stacks of flattened pancakes called the golgi body. At this point, he and his friends were clothed with some sugar and made to exit on the opposite side in a round vehicle called a vesicle. This vehicle quickly moved to the surface of the cell and spewed him and his newly clothed friends out to seek another rendezvous.

Energy-Related Organelles p.57 (energy)

1. Mitochondria are producers of ATP, whereas chloroplasts are producers of food.
2. The inner membrane of mitochondria forms shelves called cristae, which project into the matrix, an inner space filled with a gel-like fluid. Mitochondria are often called the powerhouse of the cell because they produce energy.
3. Mitochondria use up oxygen and give off CO₂ and water. Thus, mitochondria carry on cellular respiration.
4. Chloroplasts, bounded by a double membrane, have flattened sacs called thylakoids which are piled up into a stack called a granum, which in turn is surrounded by a fluid-filled space called the stroma.
5. Chloroplasts, which carry on photosynthesis, take in carbon dioxide, water, and solar energy to produce carbohydrate and give off oxygen. They contain the green pigment chlorophyll, which absorbs solar energy.
6. Prokaryotic cells, such as the unicellular bacteria and cyanobacteria, lack a nucleus. Perhaps p.63 mitochondria were originally aerobic heterotrophic bacteria and chloroplasts were originally cyanobacteria, according to the Endosymbiotic hypothesis.
7. Mitochondria use up carbohydrates + oxygen and give off CO₂ and water in a process called cellular respiration. The mitochondria have a double membrane with the inner membrane folded to form shelves called cristae, which project into a fluid-filled space called the matrix.

Cytoskeleton p.58.

1. Actin filaments, also called microfilaments, contain two chains of globular actin molecules twisted about one another. They play a structural role in the cell.
2. Intermediate filaments are intermediate in size between actin filaments and microtubules. In the skin, the filaments, which are made of the protein keratin, give strength.
3. Microtubules are small cylinders made of a globular protein called tubulin. The microtubule organizing center, called the centrosome, lies near the nucleus. Microtubules radiate from the centrosome, helping to maintain the shape of the cell and acting as tracts along which organelles can move.

Centrioles and Other Organelles

- Animal cells have two centrioles lying at right angles to each other. Centrioles are short cylinders having a 9+0 pattern of microtubules triplets. Centrioles are believed to give rise to basal bodies that direct the organization of microtubules within cilia and flagella.
- Cilia and flagella are hairlike extensions of cells that are used for movement. Both are membrane-bounded cylinders having a 9+2 pattern of microtubules, arranged as doublets.

Prokaryotic Cells p.62

- Prokaryotes are unicellular organisms that have a single chromosome in an area called the nucleoid region, and respiratory enzymes attached to the plasma membrane.
- Prokaryotes have a plasma membrane, a cell wall, flagella (if capable of movement), and outside the cell wall, a polysaccharide slime layer. Bacteria are more metabolically competent than human beings.

Cell and Organelles

- Label the organelles in this drawing of an animal cell by using the following terms: mitochondrion, plasma membrane, chromatin, nucleolus, rough endoplasmic reticulum.

- Complete the following table by writing YES or NO in the appropriate columns to distinguish between animal cells, plant cells, and bacteria.

Structure	Animal Cell	Plant Cell	Bacterial Cell
nuclear envelope	YES	YES	NO.
plasma membrane	YES	YES	YES
nucleoid region	NO	NO	YES
cell wall	NO	YES	YES
centrioles	YES	NO	NO.
chloroplasts	NO	YES	NO.
mitochondria	YES	YES	NO
lysosome	YES	NO	NO.
large central vacuole	NO <small>small only</small>	YES	NO
small vacuoles only	YES	NO.	NO.
ribosomes	YES <small>large</small>	YES <small>large</small>	YES <small>small</small>

3. Match the following chemicals to one of the structures listed below.

- | | |
|------------------------------------|---------------------------------|
| a. phospholipid bilayer | b. modifies proteins |
| c. detoxifying drugs | d. stores water |
| e. hydrolysis | f. DNA |
| g. protein synthesis | h. steroid hormones |

- | | |
|----------|-------------------|
| <u>G</u> | ribosomes ✓ |
| <u>B</u> | Golgi apparatus ✓ |
| <u>H</u> | smooth ER |
| <u>E</u> | lysosome |
| <u>D</u> | vacuoles ✓ |
| <u>C</u> | peroxisomes |
| <u>F</u> | chromatin ✓ |
| <u>A</u> | plasma membrane ✓ |

4. Match the following structures to one of the functions listed below

- | | |
|----------------------|-----------------|
| a. cytoskeleton ✓ | b. centrosome ✓ |
| c. basal bodies ✓ | d. centriole ✓ |
| e. polyribosome | f. DNA ✓ |
| g. Golgi apparatus ✓ | h. rough ER ✓ |

- | | |
|----------|--|
| <u>F</u> | directs protein synthesis |
| <u>B</u> | microtubule assembly |
| <u>D</u> | 9+0 microtubule pattern |
| <u>E</u> | functional group of ribosomes |
| <u>A</u> | for shape and motion |
| <u>H</u> | protein synthesis for export |
| <u>G</u> | packages, stores, distributes proteins |
| <u>C</u> | help form cilia and flagella |

cilia + flagella: 9+2 pattern of microtubules