Unit 2 – Cells Learning Objectives

Material may not be covered in the order that it appears here, but all objectives will be accomplished by the end of the unit.

Chapter 7: A tour of the cell

Where we covered it

How We Study Cells

1. Distinguish between magnification and resolving power.
2. Describe the principles, advantages, and limitations of the light microscope, transmission electron microscope, and scanning electron microscope.
3. Describe the major steps of cell fractionation and explain why it is a useful technique.

A Panoramic View of the Cell

4. Distinguish between prokaryotic and eukaryotic cells.
5. Explain why there are both upper and lower limits to cell size.
6. Explain why compartmentalization is important in eukaryotic cells.

The Nucleus and Ribosomes

7. Describe the structure and function of the nucleus and briefly explain how the nucleus controls protein synthesis in the cytoplasm.
8. Describe the structure and function of a eukaryotic ribosome.

The Endomembrane System

9. List the components of the endomembrane system, describe their structures and functions, and summarize the relationships among them.

The parts of the EM system are: Nuclear Membrane, Rough Endoplasmic Reticulum (ER), Smooth ER, Vacuole, Lysosomes, Golgi Bodies and the Cell membrane.

The ER is an extension of the Nuclear membrane. Proteins made in the Rough ER and Lipids and Carbohydrates made in the Smooth ER are transported to the Golgi in Vessicles (small vacuoles). Lysosomes and The vesicles fuse with the Sys side of the Golgi and dump these molecules into the Golgi. The molecules are processed in various ways by enzymes in the Golgi. They then are packaged in new vesicles that bud off of the Trans face of the Golgi. From there, they fuse with other organelles, vacuoles, lysosomes or with the cell membrane where they deliver the completed molecules. (See Diagram on Page 123)

10. Explain how impaired lysosomal function can cause the symptoms of storage diseases.

Lysosomes are supposed to use enzymes to digest various materials. If someone has one of the storage diseases, they lack necessary enzymes in the lysosomes. Therefore, undigested material builds up in the in the cell, either poisoning it or causing a lack of one of the products that should be produced by that enzyme.

11. Describe the different structures and functions of vacuoles.

12. Describe the structure of a mitochondrion and explain the importance of compartmentalization in mitochondrial function.

A mitochondrion has two membranes, one inside of the other. The inner one is highly folded into a network of mazelike christae. It provides two different internal regions. 1. The intermembrane space (the space between the membranes). Enzymes built into the inner membrane use this space to store materials. 2. The matrix inside of the inner membrane has enzymes that perform different functions than those on the membrane. They are all contained in this location.

Evolution, Unity, and Diversity

13. Distinguish among amyloplasts, chromoplasts, and chloroplasts.

14. Identify the three functional compartments of a chloroplast. Explain the importance of compartmentalization in chloroplast function.

Other Membranous Organelles

15. Explain the roles of mitochondria and chloroplasts.

16. Explain the role of peroxisomes in eukaryotic cells.

Peroxisomes are specialized lysosomes that primarily digest or assemble lipids, fatty acids and cholesterol. They detoxify waste products or materials eaten by the organism(alcohol) They get their name from the ability to break down hydrogen peroxide that is produced as fatty acids, alcohol and other toxins are digested.

The Cytoskeleton

17. Describe the functions of the cytoskeleton.

18. Describe the structure, monomers, and functions of microtubules, microfilaments, and intermediate filaments.

Microtubules : hollow tubes of tubulin. Used for movement of cilia and flagella which allow a cell to move. Also provide internal support to the cell.

Microfiliments: Braided chains of actin. Used for movements that change the shape of the cell as well as cytoplasmic streaming.

Intermediate filiments: highly braided (supercoiled) fibers made of keratin. Maintain cell shape and the position of organelles within the cell.

19. Explain how the ultrastructure of cilia and flagella relate to their functions.

Cilia and flagella contain parallel rows of microtubules that can pull on neighboring microtubules. By pulling tubules on one side of a cilia/flagella, it causes the structure to bend in that direction. Pulling on the other side causes the opposite effect. Rapid alternation of these cause the structure to whip back and forth rapidly, propelling the organism through the water.

Cell Surfaces and Junctions

20. Describe the development of plant cell walls.

As a plant cell grows, it first produces a soft primary wall just outside the cell membrane. This is glued to neighboring cells with sticky secretions in the middle lamella, the space between two cells. Once a cell matures and stops growing, it either thickens the existing primary wall into something more durable or it adds an additional secondary wall inside the primary wall.

21. Describe the structure and list four functions of the extracellular matrix in animal cells.

22. Describe the structures of intercellular junctions found in plant and animal cells and relate those structures to their functions.

Chapter 8: Membrane Structure and Function

Where we covered it

Membrane Stucture

1. Describe the properties of phospholipids and their arrangement in cellular membranes.
2. Explain what freeze-fracture techniques reveal about the involvement of proteins in membranes.
3. Describe the fluid properties of the cell membrane and explain how membrane fluidity is influenced by membrane composition.
4. Describe how proteins and carbohydrates are spatially arranged in cell membranes and how they contribute to membrane function.

Traffic across Membranes

5. Describe factors that affect the selective permeability of membranes.

6. Describe the locations and functions of transport proteins.
7. Define diffusion. Explain what causes diffusion and why it is a spontaneous process.
8. Explain what regulates the rate of passive transport.
9. Explain why a concentration gradient across a membrane represents potential energy.
10. Distinguish between hypertonic, hypotonic, and isotonic solutions.
11. Define osmosis and predict the direction of water movement based on differences in solute concentrations.
12. Describe how living cells with and without walls regulate the balance of water content.

Evolution, Unity, and Diversity

13. Explain how transport proteins are similar to enzymes.
14. Explain how transport proteins facilitate diffusion.
15. Explain how active transport differs from diffusion.
16. Explain what mechanism can generate a membrane potential or electrochemical gradient.
17. Describe the process of co-transport.
18. Explain how large molecules are transported across the cell membrane.
19. Compare pinocytosis and receptor-mediated endocytosis.