

Anatomy and Physiology 1 exam 1

Chapter 3: Cells

1. What is a cell and discuss its diversity?

- When you break an organism down to its smallest part, you get to the cell. The cell is the smallest building block that every living thing is made out of. Life starts out with one cell, and it divides repeatedly and eventually you have an organism.
- The cell is the smallest living unit and it can vary in length and type, depending on its function. Its shape will determine its function (nerve cell, muscle cell, blood cell ect.).
 - The layout of the body starts with a cells, then when a bunch of cell get together with a specific function, you get a tissue. Then a bunch of tissues together make an organ. Then organs together make a human body. So cell→Tissue→Organ→Body

2. Discuss a generalized cell. List the three main parts of a cell and their functions

- A cell is composed of carbon, hydrogen, nitrogen, oxygen mainly, and other trace elements. Every cell has three main parts and these are the cytoplasm, plasma membrane, and the nucleus.
- If you think of the cell as being a city, all the organelles (compartments in the cell) make better sense and are easier to understand.
 - Think of the plasma membrane as the border control of the cell. These are the gates and they only lets certain molecules in. It seperates the intracellular fluid, or the fluid in the cell, from the extracellular fluid, or the fluid outside the cell.
 - The cytoplasm is the air of the city. It is everything that surrounds the cell, and specifically it is a fluid. The organelles are surrounded by the cytoplasm

- The nucleus is like the city hall of the cell; it controls the cell and is in the center of the cell.

3. Discuss the fluid mosaic model of membrane structure.

- This refers to the plasma membrane, or the border control of the cell. The plasma membrane is the barrier around the cell that controls what gets into and out of the cell. The membrane is a bilayer made of phospholipids, with a polar "head" and a nonpolar "tail".
- The heads of the phospholipids are on the outside of the bilayer, and these are hydrophilic. Meaning they are attracted to fluid, such as the extra- and intracellular fluid. The tails of each phospholipid are faced inward, away from the fluid and are hydrophobic. These phospholipids can move side to side, but they cannot switch sides (because the hydrophobic end would have to touch to fluid to do that).
- Understanding the nonpolar concept of the hydrophobic tails makes knowing what molecules that can enter the cell much easier.

4. List and describe the plasma membrane specializations.

- Along with the bilayer mentioned above, the phospholipids have additional molecules attached to them.
 - Around 20% of the bilayer is cholesterol, which is shaped as nonpolar rings that help stabilize the phospholipids. This shows that cholesterol is essential to normal function of the body, just having too much is bad.
 - There are proteins embedded in the bilayer that serve as transport molecules to help substances into and out of the cell. These are integral proteins and peripheral proteins.
 - o By name, the integral proteins are in the bilayer, with half in the hydrophobic section and the other half sticking out of the cell. These are transport molecules
 - o Peripheral proteins aren't attached to the bilayer. These are on the integral proteins (on the periphery) and function as support and enzymes.

- o Some just float around the cell for support and if a sugar group is attached, it is called a glycoprotein.
- The function of the membrane is to control what gets into and out of the cell, and for communication with other cells. Communication is done by junction, which are when surrounding cells “fit” together like a puzzle. There are three:
 - Tight junctions are when the cells fuse together tightly with no space between them. The integral proteins latch onto each other and fuse, making an impermeable junction. This prevents molecules from passing through the junctions.
 - Desmosomes are formed when two cells are joined by protein filaments and the space between them is wider than in tight junctions.
 - Gap junctions are a communicating gap between cells and they are connected by connexons (a protein)
- These junctions are how all the different epithelium (tissues, which is a mass of cells with a function) are connected.

5. Discuss membrane transport. Differentiate between active and passive transport.

- Remember the metaphor of the plasma membrane to border control? Now this will make much better sense. The membrane controls what enters and leaves the cell and only certain molecules can, thus it is selectively permeable. So nutrients for the cell can pass in, and harmful substances (bacteria, viruses) can't. Alternatively, proteins stay in the cell, and water can leave as needed.
- Substances can move through the barrier via active (need energy to transport) or passive transport (no energy), depending on the substances structure.

6. Compare and contrast simple diffusion, facilitated diffusion, osmosis, and filtration

- There are essentially four types of passive transport:
 - There is simple diffusion, which is when a substance moves down its concentration gradient. This means something moves from an area of high concentration to area of low concentration. A simple rule to memorize is that most everything moves from high to low concentration (air, gas exchange, pressure, blood etc.) This requires no energy. Also there is