

Biology 1113

Chapter 7

Each topic is the focus of each section from the book. The questions answered are from the concept questions at the end of the chapter. Please note that not all questions are answered, the vast majority are, and I don't claim that my answers are the only right answer or they are always right. The guide follows a numerical order in which the chapter was taught. This guide utilizes concept and concept questions from Campbell Biology, "Biology" by Reece, Urry, Cain, Wasserman, Minorsky, and Jackson. It also involves information learned from Professor Ball's lectures. Any of their work shown here is copyrighted and belongs to them respectively. I do not own any of this information. All images were acquired from Google images and they are also copyrighted and belong to them. I do not own any of these images.

Chapter 7: Membrane Structure and Function

Life at the Edge

The membrane controls traffic into and out of the cell

Selective Permeability- Allows some substances to cross it more easily than others

Concept 7.1: Cellular Membranes are fluid mosaics of lipids and proteins

Lipids and proteins are the main ingredients of membranes

- Carbohydrates are also important
- Most abundant lipid is are the phospholipids
- Phospholipids are amphipathic molecules
 - o **Amphipathic-** A molecule with a hydrophilic region and a hydrophobic region
- **Fluid mosaic model-** The membrane is a fluid structures with a variety of various proteins embedded or attached to a double layer (bilayer) of phospholipids

Membrane Models: Scientific Inquiry

Hydrophilic heads, hydrophobic tails

Davson-Danielli model began to be supported but had some problems

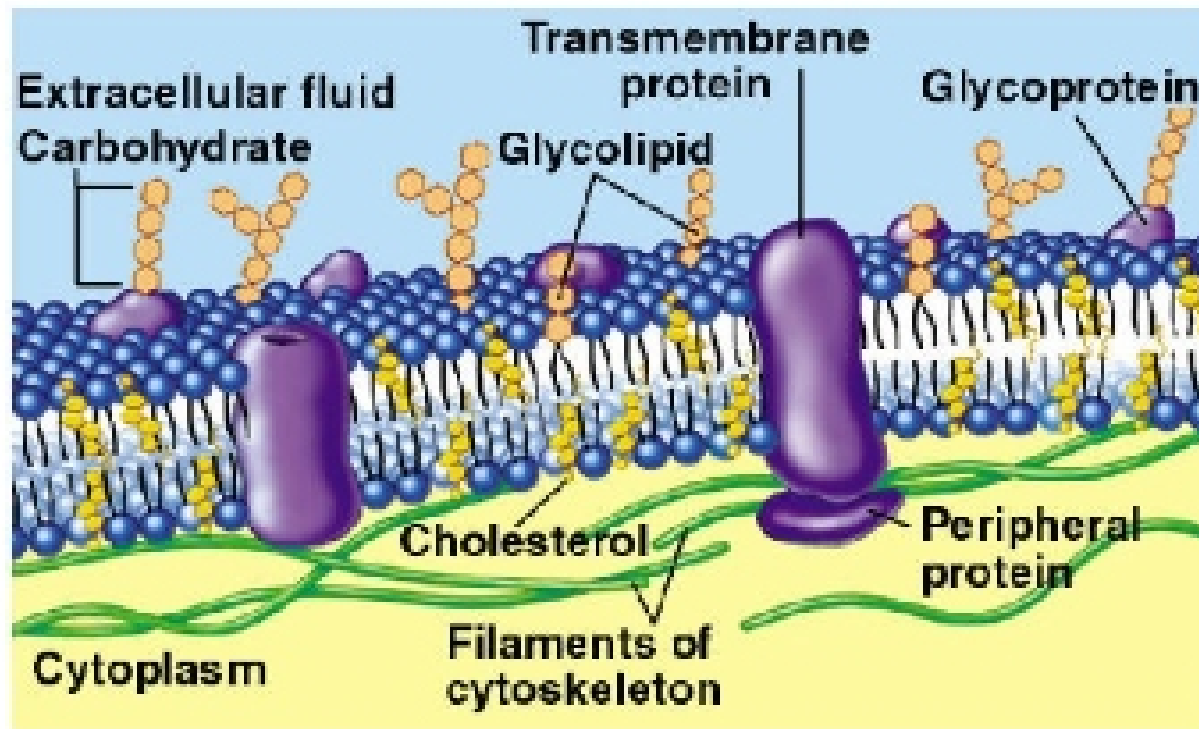
- Membranes with different functions differ in structure and chemical composition
- Membrane proteins aren't soluble in water because they are amphipathic

S.J. Singer and G. Nicolson had new theory in 1972

- Membrane proteins reside in the phospholipid bi layer with hydrophilic regions sticking out
 - o This format would maximize contact of hydrophilic regions of proteins and phospholipids with water
- Puts each part of the proteins where it would like to be in respect to hydrophilic and hydrophobic parts
 - o Freeze fracture splitting then viewing under a microscope proves this

Picture of fluid mosaic model is below

Fluid Mosaic Model



The fluidity of membranes

Membranes aren't static sheets

- Locked together by mainly hydrophobic interactions
 - o Much weaker than covalent bonds
- Proteins shift laterally
 - o Rarely shift across the membrane
 - Hydrophilic heads switching sides
- Phospholipids within the membrane switch laterally very quickly
 - o Proteins are slower in switching
- The hydrocarbon tails are unsaturated (thus the tail is kinked)
 - o Do not pack together as closely as saturated hydrocarbon tails
 - o This is what makes the membrane more fluid

The cholesterol wedged in between the phospholipid molecules has different effects on membrane fluidity at different temperatures

- At higher temperatures can make membrane less fluid by restraining phospholipid movement
 - o This also lowers the temperature that is needed to solidify the membrane

Evolution of differences in membrane lipid composition

Different environment means different membranes

- Fish have unsaturated hydrocarbon tails
 - o Enables their membrane to remain fluid
- Natural selection favors organisms whose membrane lipids ensure the correct level of fluidity for their environment