Name _____ **Period** _____

AP Biology **Date** _____

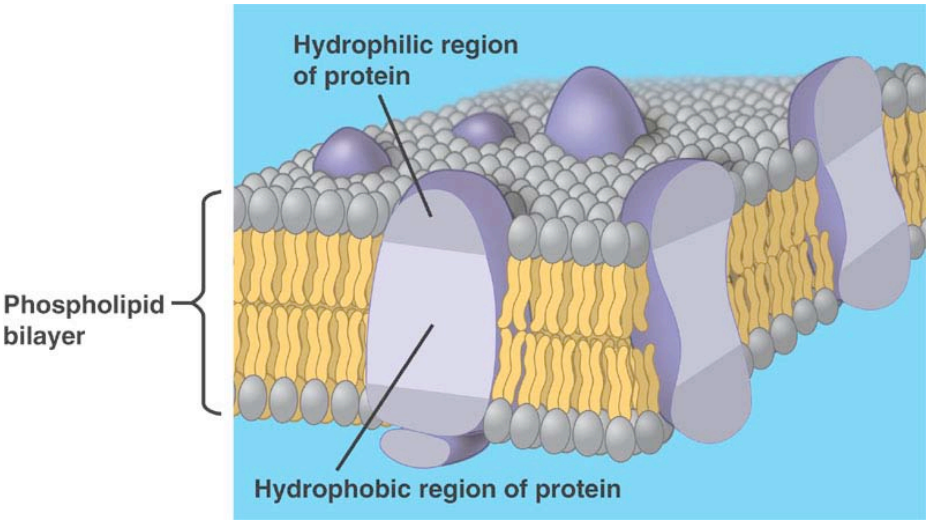
LAB ____. CELL MEMBRANES

The **cell membrane** regulates what enters and leaves the cell and also aids in the protection and support of the cell. In a way, the cell membrane is similar to the walls that surround your house. As these walls help to protect your house from what is outside so the cell membrane seals off the cell from its outside environment. But if you lived in the house, you would still want to receive messages, fuel, and power from the outside environment. So utilities lines like telephone, gas, and electric would have to be able to pass through the walls of your house. You would also like to bring in food and take out trash. Thus doors would be needed. The needs of the cell are similar. It must communicate with other cells, take in food and water, and eliminate waste. All of these processes take place through the cell membrane.

The cell membrane is composed of several kinds of molecules. The most important of these are **lipids**. A double layer — a **bilayer** — of lipid molecules forms the basic unit from which cell membranes are constructed. The lipids in the cell membrane are a special type of lipid called **phospholipid**. They have a phosphate head and a lipid tail region. The head is hydrophilic (water loving) and the tail is hydrophobic (water fearing). This is one of the reasons why some molecules easily pass through the membrane (like O_2, CO_2, and steroids) and others with difficulty (carbohydrates, proteins, nucleic acids).

Proteins and **carbohydrates** are also associated with the cell membrane. Some proteins stick to the surface of the lipid bilayer — **peripheral proteins**— whereas others span the membrane from one side to the other — **transmembrane proteins** — and are free to move around within the membrane. This is dependent on their molecular structure. Some of the free-moving proteins serve as **transport proteins** — acting as channels or tunnels through which molecules may pass. Others act like small **pumps**, actively pushing molecules from one side of the membrane to the other, much like a revolving door. The carbohydrates are attached to either proteins or lipids. These act as recognition sites — identifying tags —and allow cells to recognize other cells from the same organism. These carbohydrates are the reason why an organ such as a kidney can be rejected after a kidney transplant. It is also the reason why we can only receive blood transfusions from certain blood types and not from others.

As a result of its structure, our concept of the cell membrane is often described as the **Fluid Mosaic Model**. The word *fluid* refers to the idea that the membrane is actually moving. Most of the lipids and some of the proteins drift at a rate of approximately 2μm/second. The *mosaic* refers to the idea that the membrane is like a collage of proteins and other molecules embedded in the fluid matrix (much like different color tiles embedded in grout in a ceramic mural or floor)



CONSTRUCTING A MODEL OF THE CELL MEMBRANE

1. Construct a model of the cell membrane using diagrams you have been provided in your text, during lecture, and in this lab.

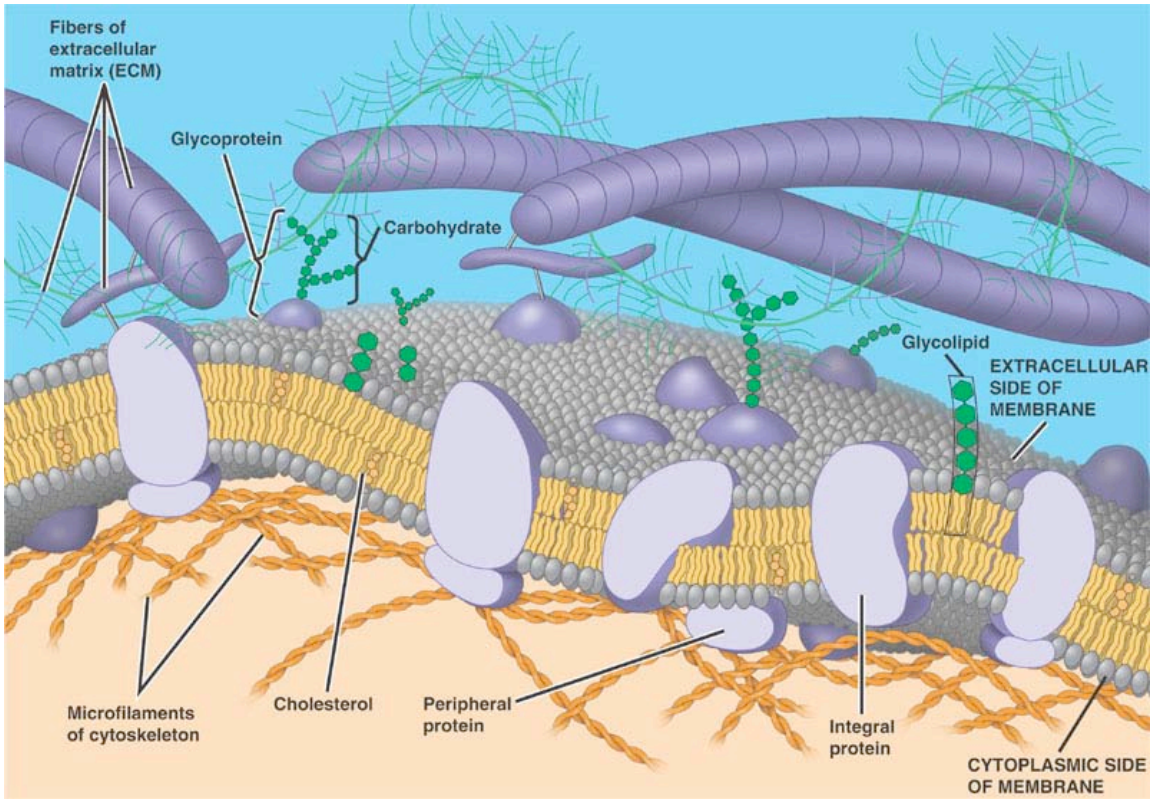
2. You may use construction material provided (assorted food & non-food materials: assorted pasta, assorted cereals, glue, pipe cleaners, yarn, and more) or supply additional material on your own.

3. Make sure your model includes the following components:
    a. **Phospholipid bilayer (heads & tails!)**
    b. **Transport proteins**
    c. **Peripheral proteins**
    d. **Protein pumps**
    e. **Carbohydrates**
    f. **Receptor proteins**
    g. **Cholesterol**

4. Make a key to show what each item represents

5. Glue your cell membrane to the paper or cardboard provided.

6. Answer the Summary Questions.



SUMMARY QUESTIONS

1. What are the functions of the cell membrane?

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2. The cell membrane is often described as a bilayer. Explain this term. What two layers make up the cell membrane?

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3. Where are proteins found in the cell membrane?

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4. Explain why the cell membrane is described as a Fluid Mosaic Model.

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5. Give an example of a molecule that is unable to pass through the cell membrane. Explain why.

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6. Explain the function of a transport protein.

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7. Explain the commonalities and difference between active transport and facilitated diffusion and give an example of each.

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8. Some of the proteins on the surface of the cell are known as receptor proteins because they receive messages from outside the cell. Draw a diagram to show a receptor protein and the signal molecule it receives. (Remember the importance of shape in biology.)

9. What is one possible message that one cell might send to another cell?

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10. What is the function of cholesterol in the cell membrane?

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