Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_ Period:\_\_\_\_

**Cell Membrane Lab**

**Purpose:** To learn about cell membranes by using soap bubbles as a model.

**Background:** A model in science is a thing which takes place of something else. It is used to show how a thing works without actually using the real thing! Confusing? In this case, we will use soap bubbles to stand for a plasma membrane. The soap bubbles are going to stand for the plasma membrane, so they are a model. This works because soap bubbles are a phospholipid bilayer just like the plasma membrane of a real cell. Remember the picture I made you draw in your notes of the plasma membrane? Both the soap bubble and the plasma membrane are made of a double layer of fat molecules. Whatever the soap bubble does, the plasma membrane does also. Use your notes to label the Cell Membrane (aka Plasma Membrane) below.

 

**Word Bank:**

-Phospholipid bilayer

-Phospholipid

-Hydrophilic head

-Hydrophobic tail

-Protein Molecule

-Carbohydrate

**Materials:** Lemon fresh joy bubble mixture, small rubber band, bucket, plastic sheet, straws

**Experimental Design:**  In each of these demonstrations, you will want to get a soap film in you bubble holder. To do this, place the bubble holder into your bubble mixture and gently lift the holder by the two straw handles. Gently open the handles over the bucket

**Part A: How cell membranes behave**. Fill the bubble holder and then twist it into a figure 8 pattern. Try to do other shapes and patterns with the soap. The soap is actually less flexible than one of your plasma membranes in your skin cells!

1. How does a soap film behave when it is twisted? How flexible is a soap film?

**Part B: How substances get into and out of the cell.** Make a big bubble floating on the surface of soap solution by first dipping the straw into the soapy water and the pulling it out of the water. Now, holding the tip of the straw above the surface of the pan, gently blow a bubble onto the solution. Carefully lift the straw out of the bubble. Now try to pass soapy objects through the surface of the bubble (remember that it is really a phospholipid bilayer, just like a plasma membrane). The bubble should not pop if you do this right, because the soap film seals itself as each object is removed.

1. Can a lipid bilayer seal itself as things enter and leave it? Explain.

 2. An object going into a real cell is surrounded by a layer as it goes in and forms a sac called a food vacuole. How does this compare to the soap bubble? (Hint: what did you do to the objects before you put them through the bubble?)

**Part C: The function of Proteins in the cell membrane.** Proteins are part of the plasma membrane. Place some objects in the pan of soapy water. We will let these stand for proteins. I suggest pens, pencils, straws, and anything else you have handy and want to try. Fill your bubble holder in the pan of soapy water and lift the bubble holder out of the water. Stick your proteins (pens, etc.) into the surface of the bubble bilayer. Move the proteins around on the surface of the bilayer.

1. Can the proteins of a plasma membrane move around between the phospholipids? (Remember that the bubble stands for a plasma membrane). Explain your answer.

**Part D: How large molecules that are not membrane bound get into and out of the cell.**

A real plasma membrane is filled with tiny pores which allow things to pass into and out of the cell to get into the endoplasmic reticulum. Tie a piece of thread into a circle and place it in the soap mixture to soak. Fill the bubble holder and carefully place the soapy piece of thread onto the bilayer. If you do this right, the bubble holder should not pop. Take a piece of dry paper towel and pop the soap film inside the thread. If you did this right, the rest of the bubble holder should still have a soap film in it and the thread should form a hole through the holder. This is like a pore in a plasma membrane. If you stick your finger through the pore, you should be able to move the pore around the surface of the bubble holder without popping the rest of the bubble holder. This same thing can happen in a real cell.

1. Why are pores important in cells? Explain.

 2. Is it possible that pores in a plasma membrane might be moving? Explain.

**Part E: Other organelles have a phospholipid bilayer too.** Our cells are surrounded by a double layer which is called a phospholipid bilayer. Other cell parts are also made of this same double layer, such as a mitochondria and the nucleus. The closest we can come to this is to try to make a bubble inside of a bubble! Fill the bubble holder and gently move it through the air while twisting it. If you do this right, a big bubble should form which you can balance on the bubble holder. Now, gently blow on the surface of the big bubble. You are trying to blow a small bubble inside the large one. This is tricky and may require some patience (maybe quite a lot!). This is worth 5 extra points if you succeed!

**Part F: Next, you are going to see how cells fit together in a 3 dimensional way.** Make a tube out of a sheet of plastic overhead transparency film. Hold the tube about an inch over the bubble mixture and place the straw under the tube. Blow bubbles in the mixture and let them collect inside the tube. Continue until the tube is entirely filled. The bubbles represent cells and the way they fit together is how cells form.

1. Are individual bubbles that you blow usually round or some other shape?
2. When many bubbles come together to fill a tube, are the bubbles round? Explain.
3. Is the shape of a cell affected by the cells around it? Explain (Remember that this soap film is a model).
4. How many layers thick is the place where the two bubbles come together? Explain (Careful, remember that this is a bilayer!).
5. Write a paragraph summarizing that you learned about the plasma (cell) membranes of the cells in your body. Use and underline at least 5 vocabulary words for full credit.