Student Handout 2

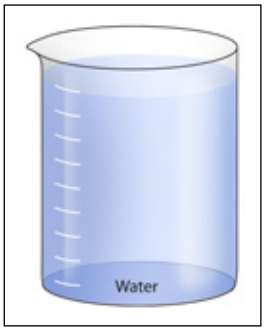
The Kessler Membrane Activity

The Spontaneous Assembly of Membranes

Models

50 Mini Phospholipids with Negative Charge

20 H_2O



Water Beaker Sheet

Monolayer

1. Use 8 of the phospholipid models. Using the laminated sheet of the beaker of water, arrange the 8 phospholipids to show how the phospholipids will orient themselves in water.

   Sketch your result below. Label the hydrophobic and hydrophilic parts of the phospholipids.

Chemical Properties

- Hydrophobic or non-polar (yellow)
- Hydrophilic or polar (red)

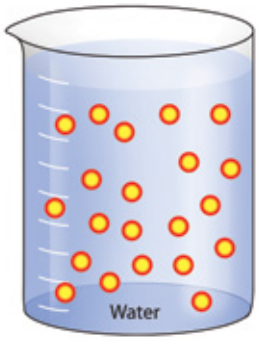
The Kessler Membrane Activity Continued

Micelle Structure

2. Using the same 8 phospholipids, rearrange them in the beaker so that they are submerged in the water while still maintaining the correct hydrophobic and hydrophilic interactions.

   Sketch your result below.

This structure is called a **micelle**. Micelles form when phospholipids are mixed with water. Micelles can act as **emulsifiers** to form emulsions. An emulsion is a combination of two liquids that normally won't mix together, such as oil and water or soap and water, which mix together so that one liquid is suspended within the other.



Liposome Structure

3. Construct a structure that is both submerged in the water and contains water on the inside. You may use as many of the phospholipids in your kit as you wish.

   Sketch the resulting structure below.

The Kessler Membrane Activity Continued

4. Based on the structure of a phospholipid, explain the reasoning for your arrangement.

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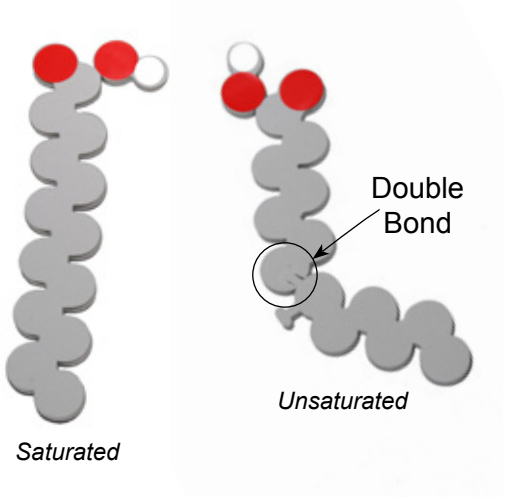
The resulting structure is referred to as a **liposome**. As your model shows, the liposome vesicle is composed of the phospholipid bilayer, with water or other liquid in the middle to faciliate delivery of the nutrients or pharmaceutical drugs.

Upon closer examination of the hydrophobic tails of the models (right), you may notice that in one of the tails all of the carbons are connected with single bonds. These hydrocarbon tails are **saturated**.

In the second tail, a double bond connects two adjacent carbons. The presence of a double bond creates a **kink** in the structure of this hydrocarbon chain. The hydrocarbon tails containing a double bond or bonds between adjacent carbons are **unsaturated**.



5. Develop an explanation for the necessity of having **kinks** in the hydrophobic tail of the phospholipids that make up cell membranes.

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6. How might the cis or trans configuration (as described in *Student Handout 1*) contribute to the fluidity of the plasma membrane?

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7. Develop an explanation for why fluidity in the cell is important.

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The Kessler Membrane Activity Continued

8. Compare the number of phospholipids in the inside leaflet to the number in the outside leaflet.

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9. What happens to the structure if inside phospholipids flop to the outside layer?

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10. How do you think phospholipids move from outer to inner leaflets in a bilayer?

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