Movement of color

This bright experiment does not only put on a great show but it is a great way to expose the unseen interactions of molecules. This will illuminate hydrophilic and hydrophobic interactions. What’s great about this experiment is that it allows the students to better understand what actually occurs on the molecular level when these interactions occur, aside from looking at a diagram. Milk is mostly water, however it is also composed of minerals, proteins, vitamins and fats. Soap is a special molecule because it has bipolar characteristics. That means that one end of the molecule is polar and one end is nonpolar. This diagram shows the difference between the two interactions:

![Diagram of hydrogen bond]

These reactions are responsible for many things throughout everyday life and usually go unnoticed. These interactions play a part in the folding of some proteins, allow detergents to perform as we expect them, as well as chemistry experiments like chromatography to be successful. Most of life relies on hydrophobic and hydrophilic reactions.

**You will need:**

1 cup water

1 cup non fat milk
1 cup whole fat milk

1 cup heavy cream

Red, blue, yellow food dye

Dish soap

4 dishes

Stopwatch

**Procedure:**

1) In each of the four dishes add aliquots of the different liquids and label which dish contains which liquid.

2) Now add four dots of each color to the dishes, do so in an alternating pattern around the outside region of the liquid in the dish.

3) To dish 1 add a single drop of the dish soap to the center of the dish.

4) Observe and record how long it takes for each dye drop to swirl together.

5) Repeat steps (3-4) for dishes 2, 3, and 4.

<table>
<thead>
<tr>
<th>Dish</th>
<th>Solution</th>
<th># of dye drops</th>
<th>Time to Swirl (s)</th>
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<tbody>
<tr>
<td>1</td>
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Questions:

Now that you have performed this experiment, let’s answer the following:

1. Write down the solutions in order of which had the most movement. The one that moved the most first, and the one that moved the least last.

2. What is it about the addition of the soap that causes the observed reaction?

3. Why do you think the different liquids reacted in the order that they did? What is different in each liquid?

4. What did you learn from this experiment?
Materials List

Each student will need:

1 cup water

1 cup non fat milk

1 cup whole fat milk

1 cup heavy cream

Red, blue, yellow food dye

Dish soap

4 dishes

Stopwatch

In order to calculate how much of each material is required I will need to have an idea of the class size.