**Exploring the Properties of Oil**

**Experiment 1: Making an Emulsion with Oil and Water**

**Materials:**

Large test tube with Stopper

10 ml graduated Cylinder

Vegetable oil

Water

Digital stop watch

**Step 1:** Pour approximately 5 ml oil and 5 ml of water into a large test tube and insert the rubber stopper. Shake well and observe the mixture. Describe the solution that is created after shaking the mixture. Make some drawings of what you are observing. (You may also take pictures but I would like a sketch)

**Step 2:** Describe what happens to the oil and water after they are left to sit undisturbed for two minutes and for five minutes. You may have seen such an emulsion before if you have observed salad dressing made of oil and vinegar. Oil and water do not mix. Oil is hydrophobic, meaning it does not like water. Describe your observations after the two and three minutes.

**Questions:**

1. How long does it take for the oil to separate entirely? (write a short answer for this question)
2. Why does oil float? (write a short answer for this question)
3. What does density mean? (write a short answer for this question)
4. Describe oil and water in terms of their densities. (write a short answer for this question)
5. How does this activity relate to oil spills? (write a short answer for this question)
6. In an oil spill, crude oil may be spilled onto salt water. How does the density of salt water compare to the density of fresh water? How does the density of crude oil compare to the density of salt water? (write a short answer for this question)

**Activity 2: Examining the Densities of Oil and Water**

**Materials:**

Test tube with stopper

Test tube rack

10 ml graduated cylinder

Corn syrup

Water

Food coloring

Isopropyl alcohol

Vegetable oil

You can make a density gradient using corn syrup, water, isopropyl alcohol, vegetable oil. In this activity, you will layer approximately 5ml of each liquid into a tall test tube to make a density gradient.

**Step 1:** Begin with the most viscous liquid, the corn syrup. You will want to just estimate the amount of corn syrup, and pour it directly into the test tube, as it is so viscous and sticky that it is difficult to manage in the graduated cylinder.

**Step 2:** Next, measure 5 ml of water in your 10 ml graduated cylinder. Add one drop of food coloring to the water as a marker. Pour the colored water solution into the test tube.

**Step 3**. Measure 5 ml of oil in your 10 ml graduated cylinder. Gently later the oil on top of the water.

**Step 4**. Now measure 5 ml of isopropyl alcohol in your 10ml graduated cylinder. Add a drop of food coloring to the alcohol as a marker. Gently add the colored alcohol to the top of your density gradient.

**Step 5**. Describe your density gradient. Draw a picture of it, and label the layers. This will help you answer question later. (You may take a picture, but I want a sketch as well)

**Step 6.** Now put the stopper in your test tube, and gently mix the gradient? Describe what happened. (write a short answer for this question)

**Step 7**. Allow the contents or your density gradient to settle, and note where the food coloring appears. (write a short answer for this question).

**Questions**

1. What does the exercise tell you about the solubility of the components or the density gradient? (write a short answer for this question)
2. Define the word Soluble.
3. Comment on the density of the solutions in relationship to one anowther. Describe the new gradient. (write a short answer for this question)
4. Define the term viscosity?
5. Describe the viscosity of each of the components of your density gradient. (write a short answer for this question)

**Activity 3: Discovering Dispersants**

Materials:

Sink with cold and hot water

Vegetable oil

Dawn Dishwashing liquid

Soil

1. **Step 1:** Coat your hands with a small amount of oil. Have your lab partner turn on the cold water for you. Try to wash the oil from your hands using cold water, without using soap. How successful were you? Write your descriptions. (Write a short answer for this question).
2. **Step 2.** Now try coating your hands with oil and using warm water to wash the oil from your hands. Were you any more successful at removing the oil using warm water? Write your descriptions. (Write a short answer for this question).
3. **Step 3.** Try again using hot water. Heating the water reduces the surface tension of the oil, making it slip easier so that some oil should be removable from your hands. Can you explain why the temperature of the water would affect the surface tension of the oil?
4. **Step 4.** If your hands are no longer oily, reapply a coating of oil on your hands. Now try washing the oil from your hands dish washing liquid. Isn’t it amazing how much the soap helps to disperse the oil? Try this at various water temperatures to see how the soap increases the dispersing effects. Create a table to describe the way that soap disperses the oil in the different temperatures of water. Be very descriptive. Now repeat the same procedure with Dawn Dishwashing liquid. Create a table to describe the way that soap disperses the oil in the different temperatures of water. Be very descriptive. Draw a diagram showing what is happening with the oil, water and soap.

**Question:** From what you have just observed, explain why you think Dawn dishwashing liquid was used in oil spill cleanup efforts to clean birds and animals that were covered in oil. Would it matter what dish soap was used? (Explain answer in a short answer format).

Step 5. If you are ever outside and get your hands covered with oil, but have no soap, you might try adding a little dirt to help cut through the oil. As you rub your hands with the dirt, the oil will start clinging to the dirt and coating it, drawing the oil from your hands. Coat your hands with oil again. Then, pick up a small amount of soil. Rub the soil in your hands and notice how oil likes to cling to anything. Now wash your hands with a small amount of regular dishwashing liquid. Describe what is happening when you wash your oil hands with detergent or handle the soil with oil hands in terms of micelles. After you have written you observations repeat the above procedure with the Dawn dishwashing liquid. Can you tell the difference from the regular dishwashing liquid and the Dawn dishwashing liquid? (Explain answer in a short answer format). Make a diagram of a micelle, and label the components.

**Useful Vocabulary**

1. **Surface tension**- Cohesive forces between liquid molecules that allow it to resist an external force.
2. **Specific gravity**- A measure of the density of a substance in relation to water.
3. **Viscosity**-a measure of the resistance of a fluid to move
4. **Amphiphilic molecules-** Molecules having a polar, water-soluble group attached to a nonpolar, water-insoluble hydrocarbon chain.
5. **Hydrophobic**- Water loving or polar
6. **Surfactant**-molecular compounds that reduce the surface tension of liquids
7. **Emulsification**-dispersing of one liquid into another which it does not mix well with.
8. **Micelle**-lipid molecules that arrange themselves in a spherical form in aqueous solutions with hydrophilic regions (polar head groups) usually facing outward and hydrophobic regions (the long hydrophobic tail) usually facing inward.