Lower Merion High School Chemistry

Condensed States of Matter Activities Lab #22

What follows are a series of activities that are designed to allow you to investigate some of the properties of water and soap and to learn about phase changes and solid structures.

Procedure:

1. A floating cork usually moves to the edges of the container. Can you find a way to make it float in the middle? Basic rules: the cork must be freely floating in the water without interference from you or anyone else. If the cork is pushed to the side it must return to the middle. The effect must last at least two minutes.

   When you know how to make it work, it is NOT necessary to actually do it. (You don't want to give it away to someone else!) Simply draw what you would do in the space below and show it to your instructor.

   Now that you've figured out how...why does it work?

2. Float the pin on the surface of the water near the middle of the pan. Yes, it is possible. Draw what the surface of the water looks like to the best of your ability.

   Add a single drop of soap solution to the water. What happens? Why? What happens if you add more soap? Why?

   Rinse the container out WELL.

3. Add some deionized or distilled water to three test tubes. Add 3 drops of soap solution to each and shake vigorously (you may want to put your finger over the end before you shake it!). What do you observe? (Look specifically at the amount of suds in each tube)

   Add some calcium nitrate to **two** of the test tubes and shake all three test tubes vigorously. What do you see?

   Add some washing soda to **one** of these two test tubes (with the calcium nitrate) and shake all three vigorously. What do you see?

   Magnesium and calcium are the common ions that make water "hard". Based on the amount of suds you saw in each test tube, what might you expect to observe in the "real" world in a place where the water was very soft (your water is fairly hard).

4. Place a drop of water on a piece of parafilm or waxed paper. Draw the shape of the drop from above and from the side. DO NOT assume that you already know what it looks like! Be careful to draw exactly what you see.

   Using a toothpick that has been soaked in the soap solution, touch the drop. (This will add just a bit of soap.) What happened? Redraw the drop.

   Place a drop of water on a piece of notebook paper. Wait a minute. Draw the shape of the drop from above and from the side. DO NOT assume that you already know what it looks like!

   Use the toothpick in the soap solution to touch the drop. (This will add just a bit of soap.) What happened? Redraw the drop.

   What differences did you observe between the wax paper and the notebook paper? Why does the water behave differently on each?

   What changes occur after you add the soap? Why?

5. Heat the test tube of wax in a beaker of water until it has completely melted. Remove the heat and the water bath. Take the temperature every 60 seconds until it reaches 40°C. Make any and all appropriate observations. Graph your results with time on the horizontal axis and temperature on the vertical axis.

   Why does the graph take the shape that it does?

6. Put some water in a beaker. Add a drop of oil to the water and observe. Rinse this beaker out and dry it. Add a drop of water to the beaker of oil that is already out. Observe. What happens to each drop? Why the difference? DO **NOT** dump out the oil.

7. Answer the following questions:

a) When a drop of water is added to gasoline it forms a small sphere that sinks to the bottom. When gasoline is added to water it spreads out in a thin layer on the surface. Why do they behave so differently?
b) Hydrogen bonding occurs only with hydrogen bonded to a very electronegative atom. What's so special about hydrogen?
c) List the intermolecular attractions in order form weakest to strongest.
d) Why doesn't water wash away the burning sensation from Jalapeño peppers?
e) What shape are raindrops as they fall through the air, and why do they take that shape?
f) Why does putting salt on a slug cause it to shrivel up? (No I do not support trying this at home)
g) Why does pouring water on the slug revive it?
h) Why do your hands get all "pruny" when you've been swimming?
i) Why does seawater dry your skin?
j) Why doesn't the temperature change while a liquid is boiling?
k) Why is boiling endothermic (Why does the reaction take in heat)?
l) Why do you feel cold when you get out of a pool?
m) Why doesn't all of a liquid evaporate into a closed space?
n) Which is bigger, a pickle or the cucumber from which it was made? Why?