PART ONE

IN CLASS ACTIVITY 1

YOU NEED: a deformable metal wire (e.g. a tin wire – I use copper wire), water, soap solutions with different concentrations of soap and glycerin.

Use the wire to make loops of different sizes and dip it into water to try to make a film. Then do it in the soap solutions.

RECIPE for a SOAP SOLUTION

1 cup of dishwashing soap (e.g., in the US, Ultra Ivory Blue or Palmolive or Joy or Dawn)
12-16 cups water
3/4 tablespoon glycerin (available in pharmacies or chemical supply houses) or corn syrup or 2 tablespoons of sugar (cheaper---but bugs like sugar)

Stir gently. Prepare the bubble solution two to three days in advance.
Glycerin/corn syrup slow down the evaporation, making the soap films last longer, but too much makes the films too heavy to support their own weight.

Make sure anything your bubble may touch is wet. Try to avoid dust and other material that may contaminate the solution.

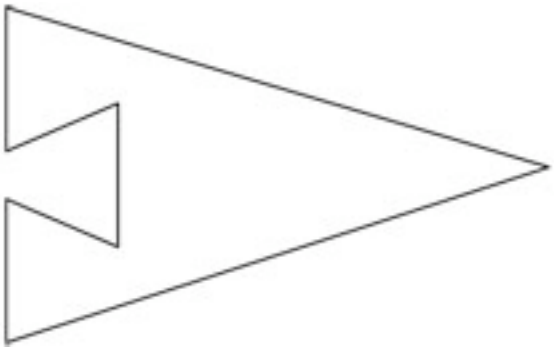
NOTE: This is a lot of soapy solution, so you may need a big container. You can make less solution by keeping the proportions (e.g., 1 spoon of soap, 16 spoons of water).

IN CLASS ACTIVITY 2

YOU NEED: water in a dish/bowl, soap solution in a bottle, cardboard, paperclips, a piece of tissue paper.

- Try to make the paper clip float
- Tear a small piece of tissue paper, and gently drop it onto the surface of the water

- Gently place a DRY paper clip flat onto the tissue
- Cut models (shape provided) of surfactant powered boats, play and discuss how they work.



[boat template: boat.jpg
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IN CLASS ACTIVITY 3

Find how the frame can be used to measure the surface tension. Try with different liquids. (see the notes for the teacher for suggestions)

IN CLASS ACTIVITY 4

A thread, a wire, soap solution.

Make a ring with the wire and dip it in the soap solution to make a film.
Put a thread across the ring, loosely, so that it crosses itself. Break the film on in the center with a pin. The thread is pulled into a perfect circle, which maximizes the internal area (and therefore minimizes the film area).

IN CLASS ACTIVITY 5

2 perspex (or any transparent plastic) parallel plates, a drill, screws, clay, soap solution.

Put one plate on top of another and make as many holes as cities that you want to connect [in the image motorway.jpeg there are 3]. Put a screw in each hole, tightening the screws so that the two plates remain parallel to each other. If needed, fix the screws with some clay. Dip this frame in the soap solution and extract it delicately. For each frame try more times: is the solution unique?

IN CLASS ACTIVITY 6

A tin wire, soap solution, a container for the soap solution.

Make two rings of the same diameter with the tin wire. Dip them into the soap solution and extract them one on top of the other. Withdraw them slowly and pull them apart gently.

The soap film in between takes the shape of a catenoid. With some patience and luck it is possible to pull the two rings more apart until when the catenoid explodes and the film covers the two rings without connecting them. Indeed once the distance between the two rings becomes about twice the radius of the rings, the minimal surface is not anymore the catenoid, but the two disks.

PART TWO

REFERENCES

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