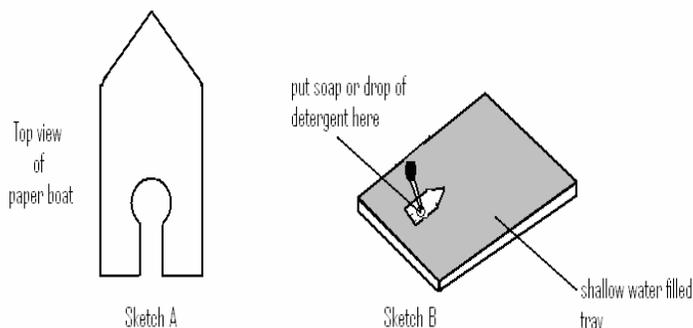


THE DETERGENT PROPELLED BOAT

A. Question: *Can soap break tension of water?*



B. Materials Needed:

1. A paper card (3x5”).
2. A shallow tray or sink.
3. A piece of soap or a few drops of liquid detergent.

C: Procedure:

1. Fill the shallow tray (or sink) with water.
2. Cut out a boat from the paper card in the form of sketch A.
3. Let the paper boat float on the water and touch a corner of the soap block to the water in the center opening of the boat (or place a drop of liquid detergent here).
4. Observe the movement of the boat.

D: Anticipated Results:

Students should observe movement of the paper boat when detergent or soap is added to the water.

E: Thought Questions for Class Discussion:

1. Why does the paper boat move forward only when the soap touches the water?
2. What made the paper boat be pulled forward?
3. What did the soap or detergent do to the cohesive forces between the water molecules?
4. What other shapes of boats would work the same way?
5. Would it work without a hole in the paper card?
6. What would happen if we touched the soap to the side of the boat?

F: Explanation:

The soap touching the water or the drop of detergent in the water is breaking the surface tension. There are cohesive forces between the water molecules in front and in the back of the boat, as well as on both sides. By touching the soap towards the rear of the boat, these cohesive forces are broken in the rear of the boat but not in the front of the boat. This makes the boat to be pulled towards the front. Similarly, before the detergent was dropped, the water molecules on the surface of the water were pulling the boat on all sides with an equal force. After the detergent was dropped, the attracting force in the rear of the boat was eliminated, so that the resultant force is to the front. The shape of the boat is irrelevant. Any shape will do the same thing. When the surface tension on the left is broken, the paper boat will move to the right. The propelling can continue until the detergent has lowered the surface tension considerably.