

# Soapy Membranes

Squeaky clean! Explore how membranes keep things in and out of our cells and how soap ‘pops’ the membranes of viruses.

## TEKS:

SCI 7.3 B: The student is expected to use models to represent aspects of the natural world such as human body systems and plant and animal cells.

SCI 7.12 D: The student is expected to differentiate between structure and function in plant and animal cell organelles, including cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole.

## Materials:

- Dish soap (2 teaspoons)
- 2 plastic straws
- Ruler
- Scissors
- Shallow pan
- String (48 inches)
- Unsharpened pencil
- Water ( $\frac{1}{2}$  cup)
- White sugar (2 teaspoons)

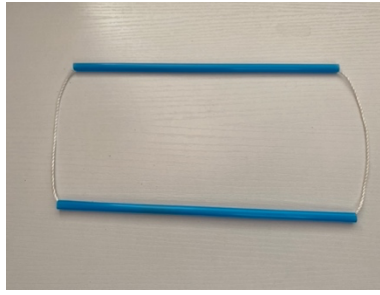
## How To:

1. Mix the dish soap, white sugar, and water in a shallow pan. This is your soap solution.
2. Cut the cotton string into two 24-inch pieces.
3. Thread one 24-inch piece of string through both straws and tie the ends of the string together in a knot. Tuck the knot into one of the straws. Arrange the straws so that they are parallel to each other and the string and straws look like a rectangular frame.

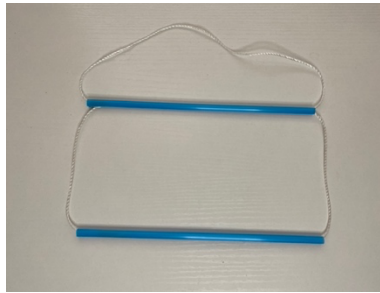
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4. Thread the other 24-inch piece of string through one of the straws in the rectangular frame and tie together the ends of the string to make a handle for the frame.



5. Holding the handle, dip the frame into the soap solution. Slowly pull the frame out of the soapy mixture. There should be a film on the rectangular frame!
6. Wet one of your fingers with the soapy mixture in the pan. Then, gently poke your finger through the soapy film in the frame. Observe what happens.
7. Repeat step 5. Now, wet one of your fingers with plain water and gently poke your finger through the soapy film. Observe what happens.
8. Repeat step 5. Gently poke a dry finger through the soapy film. Observe what happens.
9. Repeat step 5. Use a dry unsharpened pencil to poke through the soapy film. Observe what happens.
10. Repeat step 5. Get the unsharpened pencil wet with the soapy mixture and poke through the soapy film. Observe what happens.

### STEM Explanation:

Why did the soapy film pop when you put some objects through but not other objects? It has to do with how the soapy film, or membrane, is made. Our soapy membrane has two major parts: one part that likes touching water and another part that does not like touching water. When we place a soapy finger through the soapy membrane, the part of the soapy membrane that likes water can connect to the water on our finger and the membrane stays together. However, if our finger is dry, there is no water for the membrane to latch on to and our soapy membrane breaks instead of letting our finger in.

This soapy membrane works just like cell membranes in our bodies! Each cell in our body is surrounded by a semipermeable membrane. This means that it lets some things into the cell, but other things cannot enter. This allows for our cells to have only what they need inside of them. Viruses, such as the coronavirus and the flu, do not have cell membranes. However, they are surrounded by a protein capsule that acts as a cell membrane. When we wash our hands with soap, the soap pulls apart the protein capsule of the virus and

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breaks it apart. Think about what happened when you placed a dry finger through the soapy membrane. It popped! The same thing happens to the outside of the virus when soap touches it. This leaves the virus vulnerable, and it eventually dies. That is why it is best to wash your hands with water and soap: the soap breaks down the viruses and bacteria on our hands that can make us sick.

### **Career Connection:**

*Virologists* are biologists that specialize in the study of viral infections. They identify viruses, study their growth and development, and investigate how viruses impact humans, plants, and animals.

### **Resources:**

[https://www.ontariosciencecentre.ca/media/1152/scienceathome\\_bubbles\\_biograde12u.pdf](https://www.ontariosciencecentre.ca/media/1152/scienceathome_bubbles_biograde12u.pdf)

<https://www.exploratorium.edu/snacks/cellular-soap-opera>

<https://www.cdc.gov/handwashing/why-handwashing.html>

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