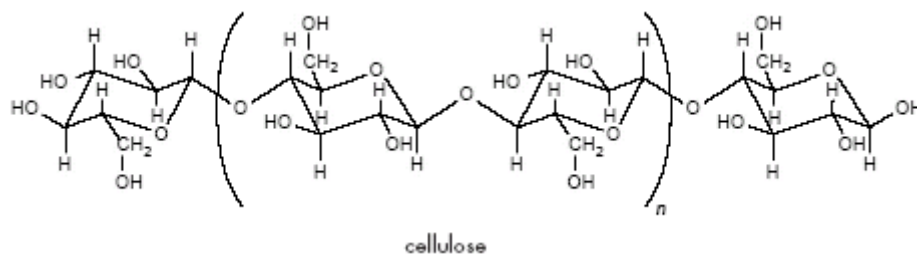


Student Page

Title: Colorful Lather

Introduction: Paper marbling has been popular for centuries. In a Japanese version called *sumi nagashi* (meaning “ink floating”), hydrophobic, carbon-based inks are dropped onto water and blown across the surface to produce swirls like those seen in polished marble. Rice paper lifts the ink off the surface of the water. In this activity, you will investigate the art and science of the creation of colorful marbled paper patterns using shaving cream and food color. Shaving cream contains soap, which consists of long ionic species that have a hydrophilic (“water loving”) head and a hydrophobic (“water hating”) tail. Paper contains cellulose, which is a polymer of glucose (see below), as well as other chemical substances.



Materials

- Aerosol shaving cream (standard white type)
- Paper plate
- Scraper such as spatula or tongue depressor
- Toothpicks
- Food color
- 3–4 small (~3 _ 5 in.) pieces of non-glossy, sturdy paper such as index cards, card stock, or art paper
- Eye dropper
- Water
- Small transparent cup
- Paper towels.

Procedures:

1. Read the label on a can of aerosol shaving cream. Record the list of ingredients.
2. Place a drop of food color on a clean piece of non-glossy, sturdy paper, such as an index card. Observe and record how the drop spreads.
3. Fill a small, transparent cup half-full with room-temperature water. Without stirring, add a drop of food color to the water. Observe and record how the drop spreads.
4. Spray a pile of shaving cream the size of your fist onto a paper plate. Use a scraper such as a spatula or tongue depressor to shape the pile so that the top surface is flat and slightly larger than the paper that you will marble. Apply only 4–6 drops of food color to the shaving cream surface, one drop at a time. Observe and record how the drops spread.
5. Drag a toothpick through the shaving cream and food color to create colored patterns. Press a 3 x 5 in. piece of non-glossy, sturdy paper firmly on the shaving cream surface. What do you observe through the back of the paper?
6. Lift the paper off of the shaving cream. Scrape off any excess shaving cream close to the paper with a spatula or side of a tongue depressor and return it to the original pile. Observe the front of the paper. What happened?
7. Repeat steps 5–6 to marble additional papers with the remaining tinted shaving cream, or move on to step 8.

8. Using a spatula or tongue depressor, mix the leftover pile of colored shaving cream until it is one uniform color. If most of the color has already been removed by paper, add 1–5 more drops of food color before mixing completely.
9. Using an eye dropper, apply a drop of water to the tinted shaving cream. Observe and record what happens.

Prediction/Hypothesis

If _____,
[state hypothesis]

Then by changing _____ and measuring _____,
[INDEPENDENT VARIABLE] *[DEPENDENT VARIABLE]*, I predict that _____.
[Prediction of results. Be specific. Do not simply state that there will be an effect]

Because _____

[Scientific phenomenon to support your prediction. Cite evidence from your textbook.]

Data/Observations:

Analysis

1. Compare and contrast the spreading you observed when dropping food color onto clean paper, into water, and onto shaving cream. Explain your observations.

2. Based on your observations, what claims can you make about the polarity of the food color and the paper? Explain.

3. Using the chemical structure of cellulose, explain the claims you made regarding the polarity of paper in question 2.

4. Shaving cream is a lather, similar to a foam. A foam is a colloid consisting of a gas dispersed within a liquid. (The liquid in shaving cream is water and soap, with larger sized soap particles dispersed in water.) What other common products are foam or lather colloids?

5. Artists have created beautiful marble papers since the middle ages. How do you think an artist's understanding of materials influences his or her work? Explain your answer.

Conclusion:

Inquiry Extension

Try the same marbling technique using foam pump soap or gel shaving cream as the base, or different artists' paints on standard white shaving cream. What factors influence your results?