

Marbled Milk Paper



Materials

- Milk
- Watercolor Paper
- Eyedropper filled with dish soap
- Q-tips
- Food Coloring
- Tray/Shallow Dish
- Towels to place your marbled paper

Instructions

1. Make sure your paper fits in your tray, if not give it a trim to fit without bending. Keep your stack close by to your tray, because this experiment goes fast!
 2. Pour a thin layer of milk in your tray, enough to cover the bottom completely.
 3. Add the food coloring in drops around the tray. Pick your favorite colors!
 4. Add drops of soap on top of your food coloring drops. You should see some interaction brewing!
 5. Using a q-tip swirl your colors. Wow! Check that out!
 6. Add your paper sheet on top of the milk and press down and quickly pull out and set aside on a towel to dry.
 7. Let it dry!
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Tips

- Watercolor paper absorbs the color the best, but if you don't have that around use cardstock. Try not to use printer paper, it doesn't absorb your design as well.
- Work quick and next to a sink so you can start over once the colors have mixed too much.
- Try dipping your paper before you swirl, the design might be different! Talk to your parents about why this might be!
- If your paper doesn't dry straight you can carefully iron your design between two other sheets of paper.
- Eyedroppers aren't necessary to observe the effect, but kids think they are cool, and it makes cleaning up a cinch.
- Don't worry, after a few days of drying the paper won't smell!



Dish the Science

Milk consists of a lot of different types of molecules, including fat, protein, sugars, vitamins, and minerals.

When you add soap to milk, something magic happens. Ever wonder why it's so hard to swim at the pool? It's something called surface tension... and adding soap to your milk breaks this surface tension and sets your food coloring free to explore the milk in your pan. The chemical properties of soap allow each molecule to form around some of the molecules in your milk and form "micelles", like little bubbles. The outside of these micelles are attracted to water, while the inside is attracted to some of the molecules of your milk, which is how soap gets your clothes clean in the wash! As these micelles form in your pan, your food coloring starts to move around the water in your milk. At the end, when your mixture meets equilibrium, all your colors will be mixed together in your pan.

Take it to the Limit!

Oil and water don't mix right?! (Not always!) When we want to mix two things that don't normally mix (AKA immiscible), we can use an emulsifier! In this experiment, your soap is acting as an emulsifier which allows two immiscible substances to form an emulsion or a mixture. But what does this have to do with cleaning up the environment? When tough oil spills happen, we can use this knowledge to help us understand how certain products in the remediation industry work. Oils are made up of many different forms of molecules that contain a lot of carbon – which



microbes use to breathe and grow. Using emulsified oils, you can provide food for the microbial cleanup crew under the ground. It's called electron donor addition and it helps us make the world a safer place! Understanding the same principals of surface tension and forming micelles, you can understand how emulsifying an oil can help spread this food for microbes further underground. How neat is that?!

Sources

Cassiday, Laura. "Emulsions: Making Oil and Water Mix." *Coconut Oil Boom*, Apr. 2014.

Dziengel, Ana. "Science & Art for Kids: Marbled Milk Paper." *Babble Dabble Do*, 3 Dec. 2017.