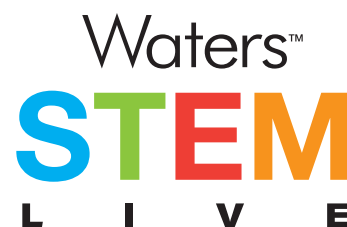


Dancing Art!

The science of a dry-erase marker



In this experiment, we will look at dry-erase markers. These markers contain non-water soluble materials (or **hydrophobic**). They are made up of a solvent, which is usually some kind of alcohol. This is used to dissolve the color pigments that determine the marker's color.

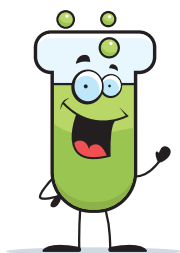
In addition, a resin or polymer is added, which is the key to making the ink erasable. **Polymers** are materials made of long, repeating chains of molecules. The materials have unique properties, depending on the type of molecules being bonded and how they are bonded.

Some polymers bend and stretch, like rubber and polyester. In a dry-erase marker the resin is an oily silicone polymer, which acts as a "release agent." This makes the ink of the marker very slippery and prevents it from sticking to the whiteboard's surface. This is why the ink can easily be wiped off from a very smooth nonporous surface such as a whiteboard or glass with just force.



MATERIALS

- One to two shallow trays
- One to two smooth glass or plastic plates that you have permission to draw on with markers
- Dry-erase markers (different colors, and different brands are recommended)
- Cup
- Water
- Paper towels or a cloth
- Permanent marker and rubbing alcohol (needed for clean up if you chose the optional experiment!)



Safety tip!
Find a work area that can tolerate water spills.

INSTRUCTIONS

Step 1: Fill your cup with room-temperature water and set it next to your trays or plates.



Step 2: Choose one color of your dry-erase markers and make a drawing on your first plate such as a stick figure, a heart or word.

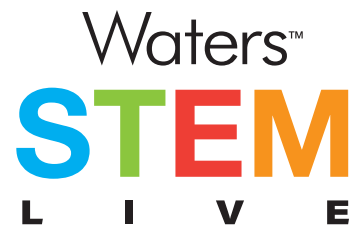


Step 3: Let it dry for a couple of seconds and then use a dry finger to wipe across your drawing.

(continued)

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INSTRUCTIONS (CONTINUED)

Step 4: If the drawing came off, make a new drawing. Otherwise, keep the old one. Then pour just enough water onto your plate to cover the drawing. Wait and observe. If nothing happens, shake the plate a little bit.

Different formulations from brand to brand likely affect the drying time.



HOW IT WORKS

Did you get your drawings to float? You should have – but only when using the dry-erase marker. When you make your drawing on the surface of a smooth plate or tray the solvent, or alcohol, that dissolves the ink ingredients will evaporate. This leaves the color pigment and polymer behind on the surface. With the permanent and dry-erase markers, it actually looks like the color is sticking. When you wipe across your drawing with your finger, however, only the drawing that you made with the dry-erase marker will disappear. This is because the oily silicone acrylic polymer resin in the permanent marker makes it stick to the surface.

The fun starts when you pour water on your drawing. You should have observed your dry-erase marker drawing magically detached from the plate and rose to the water's surface. There, it could float and move as if it were alive! The permanent marker drawing should have remained stuck to the plate. This difference is due to the special polymer in the dry-erase marker ink – because this ingredient prevents the ink from attaching to the plate, and the water can slip underneath. And because the ink is lighter than water it can float. When you poured rubbing alcohol on your drawings, however, you should have seen them both slowly dissolve. This is because alcohol is used as the solvent in both markers.

ADDITIONAL EXPERIMENTS

- Make drawings with different colors of dry-erase marker. *Do all of them behave the same way or are they different? Which color floats best?*
- What happens if you pour rubbing alcohol on top of your drawing instead of water? *Does your drawing still float? Do dry-erase and permanent markers give you the same result? Why or why not?*

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