

FLOATING INK EXPERIMENT



SUPPLIES NEEDED

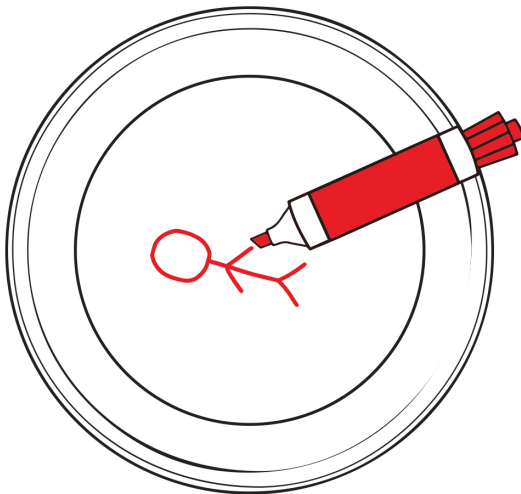
- Dry Erase Marker
- Smooth, flat surface (plate or piece of glass)
- Water

KEY CONCEPTS

insoluble
buoyancy force
density

STEP 1

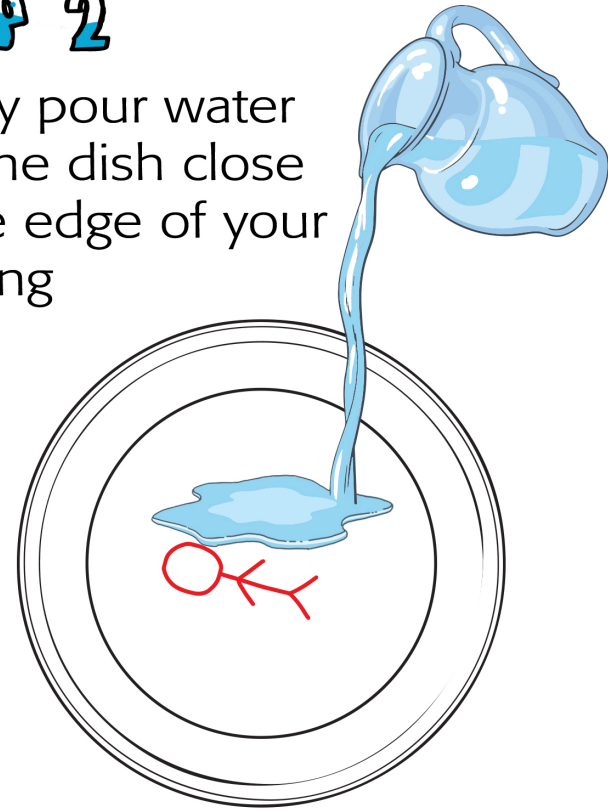
Draw a shape, stick figure or letters on your plate. Let your drawing dry for a minute.



*NOTE: New markers work the best, the fresh ink allows you to get a good thick layer of ink down

STEP 2

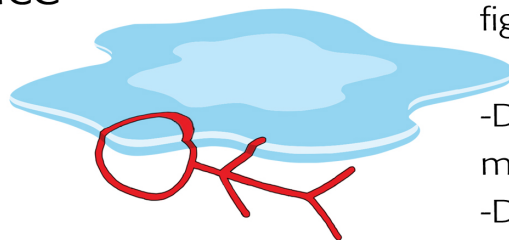
Gently pour water into the dish close to the edge of your drawing



STEP 3

As you add more water, the ink will lift away from the bottom of the dish and float to the surface of the water.

*NOTE: Some of your drawings may only lift a little, and some might not at all. Results can be different every time. Just try again!



WHAT DID YOU OBSERVE?

- Do solid shapes float better than stick figures or letters?
- What happens if you blow on it?
- Does the smooth surface you use make a difference?
- Does the temperature of the water make a difference?
- Can you pick up your floating shapes?

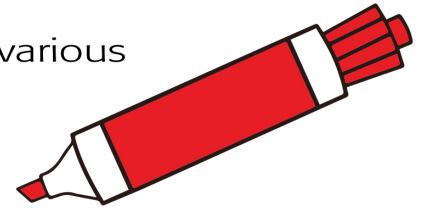
FLOATING INK

THE SCIENCE BEHIND



DRY-ERASE

markers have been around in various forms since the 1960s. They are designed to behave differently than normal pens and permanent markers, which have really sticky ink that stays where it's put.



But the ink in a dry erase marker is meant to be removed when you've finished with it, so it is designed to be less sticky.

MARKERS

work by mixing ink and alcohol with a sticky, plant-based resin that acts as an adhesive. When you write with a marker, the alcohol evaporates and only the sticky ink is left on the surface. Permanent indelible markers (like a Sharpie) use a strong adhesive that sticks to almost any surface you write on. But dry erase markers use only a minimal adhesive, which makes it easy to wipe away your notes and drawings without using a liquid solvent...in other words, they easily "dry erase." See how they get their name? But they only dry erase if you write on a smooth, non-porous, surface.

SO

why does a dry erase marker make floating ink? There are a few reasons. First, dry erase ink is not that sticky, so it doesn't stick all that hard to our plate. Also, it's **insoluble** in water. That means it can't be dissolved in water. And lastly, it's less **dense** than water - which means it will float! When you draw your image, the alcohol in the mixture evaporates and you're left with a thick, solid, layer of sticky ink that will not dissolve in the water. So when you pour water onto your dry erase doodle, it not only holds its shape, it also experiences a strong **buoyancy force** that overcomes the stickiness of the ink. That force pulls the doodle off the plate and causes it to float to the surface of the water. Free that doodle!

THE

word **insoluble** comes from the Latin *insolubilis*, meaning "that cannot be loosened." In our case, our insoluble doodle cannot be dissolved or loosened in water. And it floats because it's less dense than the water.

Density is a word we use to describe how much matter or substance (mass) is in a certain amount of space (volume). If you could form a puddle of water into the exact shape and size as your doodle, there would be more water in the puddle than ink in the doodle. **Buoyant force** is the upward force exerted on objects that are submerged in fluids...like a boat in water or a balloon in the air.