Magnetics vs. Viscosity

Estimated Time: 45-60 minutes

SUMMARY

You likely observe magnets at work daily. Generally, these magnets are working in the ambient air. Can a magnet still work through water, milk, or viscous (thick) liquids? That is to say, do these liquids interfere with magnetic fields? In this activity, the student will design an experiment that can answer that question! The student will begin with a hypothesis, design and experiment, collect data, and draw a conclusion.

WHAT YOU'LL LEARN

- The impact of viscous liquids on magnetic fields.
- Experimental design, including forming a hypothesis, creating an experiment to test the hypothesis, and drawing conclusions from observations.

Materials Used

- Cups (plastic, paper, or glass work!)
- ½ cup water
- ½ cup light corn syrup
- ½ cup glycerin
- ½ cup vegetable oil
- ½ cup heavy cream
- Magnets (i.e. refrigerator magnets)
- Paper clips

Resources Used

- https://extension.purdue.edu/4h/Documents/Volunteer%20Resources/Chemistry/Magnet%20Magic.pdf

WHAT TO DO

1. Consider how a magnet will attract a paper clip in ambient air. Observe what happens to the paper clip when the magnet is brought close. The paper clip will stick to the magnet because magnetic fields travel rapidly through atmospheric gases, or the air we breathe.
2. Discuss with the student what would happen if the paper clip was put in a cup of water. If the magnet is placed on the side of the cup, can the magnet still attract and adhere to the paper clip? What is different about this situation from a magnet picking up a paper clip in the air? What two features are interfering with the magnetic field in this situation?

At this point, the student can begin developing a hypothesis about how a magnet will behave in water.

3. Pour out ½ cup of each liquid into a cup. Have the student make and record observations about each liquid. Include descriptors such as if it is thick, sticky, transparent, etc. in the observations. Compare and contrast the liquids in front of the student. Develop a hypothesis of magnetic behavior according to these observations.
4. For each cup, place a paper clip into the liquid. Bring a magnet towards the side of the cup. The student can choose to measure magnetic activity in a multitude of ways; encourage their creativity in experimental design. Perhaps they could time how quickly the paper clip moves through the liquid toward the cup's wall with a magnet, or simply record if the magnet could attract the paper clip at all. Regardless of how the student chooses to collect data, record the results.
5. Discuss the results of the experiment with the student. Do these results support or refute the hypothesis? Was the student surprised by the results? Explore some possible explanations for the relationship between viscosity and magnetism.

TIPS

- Depending on the availability of resources, feel free to pick and choose the liquids used in the experiment. Or, consider some others that would be interesting to test. While soap may be scarce in a pandemic, one of its main ingredients, glycerin, is an affordable and accessible substance that could be tested. Or consider creating a saltwater solution. The possibilities are endless!