

T-Shirt Tie-Dye

Section PROPERTIES OF MATTER *Topic* SOLUBILITY

Estimated Time ⌚ Setup: 5 minutes; Procedure: 15 minutes

OVERVIEW

Students draw colorful designs on fabric and transform them into a permanent tie-dye pattern using rubbing alcohol.

In this activity, students explore that some solutes are only soluble in specific solvents. In this case, students draw designs on a T-shirt using permanent marker, which is not soluble in water. But when rubbing alcohol is added to the design, the ink easily dissolves and spreads throughout the fabric. Once the shirt is dry, the permanent tie-dye design of the markers will remain on the shirt even after washing!

INQUIRY QUESTIONS

Getting Started:

🔍 What happens if a dye is absorbed by a solid?

Learning More:

🔍 How can we dissolve “permanent” dyes?

Diving Deeper:

🔍 On a molecular level, what factors determine solubility?

CONTENT TOPICS

This activity covers the following content topics: properties of matter, solubility, mixtures, absorption, polarity, diffusion

This activity can be extended to discuss: chromatography, separation techniques

NGSS CONNECTIONS

This activity can be used to achieve the following Performance Expectations of the Next Generation Science Standards:

- 🔍 **2-PS1-2:** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- 🔍 **5-PS1-3:** Make observations and measurements to identify materials based on their properties.
- 🔍 **MS-PS1-1:** Develop models to describe the atomic composition of simple molecules and extended structures.

MATERIALS

For one setup:

- ✔ White T-shirt or fabric swatches (10 x 10 cm or larger)
- ✔ Permanent markers of assorted colors
- ✔ Isopropyl rubbing alcohol (70% or stronger)
- ✔ Cup with at least an 8-cm wide opening
- ✔ Eye dropper or pipette
- ✔ Rubber band
- ✔ Cup of water

Optional materials:

- ✔ Bounty® paper towels

ACTIVITY NOTES

This activity is good for:

- ✔ Individuals
- ✔ Advanced students

Safety Tips & Reminders:

- ⚠ Permanent marker can easily stain clothing or skin. We recommend using gloves and an apron or lab coat for this activity and putting a plastic tablecloth or newspaper over the work area.
- ⚠ The T-shirt pieces will take some time to dry; do not remove them from the cups until they are completely dry.
- ⚠ Rubbing alcohol is poisonous if swallowed, flammable, and emits fumes once opened—which is why we recommend using pipettes and not having open containers! Be sure to do this activity in a well-ventilated area and with adult supervision.
- ⚠ If you don't want to use a whole T-shirt, you can use white fabric squares to demonstrate this activity.
- ⚠ Review the Safety First section in the Resource Guide for additional information.

