

“What is this Stuff?”

Target audience: Grades 6-12

Background and Notes:

The dictionary defines “stuff” as matter of a particular and unspecified kind. Chemistry is the science that investigates and explains the structure and property of matter. This activity uses the inquiry method in order to have students plan an investigation and develop a Data table. Key terms: polar, nonpolar, hydrophilic, and hydrophobic.

In this activity, students will investigate the properties of different samples of “stuff” in order to determine if the samples are composed of the same kind of matter.

Knowledge and skills:

- Students should know basic chemistry structure and intermolecular forces that act between atoms, molecules and compounds such as water and alcohol.
- Students should be able to design a data table to investigate unknown materials and determine polarity differences.

Fundamental understanding:

- Central concept is the distinction between polar and nonpolar substances.
- Students need to learn to be methodical in their investigations.

Essential Questions:

- What are the intermolecular forces involved in the substances being analyzed?

National standard (s):

- National Content Standard: 9-12 C: Science as Inquiry with students having the ability to do and understand scientific inquiry.

State standard(s):

- North Carolina Chemistry Standard Course of Study Objective 1.02 and 1.07: Bond Polarity and molecular polarity, including intermolecular forces in order to explain polarity

Purpose: to design a data table and to investigate the difference between two unknown substances.

Safety Precautions:

1. Do not drink or eat out of any containers
2. Do not drink any substance used in this activity

3. Place any broken glass into appropriate glass waste container

Materials:

- **Equipment:**
 1. 50 ml beakers
 2. Glass stir rods

Reagents:

1. Sand in small container (one/2students)
2. Mystic Sand in small container (one/2students)
3. 70 % isopropyl alcohol (one small bottle/4 students)
4. Water (one squirt bottle/ 4 students)

Procedure:

1. Students design a data table to determine their observations of the 2 different types of substances provided.
2. Students design a data table to determine the observations of the behavior of the 2 different types of substance in water and alcohol.

Results:

- Observations: in the data table with a 2x2 matrix table
- Observations of the behavior of the substance in different liquids: in the data table with a 2x2 matrix table

Conclusion:

1. Students should restate the purpose and/or hypothesis of this activity
2. Students should state their conclusions about these different substances in sentence form, using the terms hydrophobic and hydrophilic.
3. Students should state how they would change or improve this activity or decide on another investigation.
4. Optional: student cited resources or references that support results.

References and Resources:

Flinn Scientific: Mystic Sand, Catalog # AP304 Publication # 44304 \$6.10 each in 2002.

Teacher Notes:

Set up the lab: this activity can be done at a lab table or at student desks.

1. Sand in small containers (one/2students)
2. Mystic Sand in small container (one/2students)

3. 70 % isopropyl alcohol (one small bottle/4 students)
4. Water (one squirt bottle/ 4 students)
5. 50 ml beakers or small plastic cups
6. Stir rods or straws or plastic spoons
7. 1.0 Liter beakers, one for the regular sand waste and one for the colored mystic sand. Both sands can be filtered or decanted and left to air dry and reuse.

Note: Tell students not to mix the 2 types of sand.

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