Activity 3.1
Look-alike liquids

Can you distinguish between four clear colorless liquids based on the way they look on a brown paper towel?

In this introductory activity, students will compare the way water and isopropyl alcohol appear on different surfaces. After seeing that these liquids behave differently, students will be given two other clear colorless liquids—salt water and detergent solution. Students will then test all four liquids on a brown paper towel to discover the differences between them. Through the activities in this investigation, students will see that liquids have characteristic properties that can be used to identify an unknown.

Materials needed for each group

Tap water	Salt	Plastic bag
Isopropyl rubbing alcohol (70%)	4 Small cups	Brown paper towel
Detergent	4 Droppers	Pencil

Notes about the materials

- **Be sure you and the students wear properly fitting goggles.**
- **When using isopropyl alcohol, read and follow all warnings on the label.**
- To prevent spills, tape cups to the desk or table so that the cup and dropper do not fall over.

Preparing materials

- Use a permanent marker to label four small cups **water**, **alcohol**, **detergent**, and **salt water**.
- Use a permanent marker to label four droppers **W**(water), **A**(alcohol), **D**(detergent), and **SW**(salt water).
- Make solutions for the class according to the following procedure. These recipes make ¼ cup of each solution, which is enough for 8 groups to conduct the activity.
  - **Water**—Use ¼ cup regular tap water.
  - **Salt water**—Add 1 tablespoon salt to ¼ cup tap water.
  - **Alcohol**—Use ¼ cup 70% isopropyl alcohol. This is a common household strength.
  - **Detergent**—Add 1 teaspoon clear, colorless, liquid hand soap or detergent to ¼ cup tap water. Stir gently.
- Place about 1 teaspoon of each solution into its labeled cup. These solutions will be reused in *Activity 3.2*. Cover the solutions to store them between activities.
- Cut pieces of brown paper towel into approximately 10 × 15 cm pieces. You will need two pieces for each group.

Activity sheet

Copy *Activity sheet 3.1—Look-alike liquids*, pp. 136–137, and distribute one per student when specified in the activity.

Assessment

An assessment rubric for evaluating student progress during this activity is on pp. 153–154. For this formative assessment, check a box beside each aspect of the activity to indicate the level of student progress. Evaluate overall progress for the activity by circling either "Good", "Satisfactory", or "Needs Improvement".

Activity 3.1
Look-alike liquids

Question to investigate

Can you distinguish between four clear, colorless liquids based on the way they look on a brown paper towel?

Take a closer look

1. Have students read the introductory story on *Activity sheet 3.1* and compare the appearance of water and rubbing alcohol.

Distribute *Activity sheet 3.1—Look-alike liquids*. The student in the introductory story notices that although water and alcohol are both clear, colorless liquids, they look different on different surfaces. Give students an opportunity to compare how these liquids look on different surfaces for themselves. They can use the tests described below.

Procedure

1. **Plastic bag test:** Use droppers labeled **W** and **A** to place 1 drop each of *water* and *alcohol* on a plastic bag at the same time. Record your observations.

2. **Side of cup test:** Carefully tilt the cup of water and use the dropper labeled **W** to place individual drops of water along the inside surface of the *water* cup. Then carefully tilt the cup of alcohol and use the dropper labeled **A** to place individual drops of alcohol along the inside surface of the *alcohol* cup. Record your observations.

3. **Brown paper towel test:** Use droppers labeled **W** and **A** to place 1 drop each of water and alcohol on a brown paper towel at the same time. Record your observations.

Expected results:	**Water**	**Alcohol**
Plastic bag	Beads up	Spreads out
Side of cup	Travels down in a bead	Flows down in a flat stream
Brown paper towel	Soaks in	Soaks in and evaporates quickly

Try this!

2. Introduce students to four clear, colorless liquids and test them on a brown paper towel.

Show students samples of each of the four clear, colorless liquids in labeled clear plastic cups. Point out that even though these liquids all look very similar, they have different characteristics and uses. Remind students that they were able to tell the difference between water and rubbing alcohol on a brown paper towel. Then ask them if they think there will be differences in the way the four liquids look on a brown paper towel.

Tell students to use each dropper only with its labeled liquid. Talk about ways to prevent contamination of the liquids in the cups. Students should be careful not to put the same dropper in more than one liquid.

Procedure

1. Use a pencil to label a piece of brown paper towel with the names of each solution.

2. With the help of your partners, use separate droppers to place 1 drop each of water, salt water, alcohol, and detergent solution on the piece of paper towel at the same time.

3. Record your observations.

3. Have students discuss their results.

Ask students: What do you notice about each of the liquids on the paper towel?

***Expected results*: The water absorbs into the paper towel a little faster than the salt water does, which stays beaded up a little longer than the water. After they begin to absorb, the water and salt water appear similar, but the water seems to wet a larger area. The detergent and alcohol leave smaller marks, but the alcohol mark has a smooth edge and the detergent has a more irregular edge. Also, the detergent mark appears darker.**

What's next?

4. Ask students what they might do to identify an unknown liquid.

Ask students questions like the following:

- Let's say that I gave you an unknown liquid that was one of the liquids you tested. Do you think the differences in the way each liquid looks on brown paper towel is great enough that you could identify the unknown liquid?
- Would you be more confident about identifying the unknown liquid if you tested it along with the other liquids on other surfaces in addition to the paper towel?

Tell students that in the next activity, you will give them an unknown sample of one of the liquids they tested, but you won't tell them which one it is. They will decide how to test these liquids on brown paper towel, wax paper, newsprint, and construction paper.