



Science Unit: *Matter*

Lesson 9: *Mixtures of Matter - Part 1*

School year: 2004/2005

Developed for: Queen Alexandra Elementary School, Vancouver School District

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Grade level: Presented to grades 1 - 2; appropriate for grades 1 - 4 with age appropriate modifications.

Duration of lesson: 1 hour and 20 minutes with extension activities for 1 hour and 20 minutes

Notes: Please see the Matter unit, Lesson 10, *Mixtures of Matter – Part 2*; available from the Scientist in Residence Program website <http://www.scientistinresidence.ca>

Objectives

1. Learn about mixtures of matter, with a focus on liquid mixtures and solid mixtures.
2. Discover that some liquids mix together to form a solution, whereas other liquids don't mix together to form a solution.
3. Discover ways to separate solid mixtures of matter.

Background Information

Matter is anything that occupies space. The three states of matter are solids, liquids and gases. A solid is a state of matter that has its own shape. The shape of solids can change but the solid material takes up the same amount of space. Liquids and gases are states of matter that do not have their own shape. Liquids take up the same amount of space regardless of the size and shape of the container. Gases do not always take up the same amount of space and you cannot pick up a gas unless it is contained in something. All matter is made up of molecules and molecules are made up of atoms and sub-atomic particles. Most types of matter are mixtures and contain more than one substance or chemical. Many solid objects contain a mixture of substances. For example, rocks are comprised of a mixture of different minerals. The substances in a mixture may or may not be uniformly distributed. Water is a very good solvent. Many types of matter can dissolve in water to form a solution containing tiny particles of matter that are evenly distributed throughout the liquid solution. Solutions can be a liquid dissolved in another liquid, a solid dissolved in a liquid, a gas dissolved in a liquid, or a gas dissolved in another gas. A suspension is a mixture of liquid and tiny solid particles but these particles can settle out if the suspension is left undisturbed for a period of time. The substances in mixtures can be separated by a variety of methods based on the physical characteristics of the substances. Examples of methods to separate mixtures of matter include using a sieve or a magnet, decanting, filtration, distillation, evaporation, centrifugation, and chromatography.

Vocabulary

Matter: Something (a substance) that occupies space; what something is made of; the three states of matter are solids, liquids and gases; matter is made up of molecules.

Mix: To put together or blend together.

Mixture: A combination of two or more types of matter.

Dissolve: To mix a type of matter into a liquid to form a solution.



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Solution: Mixing one or more types of matter to form a uniform mixture; for liquids, a solution is made of uniformly dissolved tiny particles of matter evenly distributed in a liquid.

Solvent: A type of matter, usually a liquid that can dissolve another type of matter.

Suspension: Solid particles that are evenly dispersed or suspended in a liquid but are not dissolved.

Materials

- clear plastic cups
- water
- milk
- vegetable oil
- liquid food coloring
- raisins
- Cheerios
- wooden sticks
- spoons
- sugar
- sand
- pebbles
- rice
- glass bowl
- magnets
- iron filings
- sieves
- plastic bowls
- tall, clear drinking glass
- orange juice

Additional liquids can be brought to the classroom for students to experiment with such as corn syrup, maple syrup, soy sauce, orange juice, tomato juice, and cranberry juice.

In the Classroom

Introductory Discussion

1. Discuss different types of mixtures of matter (liquid/liquid; liquid/solid; solid/solid). Pour water in a clear drinking glass. Ask a student helper to describe sugar (white crystals, a solid). Ask the student to add a teaspoon of sugar into the water and to stir the water.
2. What happened to the sugar when it was added to the water? (It dissolved and went into solution.)
3. What does the word dissolve mean? What does the word solution mean?
4. Add orange juice to the water/sugar solution and stir.
5. What happened when orange juice was added to the water? (The orange juice went into solution with the water and sugar.)
6. Review vocabulary words.
7. Ask students to describe different types of mixtures of matter.
8. Show students raisins, Cheerios, and rice and discuss solids. Mix the raisins, Cheerios and rice together in a glass bowl.
9. Do the solids remain the same or change in the mixture?
10. What will happen if I add water?
11. What does the word separate mean? How can we separate the solids?
12. Describe the individual steps for the science activity to mix different liquids together. Discuss predictions of what will happen when the different liquids are added together and record predictions on a flip chart. Ask students to focus on what they see during each step of the activity and to record their observations and think about whether any of the liquids mix together and form a solution.



13. Safety rules: Do not put anything in your mouth or near your eyes. Wash hands at the end of the activity.

Science Activity/Experiment

1. Students will experiment with mixing different liquids together (water, oil, milk, and food coloring). Students will be divided into 6 groups of 3-4 students per group.
2. Prior to the experiment, place 4 empty, clear plastic cups and 2 small bottles of food coloring (different colors) on the table for each group of students.
3. Label cups with the words corresponding to the liquids that will be poured into the cups (1 cup each for milk and oil and 2 cups for water). Mark 3 lines on one of the cups that will contain water to designate a cup filled $\frac{1}{4}$ full, $\frac{1}{2}$ full, and $\frac{3}{4}$ full.
4. Pour an equal volume of water, oil and milk into 3 of the cups so that each liquid fills the cup $\frac{1}{4}$ full. Pour the same volume of water into the fourth cup.
5. Ask students to focus on what they see during each step of the activity, to record their observations, and to think about whether any of the liquids mix together and form a solution.
6. First, students will pour the oil into the cup, containing the water, that has 3 lines designating $\frac{1}{4}$ full, $\frac{1}{2}$ full, and $\frac{3}{4}$ full. Students will record their observations on their activity sheet.
7. Second, students will pour milk into the other cup containing water and record observations.
8. Third, students will pour half the volume of the water/milk solution into the cup containing water/oil to the level of the top line drawn on the cup ($\frac{3}{4}$ full), and students will record their observations.
9. Forth, students can slowly add drops of food coloring into the cup containing, water, oil and milk and record observations.
10. Lastly, students can gently mix the liquids in the cup and observe what happens.
11. Science Journal: Students will record observations for each step of the activity as described above.
12. Students can then be given empty plastic cups, additional types of liquids, and students can first make predictions about what will happen when different liquids are mixed together, and then experiment with mixing the liquids together. Observations can be recorded in their science journal.

Closure Discussion

1. Review concepts regarding mixtures of liquids.
 - What kind of changes did you see when you mixed different liquids together?
 - What liquids remained the same?
 - What mixtures did you make?
 - What liquids don't mix together?
 - Did the liquids have different densities? Reinforce what was learned about density in the Density and Mass lesson (Matter Unit 1, Lesson 4).
 - What discoveries did you make while mixing liquids together?
 - What surprised you when you mixed the different liquids together?



References

1. [e.encyclopedia Science](#), Google. 2004. Pp. 10-21, DK Publishing Inc.
2. Hann, Judith. 1991. How Science Works. A Reader's Digest Book. Pp. 14-35. Dorling Kindersley Limited, London, England.
3. <http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch18/soluble.php> Solubility, Why do Some Solids Dissolve in Water? Bonder Research Web, The Bonder Group, Division of Chemistry Education, Purdue University.
4. <http://www.sugar.org/facts/what.html> Sugar Facts, The Sugar Association.
5. <http://www.newton.dep.anl.gov/askasci/chem99/chem99484.htm> Polar vs Nonpolar Molecules, Ask a Scientist, Chemistry Archive [Information about why oil and water don't mix]. Department of Energy, USA.

Teacher Assessment of Learning

1. Teacher will circulate throughout groups and listen to conversations for appropriate predictions and conclusions.
2. The teacher will review recording sheets for accuracy.

Extension of Lesson Plan

Separate solid mixtures

Experiment with mixtures of solid objects such as sand, pebbles, sugar, and iron filings. Students can devise ways to separate the mixtures using a magnet, different sized sieves, and water.

Objective

The students will be able to name at least two ways to separate solid mixtures of matter.

Materials

- sand
- iron filings
- sugar
- pebbles
- magnet
- containers
- sieves

Introductory Discussion

Review background information and vocabulary from the Mixtures of Matter Part 1 lesson (page 1 of this lesson). Introduce materials to be used in the experiment. Have students predict which solids can and cannot be separated after they are mixed (i.e. sand and sugar) and record their responses. List the steps of the experiment on chart stand paper and review the experiment with students.

Science Experiment

1. Students are divided into groups of four students per group and given the necessary materials.
2. Quickly review predictions and have children mix sand and pebbles. Ask the questions, "Did they mix?" "How can we separate them?" Now have students attempt separating using materials provided. Have students note whether their prediction was correct.
3. Repeat number two, first using sand and sugar, then using sand and iron filings.



Closing Discussion

During the experiment, the predictions for each combination of solids were discussed after they were mixed and separation was attempted. For this lesson there was no closing discussion.

Teacher Assessment

Teacher observes children's responses to each step in the experiment.

Name: _____

MIXTURES OF MATTER: ADDING DIFFERENT LIQUIDS TOGETHER

1. WATER + OIL

My drawing

My observations

2. WATER + MILK

My drawing

My observations

MIXTURES OF MATTER: ADDING DIFFERENT LIQUIDS TOGETHER

3. WATER + OIL + MILK

My drawing

My observations

4. WATER + OIL + MILK + FOOD COLORING

My drawing

My observations

Name: _____

MIXTURES OF MATTER: ADDING DIFFERENT LIQUIDS TOGETHER

I learned that:

I was surprised by:

MIXTURES OF MATTER: WATER + SOLIDS

1. WATER SAND WATER + SAND

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How many teaspoons of sand did you add to the water?

What happened when you mixed sand and water?

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2. WATER SUGAR WATER + SUGAR

--	--	--

How many teaspoons of sugar did you add to the water?

What happened when you mixed sugar and water?

--

MIXTURES OF MATTER: WATER + SOLIDS

3.

WATER

KOOLAID

WATER + KOOLAID

How many teaspoons of KoolAid did you add to the water?		
What happened when you mixed KoolAid and water?		

Name: _____

MIXTURES OF MATTER: WATER + SOLIDS

I learned that:

I was surprised by:
