How Do They Mix?	Grade 2 - Properties of Liquids & Solids

Lesson Plan

Safety Notes

Do not consume any of the substances being mixed. Handling hot water should be done with adult supervision.

Description

In this lesson, students will learn about liquids and solids. They will mix up different solids and liquids to make a sugar scrub and play dough and see how the properties of the materials change.

Materials

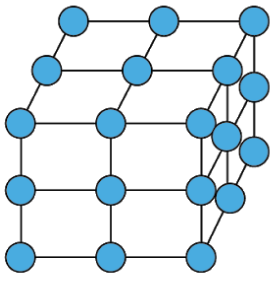
Do They Mix?
- Skittles or M&M's
- Two colourless glasses
- Water
- Cooking Oil

Sugar Scrub
- Jars with lids
- Sugar
- Oil (vegetable, olive, coconut, etc.)
- Two bowls
- Wooden spoon
- Optional: Food colouring
- Optional: Essential oil

Play Dough
- Flour
- Salt
- Water
- Cooking oil
- Cream of tartar or lemon juice
- Optional: Food colouring

Science Background

Everything around us, from the air we breathe to the ground we stand on is made of matter. Matter is made up of particles that are too small to see. There are three main states of matter, solid, liquid and gas.



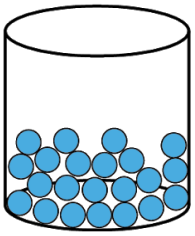
The particles of a solid are closely packed together and maintain their shape

The state of any given type of matter depends on how close together the particles are. When particles are excited and have energy, they move around much more freely than particles that don't have a lot of energy. This is like how when we're cold, we huddle up together and shiver, whereas when it's nice and warm, we can run around outside and take up more space. Water in the form of ice has particles that are much closer together and have less energy than water in the form of steam.

To define matter, we look at its properties, or abilities. The physical properties of matter include its colour, shape, size, texture (how it feels), hardness, flexibility (how it bends), smell, and taste. These

properties can be seen without changing the state of matter. Liquids also have special properties like how they flow. Some liquids are thicker, stickier, and flow more slowly than others.

Some liquids and solids are easy to identify. Water is obviously a liquid, and ice is obviously a solid. What about things that have physical properties of both a solid and a liquid like toothpaste or hair gel? Don't forget that liquids and solids aren't opposite states of matter. Some solids actually "pour" or "flow" in the same way liquids do, like how sugar pours from a bag or how sand pours from a bucket. A group of many small particles of solid materials can pour like a liquid but each individual particle maintains its own shape.



The particles of a liquid are further apart and take the shape of their container

A mixture is the combination of two or more materials that sometimes can be undone and sometimes can't. Some materials mix evenly so you can't tell them apart - like when you dissolve salt in water. This is called a solution. Others stay separate even when you combine them, like if you were to add gravel to water. There are lots of different kinds of mixtures. Some mixtures, like water and salt mix so evenly that it looks all the same. Some mixtures will separate over time, like pulp in juice. Some things do not mix evenly at all, like gravel and water. Some materials cannot mix at all, like oil and water. How materials mix depends on their properties and how they react together chemically.

We can use different mixtures of liquids and solids for all kinds of useful things. Each component of a mixture has a purpose. For example hot chocolate powder and water. This mixture contains sugar to make it sweet, cocoa powder to make it chocolate, milk powder to make it creamy, salt, vanilla, and marshmallows for flavour, all mixed into water. All of the components will mix in evenly, except for the marshmallows.

Activity Procedure

Do They Mix?

1. Pour some water into one colourless glass.
2. Pour a similar amount of oil into the second colourless glass.
3. Put one piece of your candy of choice into each glass and observe.
    a. What did you notice about the candy in the glass of water vs. the glass of oil?
    b. Do you think combining two things that don't mix completely can still be useful? Why or why not?

Sugar Scrub

1. Place ½ cup of oil in a bowl.
2. Optional: If using coconut oil, it can be melted on the stove top prior to adding sugar. Or, keep it solid and use a hand mixer.
3. Add ½ cup of granulated sugar to the bowl and mix well.

4. Optional: Add 2-3 drops of food colouring and/or essential oil and mix well.
5. Place the sugar scrub into a jar and seal the lid for storage.
6. Optional: Get creative with making a nice label for your jar!

Play Dough

Note: Using hot water should be done with adult supervision

1. Combine 2 cups of all-purpose flour, ½ cup of salt, and 3 tbsp of cream of tartar together in a large bowl.
2. In a separate bowl, pour in 1 cup of hot water (from the hot water tap), and 1 tbsp of oil. If using lemon juice instead of cream of tartar, add 9 tbsp of lemon juice.
3. Optional: Add a few drops of food colouring to the water/oil to give your play dough a pretty colour.
4. Next, pour the water/oil solution into the bowl of dry ingredients and mix well with your hands.
5. Remove from the bowl and knead the dough until smooth.
6. Store the play dough inside a resealable bag to keep soft. If stored properly, it can keep soft for up to 3 months.

Debrief

Do They Mix?/Sugar Scrub

How things mix depend on their properties. The shell surrounding the candy is made of different kinds of sugar and dye. Both of these dissolve in water but not oil. Dissolving means that they mix very well so that we cannot tell them apart from each other. This means the sugars dissolve in your mouth so the candy tastes sweet.

Sugar cannot mix with oil. They will remain as grains of sugar in the mixture. The grains sugar make a gentle abrasive that, when scrubbed against the skin, helps remove dead skin cells and makes the skin nice and soft. This kind of beauty product that softens the skin with an abrasive is called an exfoliant.

The food colouring does not mix with oil either but it can mix with sugar. So the food colouring is colouring the sugar rather than the oil. Test this out by trying to mix some food colouring and oil!

Play Dough

A mixture is when substances are physically combined but no reaction has taken place. Play dough is made of flour, salt, oil, cream of tartar and water. On their own, each part is not like

play dough at all. But combined they made a really fun dough! To start, the flour and salt are combined to make a mixture and the water, food colouring and cream of tartar are mixed to make a solution. When these mixtures are combined, the flour absorbs the solution. The water, salt and kneading breaks down the flour. This lets the flour stick together better, helping to hold the water in place and keeping the dough together. This is a chemical reaction and would be very difficult to turn the flour back to how it was before. The oil coats the other ingredients and helps to keep it from drying out. The cream of tartar makes the dough stiffer. It also acts as a preservative, keeping the play dough from going bad. And of course, the food colouring molecules spread throughout the dough to give it that pretty colour.

Solids and Liquids - How do they Mix? Grade 2: Properties of Liquids and Solids

1. Draw a line matching the image to the correct state (Liquid or Solid)

Ice

Water

Oil

Orange Juice

Orange Juice bottle

Popsicle

Chair

Honey

Liquid

Solid

2. Fill in the blanks (Liquids or Solids)

a. _____ take the shape of the container they are in.

b. _____ keep their shape no matter what container they are in.

c. When poured, _____ flow.

d. Some _____ actually "pour" or "flow" in the same way _____ do.

e. A group of many small particles of _____ materials can pour like a _____ but each individual particle maintains its own shape.

3. For the following statements circle if they are True or False.

a. All solids dissolve in all liquids. True False

b. Liquids take the shape of their container. True False

c. Solids can change shape. True False

d. Salt does not evenly mix with water. True False

Solids and Liquids - How do they Mix?	Grade 2: Properties of Liquids and Solids

1. Draw a line matching the image to the correct state (Liquid or Solid)

Ice **(SOLID)**

Water **(LIQUID)**

Oil **(LIQUID)**

Orange Juice **(LIQUID)**

Orange Juice bottle **(SOLID)**

Popsicle **(SOLID)**

Chair **(SOLID)**

Honey **(LIQUID)**

Liquid

Solid

2. Fill in the blanks (Liquids or Solids)

   a. **Liquids** take the shape of the container they are in.

   b. **Solids** keep their shape no matter what container they are in.

   c. When poured, Liquids flow.

   d. Some **Solids** actually "pour" or "flow" in the same way **liquids** do.

   e. A group of many small particles of **solids** materials can pour like a **liquid** but each individual particle maintains its own shape.

3. For the following statements circle if they are True or False.

a.	All solids dissolve in all liquids.	True	**False**
b.	Liquids take the shape of their container.	**True**	False
c.	Solids can change shape.	**True**	False
d.	Salt does not evenly mix with water.	True	**False**