10 Minute Science
Matter and Energy

TEKS	Activity Type	Title	Materials Needed
4.6A	Graphic Organizer	Sink or Float	*Sink or Float* Graphic Organizer; pencils; science notebook; scissors; glue or tape

4.6B	Text Card/ Sorting Activity	**All Mixed Up!**	*All Mixed Up!* Text Card; *Mixture/Solution Cards*; projection device'; Science notebook; pencil
	Text Card	**Making Mixtures**	*Making Mixtures* Text card; projection device; Science notebook; pencil for writing
	Graphic Organizer	**Mixtures**	*Mixtures* Template; scissors; glue or tape; pencils; Science notebook
	Analyzing Photographs/ Discussion	**Mixtures and Solutions**	*Mixtures and Solution* Photographs; projection device; Science notebooks; pencil for writing
	Graphic Organizer	**Solutions**	*Solutions* Template; scissors; glue or tape; pencils; Science notebook
	Investigation	**State Your Solution**	Per group: 2 clear, plastic glasses; water; powdered drink mix; blue and yellow food coloring; salt or sugar; plastic spoon; 2 stirring sticks; paper towels; Science notebook; pencils
4.6C	Analyzing Diagram/ Discussion	**Oil, Water, and Sand**	*Oil, Water, and Sand* Diagram; projection device; Science notebooks; pencil for writing

4.6A

4.6 Matter and energy. The student knows that matter has measurable physical properties that determine how matter is identified, classified, changed, and used. The student is expected to:

(A) Classify and describe matter using observable physical properties, including temperature, weight, magnetism, relative density (the ability to skin or float in water), physical state (solid, liquid, gas), and volume.

4.6A Measurable Objectives

Classify and describe matter based on physical properties of matter, including:

- Temperature (4.6A.1)
- Mass (4.6A.2)
- Magnetism (4.6A.3)
- Relative density (the ability to sink or float in water) (4.6A.4)
- Physical state (solid, liquid, gas) (4.6A.5)

4.6A Key Concepts

- Matter is anything that has mass and takes up space.
- Matter can be classified and described by its physical properties.
- Temperature, mass, magnetism, relative density and physical state are all physical properties of matter.
- Physical properties can be observed and tested.

4.6A Key Questions

- What is matter?
- What are physical properties?
- How can matter be compared and classified by its physical properties?
- What is temperature?
- What is mass?
- What is magnetism?
- What is relative density?
- What is physical state?

4.6A, continued

4.6A Clarifications

- Matter is anything that has mass and takes up space.
- Matter has a variety of properties that can help us compare, classify, and describe it. These properties can be identified by measuring, testing, or observing.
- Temperature (4.6A.1) is defined scientifically as the measure of the average kinetic energy of the particles in a substance. For fourth grade students, temperature can be defined as how hot or cold something is as measured by a thermometer. Temperature at this grade level is measured using a Celsius thermometer (4.1D).
- Mass (4.6A.2) is the amount of matter in a substance or object. Mass is measured in grams (g) or kilograms (kg) using a balance or a digital scale (4.1D). (Mass is different from weight, which refers to the pull of gravity. On Earth, the measurement for mass and weight is virtually the same. However, these measurements vary on other planets, the moon, or in space. When teaching the properties of matter, it is better to emphasize the term *mass* and avoid using the term *weight*.)
- Magnetism (4.6A.2) is the pulling force between an object and a magnet. Magnets attract objects or substances that contain the elements iron, nickel, or cobalt. Magnets can also attract or repel (push away) other magnets.
- Relative density (4.6A.4) is a measure of how the density of an object compares to the density of water. An object having more density than water will sink. An object having less density than water will float on top of the water. An object having the same density as water will float but may float below the surface of the water.
- Physical state (4.6A.5) describes the form that matter can take: solid, liquid, or gas. A solid has a definite shape and a definite volume. A liquid has a definite volume but takes the shape of its container. A gas has no definite volume or shape because it spreads out to fill whatever space it occupies.

4.6A TEKS Study

Verbs: What should students be doing?

- *Classify*–to put in groups according to similar physical properties
- *Describe*–to tell what something is like

Nouns: What vocabulary terms should students know?

- *Mass*–the amount of matter in an object
- *Matter*–anything that has mass and takes up space
- *Magnetism*–a force that pulls magnetic materials (those containing cobalt, iron, or nickel) across a distance
- *Physical property*–a characteristic of matter that you can observe and test
- *Physical state*–the form that matter can take (solid, liquid, gas)
- *Relative density*–the ability of a material to sink or float in water
- *Temperature*–how hot or cold something is

4.6B

4.6 Matter and energy. The student knows that matter has measurable physical properties that determine how matter is identified, classified, changed, and used. The student is expected to:

(B) Investigate and compare a variety of mixtures, including solutions that are composed of liquids in liquids and solids in liquids.

4.6B Measurable Objectives

Investigate and compare a variety of mixture, including:

- Liquids in liquids (4.6B.1)
- Solids in liquids (4.6B.2)
- Solids in solids (4.6B.3)*

*This is an implied objective that is not stated in the Student Expectation.

4.6B Key Concepts

- A *mixture* is a combination of at least two or more different substances (ingredients) that maintain their physical properties when combined — for example, sand and water, or raisins and peanuts.
- When one or more substances dissolve in another, a special mixture called a *solution* is created.
- Mixtures to be investigated and compared can be composed of solid/solid, liquid/liquid/ and liquid/solid. (Gases can also be mixed with other gases and liquids. That is beyond the scope of this Student Expectation.)
- All solutions are mixtures, but not all mixtures are solutions.

4.6B Key Questions

- What is a mixture?
- What is a solution?
- How does a solution differ from a mixture?
- What is an example of a mixture of two solids?
- What is an example of a mixture of a liquid and a solid?
- What is an example of a mixture of two liquids?

4.6B, continued

4.6B Clarifications

- A mixture is a combination of two or more substances where each substance keeps its original characteristics (physical properties). Mixtures can usually be reversed or separated (such as peanuts in trail mix).
- Mixtures can be divided into four types: homogeneous, heterogeneous, suspension or colloid.
  - Many mixtures are heterogeneous, created by combining two or more ingredients whose particles are large enough to be easily seen and do not dissolve together. The ingredients are not evenly distributed throughout the mixture.
  - A solution is a homogeneous mixture in which one or more ingredients dissolve in another ingredient. A homogeneous mixture has the same proportion of components throughout any given sample.
  - A suspension is a mixture in which solid particles are dispersed and suspended throughout a liquid. The solid particles will settle and separate from the liquid over time if the mixture is left undisturbed.
  - A colloid is a homogeneous mixture in which very small particles of one ingredient are dispersed throughout a second ingredient. Some examples of colloids are milk, mayonnaise, fog, and oobleck. (The particles in a colloid do not separate out if the mixture is left undisturbed. However, chemical changes may occur in the colloid, such as milk souring.)
- Mixtures can be made up of matter in any physical state.
- Because each part of a mixture keeps its own physical properties, you can use the different properties of the ingredients to separate them after they are mixed.

4.6B TEKS Study

Verbs: What should students be doing?

- *Investigate*–to study by close examination, observation, or testing
- *Compare*–to tell how one thing is like or unlike something else

Nouns: What vocabulary terms should students know?

- *Dissolve*–to spread out and form a solution with another substance or ingredient
- *Ingredient*–one of the substances that makes up a mixture
- *Liquid*–state of matter that has a definite volume but takes the shape of its container
- *Matter*–anything that has mass and takes up space
- *Mixture*–a combination of two or more ingredients that do not form a new substance
- *Solid*–state of matter with a definite volume and shape
- *Solution*–a special kind of mixture in which one ingredient dissolves in another

4.6C

4.6 Matter and energy. The student knows that matter has measurable physical properties that determine how matter is identified, classified, changed, and used. The student is expected to:

(C) Demonstrate that matter is conserved when mixtures such as soil and water and oil and water are formed.

4.6C Key Concepts

- A *mixture* is a combination of at least two or more different substances (ingredients) that maintain their physical properties when combined — for example, soil and water, or oil and water.
- The amount of matter is *conserved* when two or more substances are mixed. For example, if 4 mL of water is mixed with 4 mL of orange juice, there will be 8 mL of liquid in the mixture.
- Mixtures can consist of a solid mixed with a liquid, two liquids mixed together, or a solid mixed with other solids.

4.6C Key Questions

- What is a mixture?
- What does conserving matter mean?
- How can I tell if matter is conserved when two or more ingredients are combined to form a mixture?

4.6C Clarifications

- A mixture is a combination of two or more substances where each substance keeps its original characteristics (physical properties). Mixtures can usually be reversed or separated (such as peanuts in trail mix).
- Mixtures can be made up of matter in any physical state.
- Because each part of a mixture keeps its own physical properties, you can use the different properties of the ingredients to separate them after they are mixed.
- Because each part of a mixture keeps its own physical properties, the amount of matter in the mixture equals the amount (mass, volume, etc.) of each ingredient added to it.

4.6C, continued

4.6C TEKS Study

Verbs: What should students be doing?

- *Demonstrate*–to show clearly

Nouns: What vocabulary terms should students know?

- *Conserved*–the amount of matter stays the same
- *Ingredient*–one of the substances that makes up a mixture
- *Liquid*–state of matter that has a definite volume but takes the shape of its container
- *Matter*–anything that has mass and takes up space
- *Mixture*–a combination of two or more ingredients that do not form a new substance
- *Solid*–state of matter with a definite volume and shape

All Mixed Up!

TEKS:

4.6B Investigate and compare a variety of mixtures, including solutions that are composed of liquids in liquids and solids in liquids.

Materials: (Per group)

All Mixed Up! Text Card
Projection Device
Pencil
Mixture/Solution Cards
Science notebook

Advanced Procedures:

- Prepare to show the text card and solution/mixture cards on the projection device.

Facilitation:

- If desired, review what students know about mixtures and solutions.
- Display the text card.
- Have volunteers read each paragraph. Point out and discuss the illustrations where appropriate.
- In their science notebooks, have students create and complete a T-chart sorting the picture cards into two categories: Mixture Only and Solution.
- Discuss as desired.

All Mixed Up!

Why do some ingredients seem to disappear when you mix them together? Why don't others? That's because some ingredients form mixtures while others form solutions!

Blueberries do not spread evenly throughout a dish of cream. If you eat this, only some spoonfuls of the mixture have blueberries.

However, sugar stirred into water makes a solution. The sugar dissolves, or seems to disappear, because it spreads out evenly throughout the water.

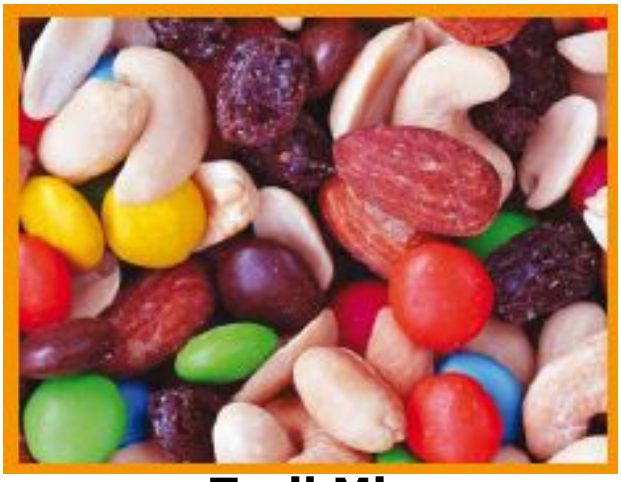
Sand does not dissolve when it is stirred into water. These ingredients form a mixture—a combination of at least two ingredients with different properties. The ingredients in a mixture can usually be separated easily. It can be more difficult to separate the substances in a solution!

Try This:

Create a T-chart in your science notebook. Label one column *Mixtures Only* and the other *Solutions*. Look at the pictures as they are displayed. Write the ones that are mixtures without an ingredient dissolving in the *Mixtures Only* column. List the solutions in the *Solutions* column.

Cement with Pebbles

Tea



Trail Mix

Cough Syrup

Cookie Dough

Perfume

Making Mixtures

TEKS:

4.6B Investigate and compare a variety of mixtures, including solutions that are composed of liquids in liquids and solids in liquids.

Materials: (Per group)

Making Mixtures Text Card
Projection Device
Pencils
Science notebook

Advanced Procedures:

- Prepare to show the text card and solution/mixture cards on the projection device.

Facilitation:

- If desired, review what students know about mixtures and solutions.
- Display the text card using a projection device.
- Have volunteers read each paragraph. Point out and discuss the illustrations where appropriate.
- As students read, ask for other examples of mixtures (i.e., liquid + liquid; liquid + gas; etc.)
- In their science notebooks, have students write the definition of a mixture using their own words.
- Discuss as desired.

Making Mixtures

Mixtures can be a combination of ingredients from all three states of matter.

Solid + Solid

One way to create a mixture is to mix a solid with another solid. Soil is a mixture of humus (decayed plants or animals and other organic materials), weathered rocks, and small rocks.

Liquid + Solid

A liquid can be combined with one or more solids to form a mixture. Milk is a mixture of liquid water, fat, and milk solids.

Liquid + Liquid

Adding two liquids together can make a mixture. When oil is poured in a glass of water, the oil doesn't dissolve in the water. It floats on top—making a mixture.

Liquid + Gas

A liquid with a gas can make a mixture. Liquid soap mixes with tiny bubbles of gas and puffs into foam when you release it.

Gas + Solid

A gas with a solid can make a mixture. Soot, ash, and partly burned substances mix with hot air to make smoke.

Mixtures

TEKS:

4.6B Investigate and compare a variety of mixtures, including solutions that are composed of liquids in liquids and solids in liquids.

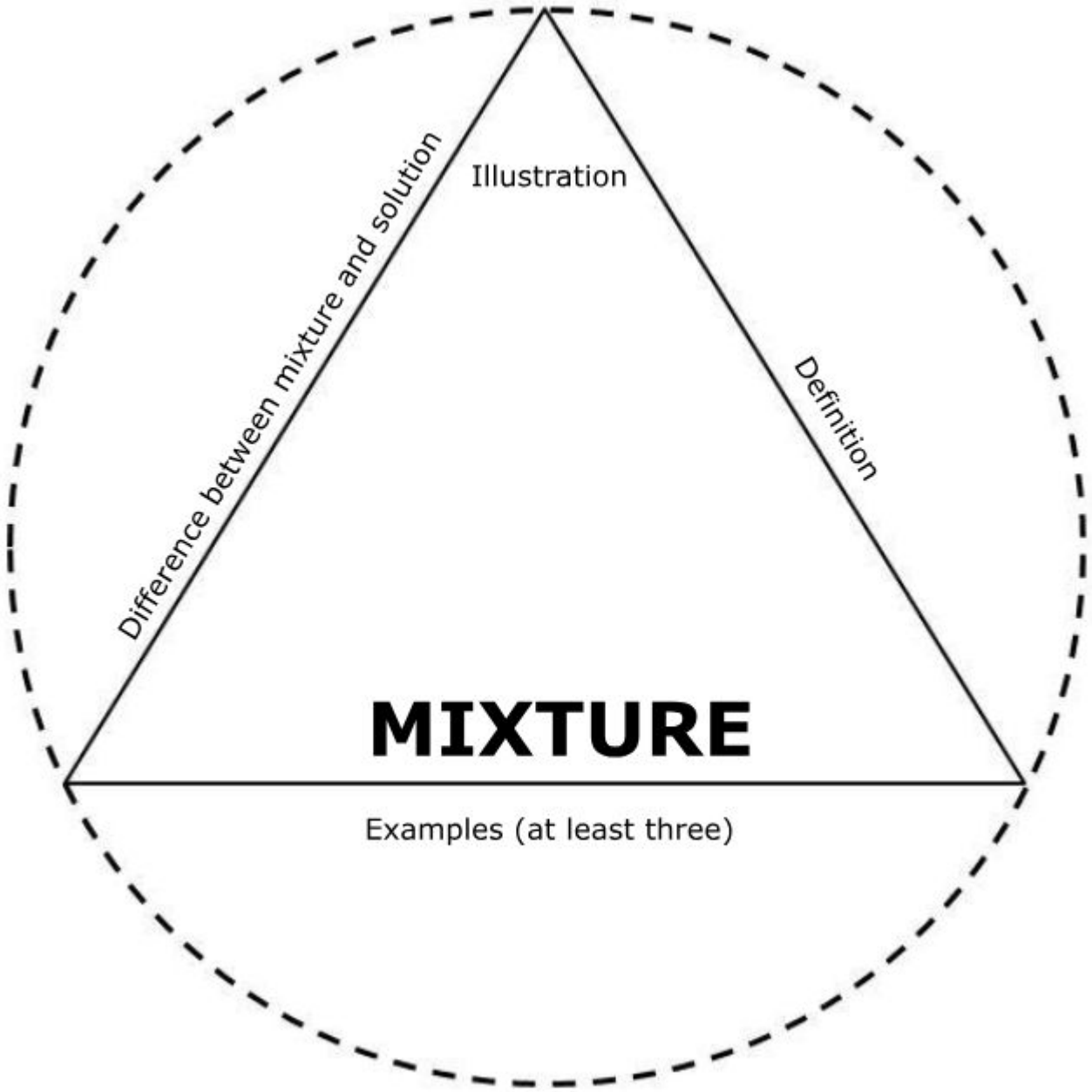
Materials: (Per group)

Mixtures Template
Glue or tape
Scissors
Pencils
Science notebook

Facilitation:

If desired, guide students through the following procedures to complete the right-hand page in their interactive notebooks.

- Add a Table of Contents entry for *Mixtures*.
- Use creative lettering to title the page (*Mixtures*) and add the page number.
- Cut out the template along the dotted line. Fold on the solid lines.
- Complete each tab as directed.
- Glue or tape folded organizer on the prepared notebook page.
- For each example written, have students write about how they would separate each mixture into its original ingredients on the left page of their science notebook.



Mixtures and Solutions

TEKS:

4.6B Investigate and compare a variety of mixtures, including solutions that are composed of liquids in liquids and solids in liquids.

Materials: (Per group)

Mixtures and Solutions Photographs
Projection Device
Pencils
Science notebook

Facilitation:

- Display the photographs using a document camera.
- Have students study the photographs for about a minute.
- Have students discuss what they see in the photograph. If desired, ask the following questions:
  - What do you see in these two photographs?
  - Look very closely. What seems important in these pictures from a scientific point of view?
  - What science term can you use to describe what you see in both pictures?
  - Which picture(s) shows a mixture only? Which picture(s) shows a solution (which is also a mixture)?
  - What ingredients can you see in each mixture?
  - How might you separate each mixture?
  - What vocabulary terms can you associate with each picture?
  - What conclusions can you draw from these two pictures?
  - What else might you infer from the picture?
- In their science notebooks, have students draw a labeled diagram illustrating what happens if liquid water is cooled below its freezing point and heated past its boiling point.

Mixtures and Solutions

Oil, Water, and Sand

TEKS:

4.6D Demonstrate that matter is conserved when mixtures such as soil and water or oil and water are formed.

Materials: (Per group)

Oil, Water, and Sand Diagram
Projection Device
Pencils
Science notebook

Facilitation:

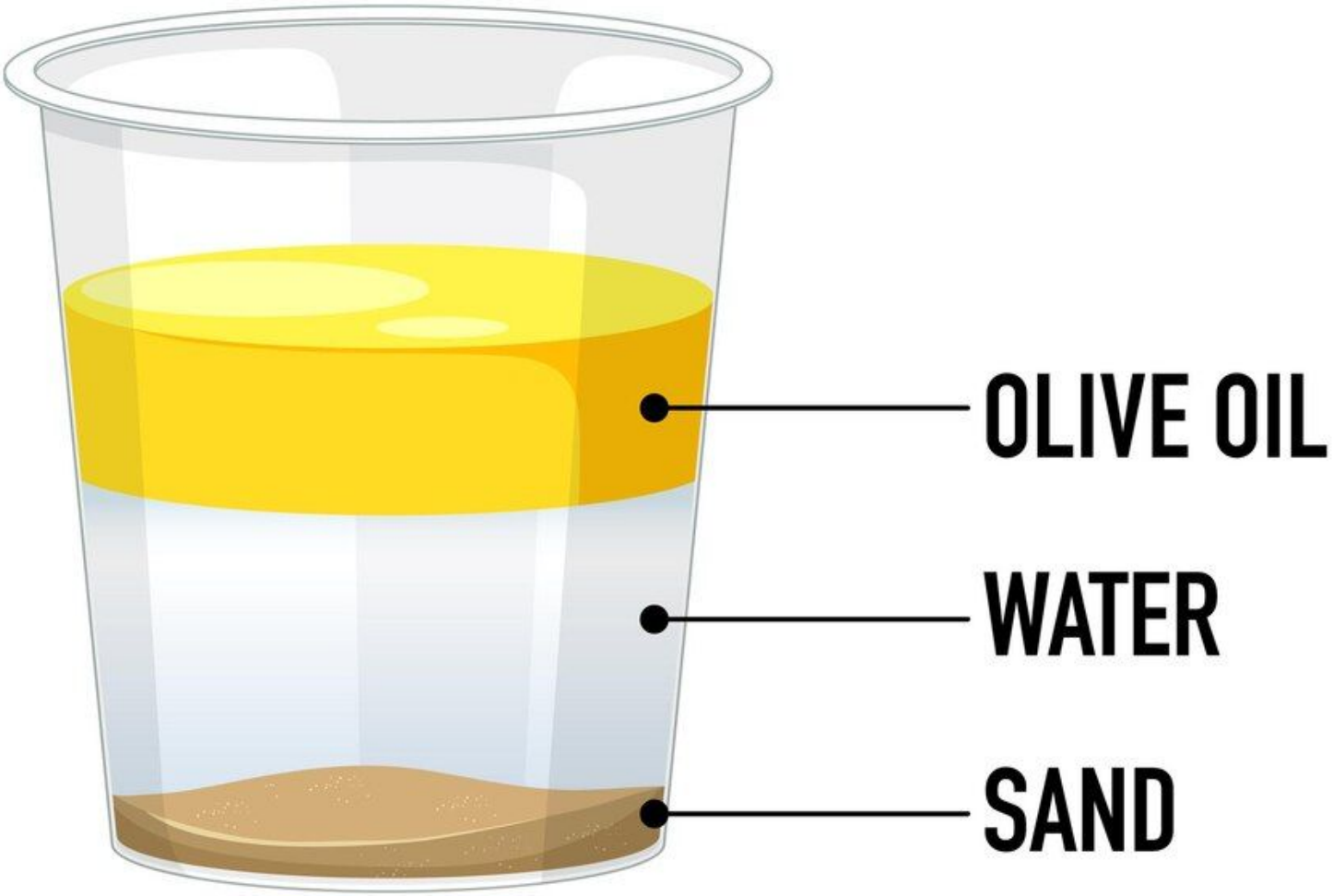
- Display the diagram using a document camera.
- Call on a volunteer to read the introductory sentence.
- Discuss the amounts of sand, water, and oil, that were added to the glass.
- Discuss why the mixture in the glass was left sitting on the table for about 30 minutes.
- Have students discuss what they see in the diagram. If desired, ask the following questions:
  - What does the diagram show?
  - How much water was added to the glass? Olive oil? Sand?
  - What do you think is the total volume of the substances in the glass? Why?
  - What happened to the olive oil after the glass had sat on the table for 30 minutes? Why?
  - What happened to the sand after the glass had sat on the table for about 30 minutes? Why?
  - Did these substances form a solution or a mixture only? Explain your answer.
  - What else might you infer from the diagram?
- In their science notebooks, have students draw a labeled diagram illustrating what happens if a crayon that has a volume of 15 mL is placed in a 50 mL beaker containing 35 mL of water.

Oil, Water, and Sand

Some students poured the following amounts of matter in a plastic cup.

Olive Oil	Sand	Water
20 mL	40 mL	5 mL

The diagram shows how the mixture looked after sitting on the table for about 30 minutes.



Sink or Float

TEKS:

4.6A Classify and describe matter using observable physical properties, including temperature, mass, magnetism, relative density (the ability to sink or float in water), physical state (solid, liquid, gas).

Materials: (Per group)

Sink or Float Graphic Organizer
Science notebook
Scissors
Pencils
Glue or tape

Facilitation:

- Duplicate a copy of the graphic organizer for each student.
- Show students an object. Brainstorm its physical properties.
- Remind students that relative density (the ability to sink or float in water) is also a physical property of matter.
- Discuss if the object you displayed would most likely sink or float in water.
- Display the graphic organizer.
- Read through the directions with the students.
- Have them complete the graphic organizer independently in their science notebooks
- Discuss as desired.

Sink or Float

A student tested the five objects shown below to see if they would float or sink when placed in water. The nail, keys, and egg sank. The ball and apple floated.

Nail **Ball** **Keys** **Apple** **Egg**

(Not Drawn to Scale)

Draw and complete the data table below to show the results of the student's test. Classify each object by its relative density. Use an X in the table to show if each object has more or less relative density than water.

Data Table		
Object	**More Relative Density**	**Less Relative Density**
Apple		
Ball		
Egg		
Nail		
Keys		

Solutions

TEKS:

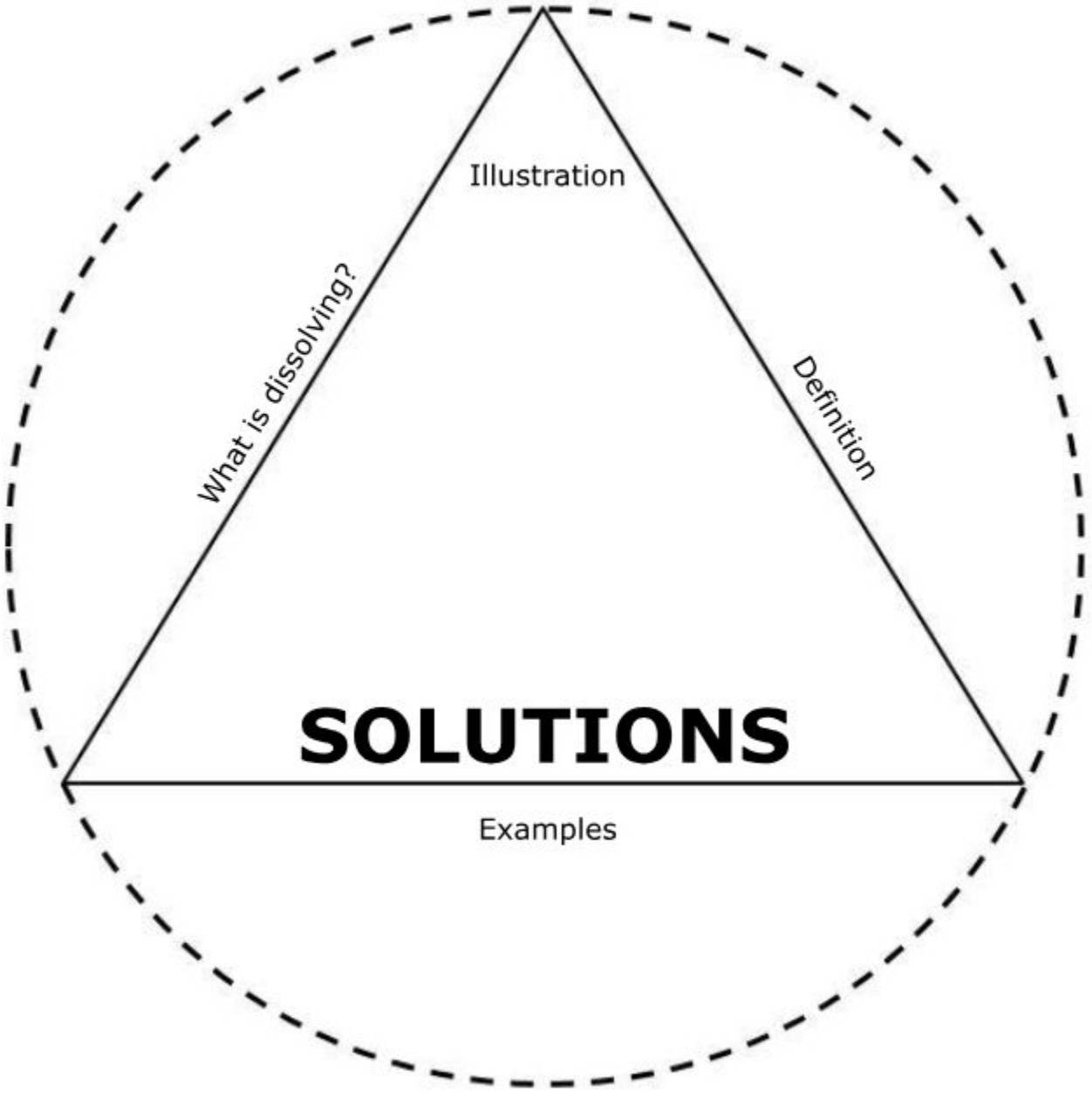
4.6B Investigate and compare a variety of mixtures, including solutions that are composed of liquids in liquids and solids in liquids.

Materials: (Per group)

Solutions Template
Glue or tape
Scissors
Pencils
Science notebook

Facilitation:

- Demonstrate the difference between mixtures and solutions using the following procedures.
  - Set up two clear glasses of water in front of the class.
  - Add 10-20 mL of sand to the first glass and stir. Ask the student if the glass contains a mixture or a solution. (It is a mixture because the sand and water stay separate with their own physical properties.)
  - Add 10-20 mL of salt to the second glass. Stir the water until the salt totally dissolves. Ask if this is a mixture or a solution. (It is a solution--a homogeneous mixture--because the salt dissolves in the water.)
- Discuss as desired.
- If desired, guide students through the following procedures to complete the right-hand page in their interactive notebooks.
- Add a Table of Contents entry for *Solutions*.
- Use creative lettering to title the page (*Solutions*) and add the page number.
- Cut out the template along the dotted line. Fold on the solid lines.
- Complete each tab as directed.
- Glue or tape folded organizer on the prepared notebook page.
- For each example written, have students write about how they would separate each solution into its original ingredients on the left page of their science notebook.



State Your Solution

TEKS:

4.6B Investigate and compare a variety of mixtures, including solutions that are composed of liquids in liquids and solids in liquids.

Materials: (Per group)

2 clear, plastic glasses
Powdered drink mix
Salt or sugar
2 Stirring sticks
Science notebook
Water
Blue and yellow food coloring
Plastic spoon
Paper towels
Pencil

Advanced Procedures:

- Assemble all of the materials in a central location for ease of distribution.

Facilitation:

- If desired, review what students know about mixtures and solutions.
- Divide the class into groups. Let the groups get the necessary materials for the investigation.
- Display the procedures using a projection device.
- Have volunteers read each step as the groups complete the investigation.
- Circulate among the groups as they work, asking questions and redirecting thinking as needed.
- Discuss as desired.

- Fill two clear, plastic glasses half full of water.
- Carefully place 1 drop of blue and 1 drop of yellow food coloring into one of the cups. DO NOT STIR THIS MIXTURE!
- Use a spoon to sprinkle a small amount of powdered drink mix on the surface of the water in the other cup. DO NOT STIR THIS MIXTURE!
- Watch both cups from the side for about two minutes. Record your observations in your science notebooks.
- Use a stirring stick to stir the glass with the food colorings. Look at the solution in the glass. What happened to the liquid food coloring? Why can you not see the food coloring separate from the water anymore?
- Use another stirring stick to stir the glass with the powdered drink mix. Look at the solution in the glass. What happened to the powdered drink mix? Why can you not see the powdered drink mix separate from the water anymore?