BATTLE CREEK AREA
Mathematics & Science Center

Student Journal

4PS2

States of Matter

A Fourth Grade Unit
supporting the
Michigan Science K-7 Content Expectations

Name: _____

Name: _____

Date: _____

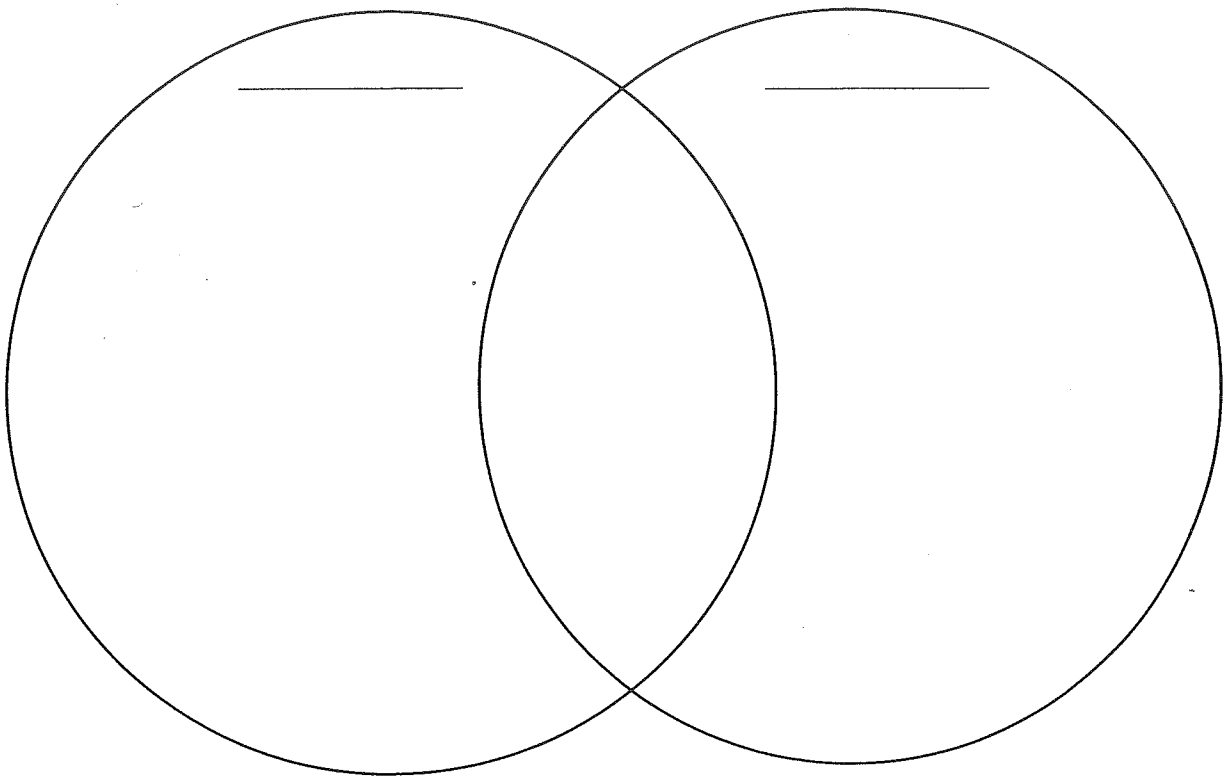
JOURNAL

What Are Properties of Matter?

1

1. Draw and write about the item you described and measured. Write how you know your item is matter.

2. Choose one other item from the class chart. Compare and contrast the items using the Venn diagram.



ACTIVITY

A Little Mass Here, A Little Mass There, A Little Mass Everywhere

Name: _____

Date: _____

2

Part 1

1. Have each person in the group hold the smaller dowel.

2. Predict how many gram cubes would equal the dowel's mass. Record your prediction on the *Mass Data Table.*

3. Hold both cups as you put items in them to keep the balance from flipping. Place the dowel into one cup.

4. Put your estimated amount of gram cubes into the other cup.

5. Put in or take out as many gram cubes you need for the ruler to become level or balanced.

6. Record the actual number of gram cubes it took to mass the object in the data table.

7. Repeat steps #1 - #6 with the rest of the items.

Mass Data Table

Objects	Mass Prediction	Actual Mass
3/4" diameter dowel	____ g	____ g
1" diameter dowel	____ g	____ g
small nail	____ g	____ g
black #3 stopper	____ g	____ g
cork	____ g	____ g
washer	____ g	____ g

Name: _____

Date: _____

A Little Mass Here, A Little Mass There, A Little Mass Everywhere (cont.)

Part 2

1. Design a *Weight Data Table* in the space below. Weigh each object and record the weight in newtons on your data table. (Hint: Use the *Mass Data Table* as a model.)

Weight Data Table

2. Find and weigh another object. Record its weight on the data table.

J O U R N A L

A Little Mass Here, A Little Mass There, A Little Mass Everywhere (cont.)

Name: _____

Date: _____

2

1. List the steps your group used to build and level your balance.

2. Explain how the balance works.

3. Compare and contrast the spring scale and the balance.

Name: _____

Date: _____

ACTIVITY
Solids

3

Part 1

1. Observe each of the solids. Make a chart and record the properties of each item.

2. Look at the data from your chart and write what all the solids you observed have in common.

_____

_____

_____

_____

_____

_____

_____

Name: _____

Date: _____

3

Archimedes and Measuring Volume

Archimedes was a Greek mathematician and scientist. He was born around 287 B.C. and died in 212 B.C. About 250 B.C., Archimedes was given a challenge by the king. The king had ordered a new crown made of pure gold. Archimedes was asked to solve a problem for the king and determine if the king's new crown was indeed solid gold. In determining the make-up of the crown, Archimedes needed to find its volume. The crown was an irregular shape and Archimedes could not use any of his normal measuring instruments. How could he measure the volume of such an oddly shaped object?

Then one day, as Archimedes sank into his bathtub, he observed that the water level in the tub rose. His body displaced, or pushed aside, water in the tub to make room for his body. He determined that this effect could help him measure the volume of the crown. He submerged the crown into a tub of water and measured the amount of water that was displaced by the crown. The submerged crown would displace an amount of water equal to the volume of the crown!

Name: _____

Date: _____

Part 2

1. Using the water in the measuring cup, fill the graduated cylinder to the 50 ml mark with water. If you are a little above the mark, pour some water out. Use the pipette to add water so the bottom curve of the water touches the 50 ml line.

2. Place the marble in the graduated cylinder. Does the water level rise? Record the water level with the marble as the volume of the marble on your chart.

3. Remove the marble from the graduated cylinder by pouring the water and the marble back into the measuring cup.

4. Refill the graduated cylinder with 50 ml of water as you did in step #1. Carefully place the screw in the graduated cylinder head first. Does the water level rise? Record the water level with the screw; calculate the volume of the screw.

5. Remove the screw and repeat the process for the remaining objects.

Object	Volume of water without object	Volume of water with object	Volume of object Volume of water with object - Volume of water without object Volume of object

J O U R N A L

Solids (cont.)

Name: _____

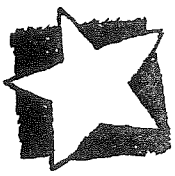
Date: _____

3

Pretend you have just found a solid object on the playground. You don't know what it is. You call a friend on the telephone for help. Write the properties you would use to describe the object.

Name: _____

Date: _____



1. Make observations of the water. Make a chart and record the properties of liquids.

2. Look at the data from your chart and write what properties you observed while exploring water.

_____

_____

_____

_____

_____

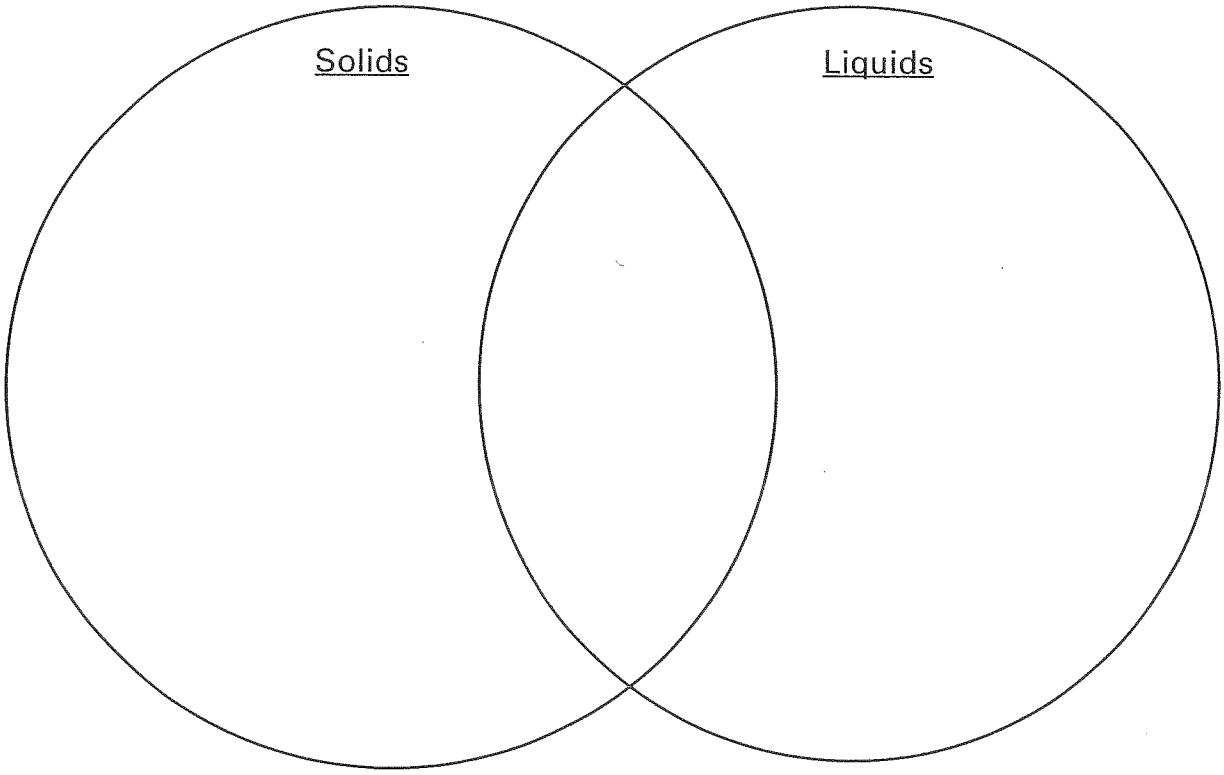
Liquids (cont.)

Name: _____

Date: _____

4

1. Use the Venn diagram to compare the properties of solids and properties of liquids.



2. Write a paragraph that describes how solids and liquids are the same and how they are different.

Name: _____

Date: _____

1. Draw and label how you would demonstrate that air has volume.

2. Explain how you would measure the volume of air in the balloon.

_____

_____

_____

_____

_____

_____

_____

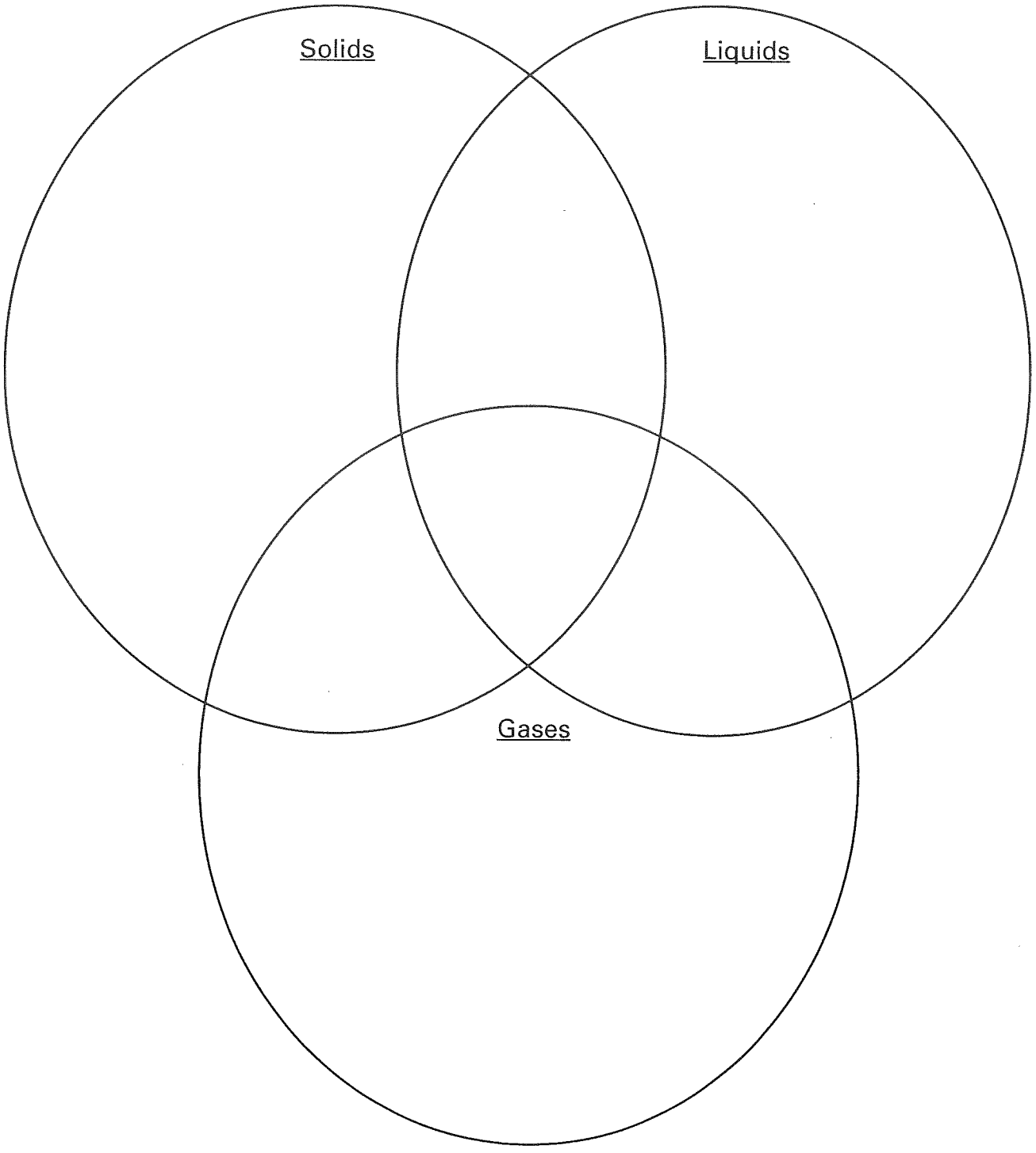
_____

Name: _____

Date: _____

5

1. Use the Venn diagram to compare the properties of solids, liquids, and gases.



Name: _____

Date: _____

2. Write a paragraph that describes how solids, liquids, and gases are the same and how they are different.

ACTIVITY

Air: What Is It?

Name: _____

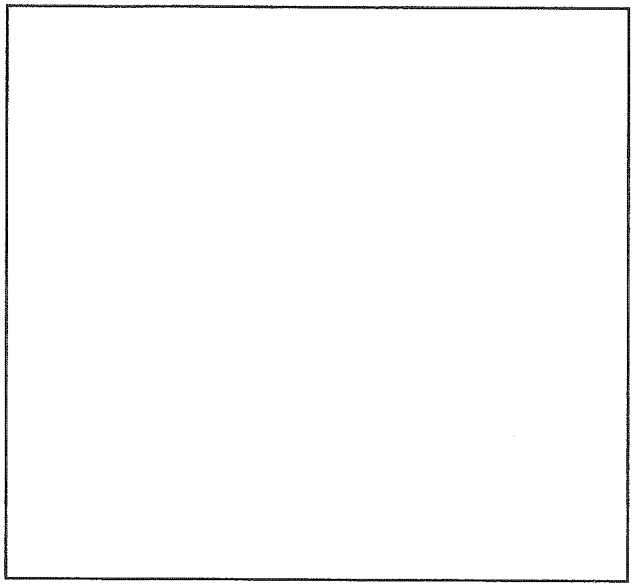
Date: _____

6

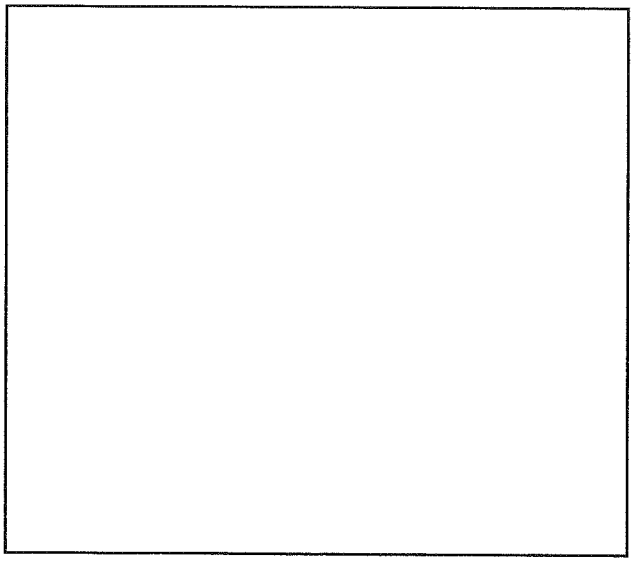
1. Crumple a tissue, push it down, and tape it to the inside of the cup.

2. Turn the cup upside down. Check to see if the tissue stays in the bottom of the cup.

3. Push the cup straight down into the water, all the way. What happened? Draw a picture and write what you observe.

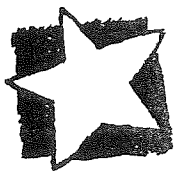


4. Raise the cup straight up out of the water. What happened? Draw a picture and write what you observe.



Name: _____

Date: _____



5. Explain how the tissue stayed dry.

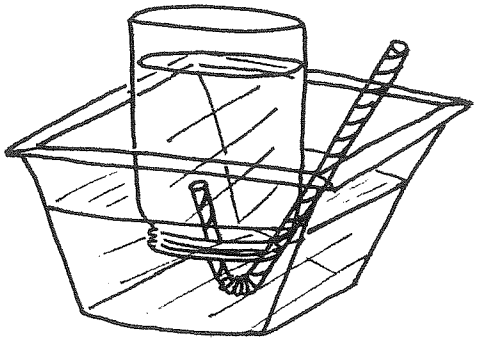
6. What did you learn about air taking up space in this activity?

Name: _____

Date: _____

6

1. Predict: What do you think will happen when you blow in the straw?



2. What did you observe when you blew in the straw?

3. Describe two kinds of evidence you learned that helped you decide air takes up space.

Name: _____

Date: _____

4. What evidence do you have that air is a mixture of gases?

ACTIVITY

It's a Matter of Volume!

Name: _____

Date: _____

7

1. Draw a picture of the volume of water in the beaker before adding the ice cube. Mark the volume of water on the drawing in milliliters.

2. Draw where you think the water level will be after you add the ice cube.

3. Measure the volume of water with the floating ice cube. _____

4. Measure the volume of water with the submerged ice cube. _____

Name: _____

Date: _____

ACTIVITY 7

It's a Matter of Volume!

1. Question: Write the question you are investigating.

_____

_____

_____

2. Materials: List the materials you will use.

3. Procedure: Write the steps you will take.

It's a Matter of Volume! (cont.)

Name: _____

Date: _____

4. Data: Write what data you will collect.

5. Conclusion: Write what you found out.

Name: _____

Date: _____

7

You are asked to prepare a pitcher of water for the family meal. You fill a pitcher 3/4 full of water. Then you add ice that brings the water level all the way to the top of the pitcher. You set it on the table and do homework until dinner is ready. When you return to the dinner table, the ice has melted and the pitcher is no longer full. Did someone take a drink? Explain what happened.

ACTIVITY

Phase Change

8

Name: _____

Date: _____

1. Draw and label a picture of your ice cube before it begins to melt.

2. Draw and label a picture of your ice cube after 10 minutes. Write what you think is happening.

_____

_____

_____

_____

_____

3. Write 3 questions you have about your melting ice.

_____

_____

_____

_____

_____

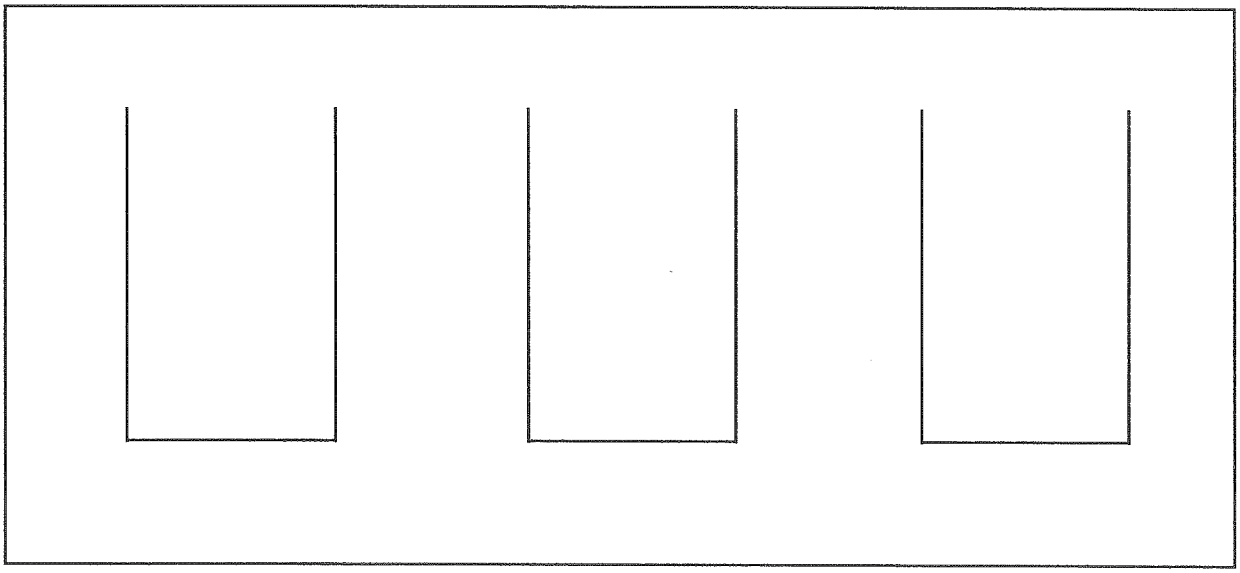
_____

_____

Name: _____

Date: _____

1. Draw and label a model of the arrangement of the water particles in each container.



2. Write how the arrangement and motion of the water particles change from state to state.

_____

_____

_____

_____

_____

3. Explain how water can change from one state to another by heating and cooling.

_____

_____

_____

_____

_____

A C T I V I T Y

Melting and Massing

Name: _____

Date: _____

9

1. Write the question you are investigating.

_____

_____

_____

2. Write what you think will happen.

_____

_____

_____

_____

3. List the materials you will use.

Name: _____

Date: _____

4. Describe the procedure you followed.

5. Make a chart to record your data.

J O U R N A L

Melting and Massing (cont.)

Name: _____

Date: _____

9

6. Write what you learned from your investigation. (Support your claim with evidence and reasoning.)

Name: _____

Date: _____

ACTIVITY

Investigations Into Melting

10

1. Write the question you are investigating.

_____

_____

_____

2. Write what you think will happen.

_____

_____

_____

_____

3. List the materials you will use.

Investigations Into Melting (cont.)

Name: _____

Date: _____

4. Write or draw the steps you will take.

5. Make a chart to record your observations.

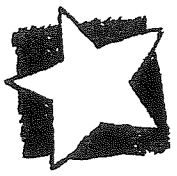
Name: _____

Date: _____

ACTIVITY 10

Investigations Into Melting (cont.)

6. Write a conclusion that answers the questions in your investigation. Include evidence in your conclusion.



A C T I V I T Y

Investigations Into Melting (cont.)

Name: _____

Date: _____

10

Use the following pages to design your investigation into the melting point of a different substance. Be sure to include the question you are asking, what you think will happen, materials you will use, steps you will take, data chart, and conclusion.

1. Write the question you are investigating.

_____

_____

_____

2. Write what you think will happen.

_____

_____

_____

_____

3. List the materials you will use.

Name: _____

Date: _____

Investigations Into Melting (cont.)

4. Draw or write the steps you will take.

5. Make a chart to record your observations.

6. Write what you found out. Use evidence from your data in your conclusion.

_____

_____

_____

_____

_____

ACTIVITY

Physical Change: Liquid to Gas

Name: _____

Date: _____

11

1. Draw a picture of your solar still as it looked at the beginning of the experiment.

2. Draw a picture of your solar still two hours after beginning your experiment.

What changes do you see?

_____

_____

_____

Has there been any change in the water level in the cup? _____

Name: _____

Date: _____

3. Draw a picture of your solar still one day after you began your experiment.

What changes do you see?

_____

_____

_____

Has there been any change in the water level of the cup? _____

4. Describe what is happening inside the solar still.

_____

_____

_____

5. Explain what is happening inside the solar still.

_____

_____

_____

Physical Change: Liquid to Gas (cont.)

Name: _____

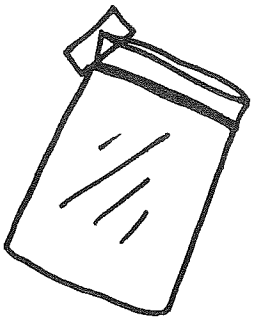
Date: _____

11

1. Explain how a liquid changes to a gas.

2. Describe what is happening in the bag using the words *condense* and *evaporate.*

3. What evidence can you give to show that the water in the bag came from the cup?



Name: _____

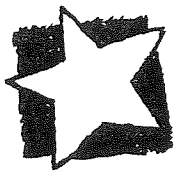
Date: _____

ACTIVITY 12

Physical Change: Liquid to Solid

Part 1

Name of liquid	Color	Mass of liquid in jar	Description of movement of liquid	Predict which liquids will freeze in order: Rank the liquids from 1-5	Freezing point/Melting point
water					
salt water					
rubbing alcohol					
vegetable oil					
dish soap					



ACTIVITY

Physical Change: Liquid to Solid (cont.)

Name: _____

Date: _____

12

1. Write the question you are investigating.

2. Write what you think will happen.

3. Materials you will use:
   a. One liquid in two baby food jars
   b. Clock
   c. Thermometer

Name: _____

Date: _____

4. Steps you will take:
   a. Record the temperature of the liquid before placing it into the freezer on your data chart.
   b. Record the temperature of the freezer on your data chart.
   c. Place one jar of the liquid you are investigating in the freezer.
   d. Place the second jar of the liquid you are investigating on the counter at room temperature.
   e. Record the time you placed the liquid in the freezer.
   f. Make observations of your liquid at 30-minute intervals and record your observations on the chart. Compare the liquid at room temperature with the liquid from the freezer.

5. Record your data in a chart. Your chart should include the room temperature, freezer temperature, time, and observations at 30-minute intervals.

Physical Change: Liquid to Solid (cont.)

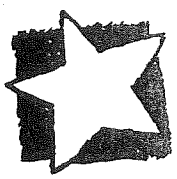
Name: _____

Date: _____

6. Write your conclusion. Use evidence from your data to support your conclusion.

Name: _____

Date: _____



ACTIVITY

Combining Solids and Liquids

13

1. Make a chart to record your observations of the properties of the separate materials and the mixture.

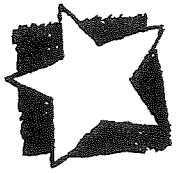
2. Write a sentence that describes the material made from combining the Borax solution and glue.

_____

_____

_____

_____



J O U R N A L

Combining Solids and Liquids (cont.)

Name: _____

Date: _____

13

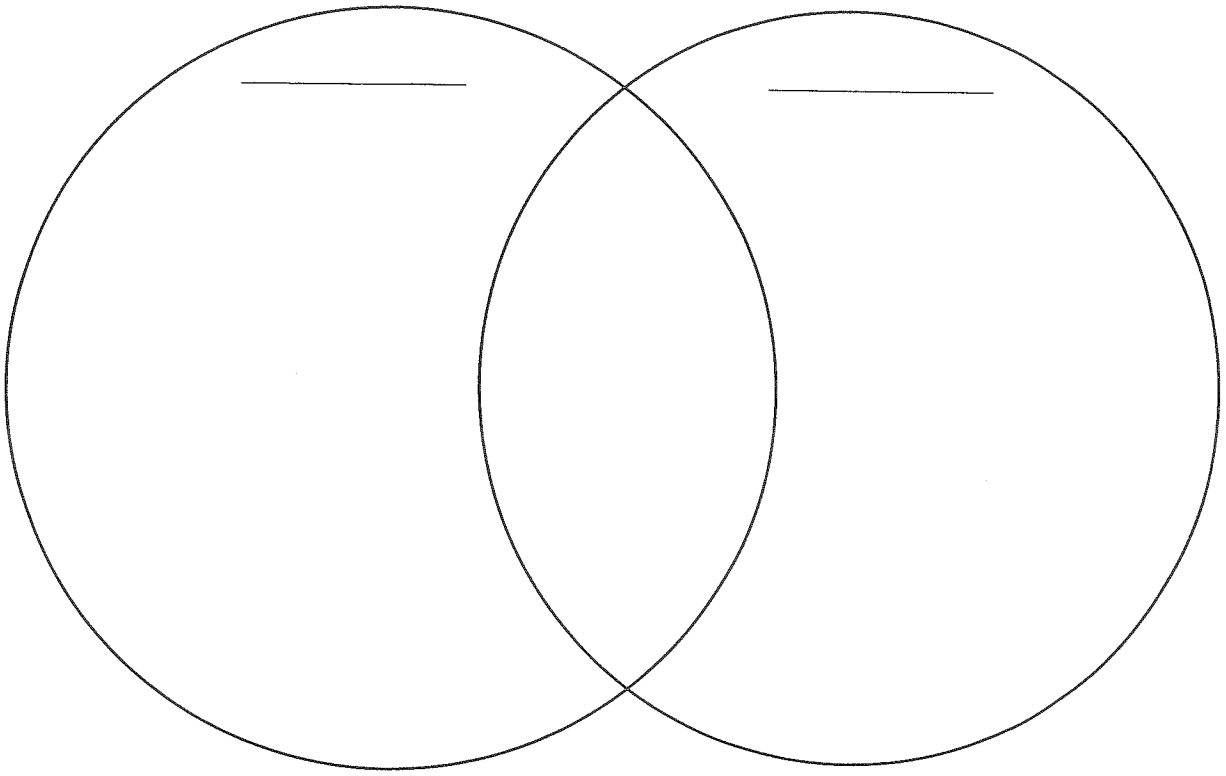
1. Write what you think would happen if you changed the volume of one of the materials in the procedure.

2. Describe what you think would happen if the "slime" was heated or cooled. Include the motion of the particles in your description.

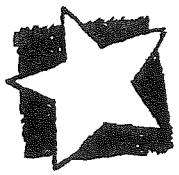
Name: _____

Date: _____

3. Use the Venn diagram to compare and contrast the "slime" with one of the materials used to make the "slime."



4. Write how they are the same and how they are different.



Key Terms

air - Air is the invisible mixture of odorless, tasteless gases that surrounds the Earth.

balance - A balance is a tool used to find the mass of an object.

boiling point - The boiling point is the temperature at which a substance turns from a liquid to a gas.

compare - Compare is to observe the similarities or likenesses between objects.

condensation - Condensation is the process where a substance that is a gas changes into a liquid.

contrast - Contrast is to observe the differences between objects.

definite shape - Definite shape describes the ability of a solid to keep its own shape unless acted on by a force.

evaporation - Evaporation is the process of changing a liquid to a gas through heating or the motion of air. It does not necessarily involve bringing the liquid to the boiling point.

freezing point – The freezing point is the temperature at which a substance turns from a liquid to a solid.

funnel – A funnel is a tool, usually shaped like a hollow cone with a tube extending from the point. It can be used to catch and direct the downward flow of a substance.

gas – A gas is a state of matter that has mass and volume but has no definite shape and does not take up a definite amount of space. A gas takes the space and shape of its container.

graduated cylinder – A graduated cylinder is a tool used to measure the volume of matter.

gram - A gram is a metric unit of measurement used for determining the mass of an object.

kilogram - A kilogram is a metric unit of measurement used for determining the mass of an object.

liquid – A liquid is a state of matter that takes up a definite amount of space (volume) and no definite shape. Liquids take on the shape of the container, can flow, and are poured from one container to another.

liter - A liter is a metric unit for measuring the volume of liquids. One liter is equal to 1000 milliliters.

mass – Mass is the amount of matter (stuff) within a substance or an object. The tool used to measure mass is the balance and the units of measure used for mass are milligrams and grams.

matter – Matter is anything that has mass and takes up space (volume).

melting point – The melting point is the temperature at which a substance turns from a solid to a liquid.

milliliter (ml) – A milliliter is a metric unit for measuring volume. 1000 ml is equal to one liter.

mixture – A mixture is a combination of two or more materials that can be separated.

newton - A newton is a metric unit used for measuring force. Weight is the measure of the force of gravity, so it can be measured in newtons.

Key Terms (cont.)

phase change – A phase change is a change in the state of matter. Phase change occurs when a material changes from a solid to a liquid or gas, liquid to a gas or solid, or gas to a solid or liquid.

physical properties – Physical properties are characteristics by which matter is described. Hardness, size, color, shape, flexibility, buoyancy (sinking and floating), state of matter (solid, liquid, gas), odor, mass, and volume are some physical properties of matter.

solar still - A solar still uses the heat from the sun to evaporate water. It can be used to change unclean water or salty water into fresh water.

solid – A solid is a state of matter in which matter has a definite shape and volume.

spring scale - A spring scale is a tool used to find the weight of an object.

state of matter - State of matter describes whether a substance is a solid, liquid, or gas.

volume – Volume is the amount of space taken up by a substance or an object, regardless of its shape or state.

weight - Weight is the force of gravity acting on an object. Weight is not the same as mass.