SECOND GRADE
JANUARY
PROPERTIES OF MATTER

STATION 1

ACTIVITY 1: IS THE GLASS OF WATER FULL?

MATERIALS

- Plastic cup
- Paper clips
- Water Liquid
- Detergent

ACTIVITY 2: CARTESIAN DRIVER

MATERIALS

- 2 Liter pop bottle Water
- The glass devil or eye dropper

ACTIVITY 3 AIR PRESSURE NEWS PAPER

MATERIALS

- Sheet of newspaper
- Ruler

STATION 2

ACTIVITY 1: MYSTERY EGGS

MATERIALS

- Plastic eggs
- Balloons filled with salt, water and air
- Air, Raw egg, Boiled egg, Blown eggshell (YOU WILL HAVE TO BRING THIS FROM HOME)

ACTIVITY 2: AIR TAKES UP SPACE: TISSUE IN A CUP

MATERIALS

- 2 plastic cups, 1 with a hole in the bottom
- 2 paper towels or tissues
- Large beaker (1000 mL) or large pail

STATION 3

SOLIDS AND LIQUIDS GAMES

MATERIALS

- Recording Sheet
- Paper or board to keep score
- Pen or chalk to write the score
- Game questions for the Trivia
- Desk bells

STATION 1

ACTIVITY 1: IS THE GLASS OF WATER FULL?

INTRODUCTION

This experiment illustrates the large surface tension of water. Water molecules tend to attract each other. In the bulk of the solution, water molecules pull on each other equally in all directions. But at the surface the water molecules are pulled into the water because there are no water molecules above the surface to pull in the opposite direction.

MATERIALS

- Plastic cup
- Paper clips
- Water Liquid
- Detergent

WHAT TO DO

1. Fill the plastic cup of water completely full of water. Predict what will happen if a paper clip is carefully added to the cup. Try it.

2. Keep adding paperclips one by one, counting how many can be added to the cup before the water spills. Watch carefully as the water rises above the rim of the cup. What shape does the water form?

3. Remove the paperclips, refill the cup, add soap to the water and try the experiment again.

QUESTIONS

1. How many paperclips can be added before the water spills? What is keeping the water from spilling?

2. Just before the water spilled, what shape did it have at the top of the cup?

3. Pour some water into a cup. Look at the interface where the water meets the air. Put a piece of black paper behind the container you are studying to see the interface of

water and air more clearly. Describe what you see at the top layer of the water. This indentation of the liquid is called the **meniscus** of the solution.

SUMMARY

The surface tension causes the surface of the liquid to act like a thin film on top of the liquid. This thin film keeps the water from flowing over the edge of the cup. As more and more paperclips are added, they take up room in the cup and push some of the water out of the cup. Because the surface tension of water is so strong, the water does not immediately spill. Instead, the water pushed out of the cup raises above the rim of the cup in a dome shape. As more paperclips are added, too much water is pushed out of the cup, and even the strong surface tension of water cannot prevent a spill.

Liquid detergent lowers the attraction between the water molecules and therefore, the when the experiment is repeated with soapy water, the water overflows quickly with the addition of paper clips.

EXTENSION

Water striders use the surface tension of water to "walk" across the liquid surface of ponds and rivers. Check out how these insects live. What would happen to them if the water in the stream became polluted with detergents?

ACTIVITY 2: CARTESIAN DRIVER

INTRODUCTION

This is a great toy that illustrates the difference in density between water and air. The difference between the density of air and water is used to make this toy function.

MATERIALS

- 2 Liter pop bottle Water
- The glass devil (look for it inside the box) or an eyedropper

WHAT TO DO

1. Start with a clean 2 Liter pop bottle with labels removed. Fill the bottle completely with water.

2. Fill an eyedropper half-full with water. Drop it in the bottle of water. If the dropper sinks, remove the dropper from the bottle and squeeze some of the water out of the dropper then try again.

3. When the dropper is floating on top of the water, screw on the cap of the bottle. Squeeze the pop bottle with both hands.

QUESTIONS

1. Carefully watch the eyedropper (or diver). What changes do you observe?

2. Can you use your understanding of density to explain what is happening?

SUMMARY

Density is a measure of mass per volume. Objects that are less dense than water can float in it, but objects that are more dense than water will sink. The diver originally floats because the dropper contains part air and part water. Air is less dense than water, meaning that one liter of air has less mass than one liter of water, thus the diver is initially lighter or less dense than water. When the bottle is squeezed the water level in the dropper increases, which causes the density of the eyedropper to increase to the point that it is more dense than water. This causes it to sink to the bottom of the bottle.

ACTIVITY 3 AIR PRESSURE NEWS PAPER

Air is all around us and it exerts pressure in all directions. This experiment will show the exertion of air pressure on the newspaper.

MATERIALS

- Sheet of newspaper
- Ruler (provided by teacher)

WHAT TO DO

1. Spread the newspaper smoothly across a table. If the newspaper was folded, make sure the inside of the paper is facing up and the outside is facing the table (otherwise air gets underneath and the results are not what they need to be).
2. Place the ruler partway underneath the paper, with one end of the ruler extending beyond the edge of the table a few inches.
3. Bring your hand down on the end of the ruler extended beyond the table edge (you can push as hard as you like!)

QUESTIONS

1. Why doesn't the paper go flying into the air?

SUMMARY

The pressure applied to the newspaper by the ruler by the experimenter's hand is less than the pressure applied by the air. In other words, the air is pushing down on the newspaper more than the ruler is pushing up on it. Therefore, the air pressure is holding the newspaper to the table. The force needed to lift the newspaper into the air is too large to produce with the ruler.

STATION 2

ACTIVITY 1: MYSTERY EGGS

INTRODUCTION

Differences in the properties of gases, liquids and solids will be explored in this experiment.

MATERIALS

- 7 Plastic eggs filled with balloons containing salt
- 7 plastic eggs filled with balloons containing air
- 7 plastic eggs filled with balloons containing water
- Balloons filled with salt, water and air
- Air, Raw egg, boiled egg, blown eggshell (YOU WILL HAVE TO BRING THIS FROM HOME)

WHAT TO DO

1. Give each group of students three plastic eggs containing the three phases of matter. Let the students develop a hypothesis on how to test the difference between the mostly solid egg and mostly liquid egg.

2. Students should record observations about each egg. What state of matter is in each egg?

3. Open plastic eggs and discuss observed differences in the phases of matter. What methods did each group use to determine the states of matter within the plastic eggs?

4. OPTIONAL:
   Have the students try to determine what state of matter is contained inside three real eggs. The students are asked to again decide which egg contains gas, liquid and solid (hard-boiled). (YOU WILL HAVE TO BRING THE EGGS FROM HOME) You do not have to break them. You can just show them and talk about it and let them fill the eggs and their weight.

QUESTIONS

1. How did you decide what states of matter were contained in the plastic eggs?

2. Did these methods work for the real eggs as well? Why or why not?

3. Describe the difference in properties of gases, liquids and solids.

SUMMARY

Solids are rigid and not easily compressed; they have definite shape and definite volume. The particles in solids are packed very close together. The particles are constantly vibrating, but their relative location does not change. Liquids have definite volume, but they take the shape of their container. Liquids are fluid and difficult to compress. The particles in liquids are in constant motion and are in contact with adjacent particles, but they are not packed together quite so tightly as in solids, so the particles are able to move about relative to each other. Gases have neither definite volume nor definite shape. They will fill any container. Gases are fluid and easily compressed. The particles in gases are spread apart so they are not touching each other. Gas particles are free to move in any direction, and sometimes run into one another.

The eggs that contain liquid exhibit a certain behavior that the solid and gas eggs will not. When the egg containing liquid is spun, then stopped briefly by a gentle touch that is immediately released, the egg will begin to spin again. The liquid inside the egg continues in the spinning motion even when the outer shell is momentarily stopped. When released the shell will begin to spin again as it is pulled back into motion by its contents. The difference between the solid and the gas is easy to tell by comparing the weights of the eggs. The solid eggs are significantly heavier than the eggs containing gas.

ACTIVITY 2: AIR TAKES UP SPACE – TISSUE IN A CUP

INTRODUCTION

Air is matter and therefore it must take up space. This experiment dramatically illustrates the fact that an empty cup is truly not empty. It is filled with air.

MATERIALS

- 2 plastic cups, 1 with a hole in the bottom
- 2 paper towels or tissues
- Large beaker (1000 mL) or large pail

WHAT TO DO

1. Ball up a small piece of paper towel or tissue. Press the towel or tissue to the inside bottom of the plastic cup without a hole.
2. Fill the pail of water or beaker approximately half full. Ask students to predict what will happen to the paper towel when the cup is dunked upside-down in the water.
3. Hold the bottom of the plastic cup. Push the plastic cup into the water with the open end of the cup pointing down into the water.
4. Pull the cup out of the water.
5. Have the students inspect the tissue or paper towel.
6. Now do the same experiment, except with the cup that has the hole in the bottom. Ask students how this will change what happens to the paper towel when the cup is placed in the water. Try the experiment again.

QUESTIONS

1. Ask the students to tell you what happened to the tissue.
2. Let the students tell you their ideas on why there was a difference between the condition of paper towel with and without the hole in the bottle of the cup.

SUMMARY

When the tissue is added to the cup the remainder of the cup continues to be filled with air. When the cup is submerged, because air is compressible, some water will enter the cup. But, because two types of matter cannot occupy the same space simultaneously, the compressed air serves as a barrier between the tissue and the water and the paper remains dry.

In other words there is air in there but you cannot see it. The air prevents the paper towel or tissue from getting wet. If the cup has a hole in the bottom, then the air will escape and there will be no air between the paper towel and the water, therefore it will get wet.

STATION 3

SOLIDS AND LIQUIDS

INTRODUCTION

The students will play two games where they will differentiate between solids and liquids. The students will understand that a solid has a definite shape and a liquid does not.

MATERIAL

- Recording Sheet
- Paper or board to keep score
- Pen or chalk to write the score
- Game questions for the Trivia
- Desk bells

ACTIVITY

GAME 1: WRITE A SOLID OR LIQUID THAT BEGINS WITH THE LETTER….

1. Divide the station in two groups. Have them sit in two different tables facing each other. You will be between the two tables.
2. Give each small group of students a copy of the recording sheet.
3. Each group should pick a student who will be the writer. Challenge each group to fill the chart with examples of solids and liquids that start with the letters listed on the left side.
4. The students should try to be quiet, so that the other team does not listen to their answers.
5. Explain that the group will receive one point for each correct response and extra point if the item was not listed by any other group. After a predetermined amount of time, allow groups to share their answers and award points as described. The group with the most points wins.

Starts with	Solid	Liquid	Points
S	*skateboard*	*soup*	*3*
M	*marshmallows*	*mouthwash*	*2*
B	*Baseball*	*blood*	*2*
R	*Rake*	*Rain*	*3*
D	*Door*	*Diet soda*	*4*
H	*hammer*	*honey*	*2*

GAME 2: LIQUID AND SOLIDS TRIVIA

1. Set the two desk bells on a desk facing each other.
2. One child from each group should stand in front of each bell facing each other.
3. Use the trivia questions to ask the questions.
4. The child that rings the bell first should answer the question.
5. If the question is correct. His/Her group gets a point, Otherwise the other child can answer. If his answer is also incorrect. The first group gets to think the question all together and try to answer. If the answer is correct they get the point. Otherwise the second group gets to think the answer all together.
6. If both groups answer incorrectly, then you say the answer.
7. Record the points.
8. The group that has more points wins.

TRIVIA QUESTIONS

1. I can be "got hold of" I do not change shape when you move me. What am I?
   a) Solid
   b) Liquid
   c) neither a solid or liquid

   The correct answer is a

2. I cannot be picked up. I take the shape of any container. What am I?
   a) Solid
   b) Liquid
   c) neither a solid or liquid

   The correct answer is b

3. Which of the following are examples of liquids?
   a) Wood and paper
   b) shampoo and oil
   c) shoes and socks

   The correct answer is b

4. Sugar and Sand can be poured. Are they examples of solids or liquids?
   a) Solid
   b) liquid
   c) neither

   The correct answer is a

5. When a solid is heated it turns into a liquid. This is called
   a) dissolving
   b) freezing
   c) melting

   The correct answer is c

6. When a liquid is cooled it turns into a solid. This is called
   a) dissolving
   b) freezing
   c) melting

   The correct answer is b

7. Ice melts at 0 degrees Celsius. Aluminum melts at 660 degrees Celsius. Which melts, if left outside, in a hot sunny day?
   a) only the ice
   b) only the aluminum
   c) both would melt

   The correct answer is a

8. Once a solid has turned to a liquid, can it be changed back into a solid again?
   a) No, it can never be turned back into a solid again
   b) yes, by heating it
   c) yes, by cooling it

   The correct answer is c

9. Why does candle wax run down the side of a candle?
   a) Because wax is always a liquid
   b) Because the wax is trying to escape
   c) Because the flame's heat turns the wax from a solid to a liquid

   The correct answer is c

10. How would you stop butter melting on a hot day?
    a) Leave it on the table
    b) Put it in the oven
    c) Put it in the fridge

    The correct answer is c

Starts with	Solid	Liquid	Points
S			
M			
B			
R			
D			
H			

Starts with	Solid	Liquid	Points
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Starts with	Solid	Liquid	Points
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