The Magic School Bus

From the desk of Ms. Frizzle

To the supervising adult:

The Magic School Bus™ science club, developed and manufactured by The Young Scientists Club™, is a fun and age-appropriate curriculum that will stimulate young scientists' natural curiosity about their surroundings.

All children learn at different levels and speeds, and it is important that children do not get frustrated. Try to encourage your young scientist to do as much reading and writing as he or she is able, but remember that science should be fun for everybody. Of course, a little coaxing is fine!

With The Magic School Bus™ science club, you are setting the groundwork for your young scientist's successful future and mastery in the sciences. Make sure that you read the adult guide in the back of the manual before starting the experiments with your young scientist. This will make for a smoother, more relaxing, and positive experience.

Now, get ready to take chances, get messy, and go on a Magic School Bus adventure.

More information on the science topic covered in each kit can be obtained by entering the Clubhouse at www.theyoungscientistsclub.com/themagicschoolbus and clicking on the individual kit icons.

An important note on safety while doing science experiments. Because the children using this program are still very young and need a lot of guidance, it is important that all the experiments be performed under an adult's close supervision. It is also important that all the directions and warnings (from the kit as well as from store-bought items) are followed carefully. Although all experiments are simple, safe, and age-appropriate, they are still performed at your own risk. By buying and accepting the kits, you agree to follow the directions and safety warnings as given and accept the inherent risks.

No product of ours is put on the market before it has passed the ultimate test-approval by multiple teams of Young Scientists in our annual summer science camps!

Today we are going to learn about the different phases in which materials can exist. Do you know what these three phases are?

_____

_____

_____

The three different phases of matter are: solid, liquid, and gas.

A solid is something that keeps the same shape, like a table or a rock.

A liquid is something that can flow and move, like water.

A gas is something very light and has no shape. It is often hard to see, like air.

Did you know that water can exist in three phases?

1. What is water called when it is a solid?

_____

2. What is water called when it is a liquid?

_____

3. What is water called when it is a gas?

_____

Solid, liquids, and gases are all made up out of atoms.

A solid has a fixed shape.

1. When water gets very cold it becomes ice and that is a solid.
2. When water is at room temperature it is a liquid and we call it water.
3. When water gets very hot it starts evaporating. This means that it becomes a gas and disappears into the air. This is called steam. This happens when you boil water for tea or pasta.

Are you ready to do some experiments?

Experiment 1
Dancing Raisins

Materials: Raisins and seltzer water (home)

Methods:
Add some raisins to a glass of seltzer water.

Results: _____

_____

Conclusion: _____

_____

_____

_____

Did your raisins go up and down?

When you put the raisins in the glass, they sink because they are heavy. When the raisins get to the bottom, gas bubbles attach to the raisins. The gas bubbles are light and travel up and take the raisins up with them. When the raisins get to the surface of the water, the bubbles escape into the air and the raisins get heavy again and sink to the bottom. This process then starts again. When do you think this process stops?

_____

_____

Experiment 2
Making Gas

Materials: Baking soda (home), 1/2 liter bottle (home), vinegar (home), funnel, measuring cup, measuring spoons (home), and balloon

Methods:

1. Add 1 tablespoon of baking soda to the 1/2-liter bottle.
2. Have the balloon ready to put on top of the bottle.
3. Add 75 ml of vinegar (3 measuring cups full) to the bottle (use the plastic funnel to do this), remove the funnel, and then quickly attach the balloon to the bottle.

Results: _____

Conclusion: _____

If you said that the process will end when all the gas bubbles have escaped into the air, you are right! At that point the raisins will just sit at the bottom of the glass. The experiment with the raisins showed us that a gas can be very light. When something is light, it will travel up. Are you ready to make some gas?

Use the measuring cup that came with the kit!

Gases are often invisible.

When the solid baking soda and the liquid vinegar mix, a gas (called carbon dioxide) is formed. This gas, which is heavier than air, pushes the air in the bottle upwards. Because you had a balloon on top of the bottle, the air moved into the balloon and made the balloon larger. Let's do another experiment!

Experiment 3
Fizzing Tablet

Materials: Fizz tablet and glass of water (home)

Methods:
Put the fizz tablet in a glass of water.

Results: _____

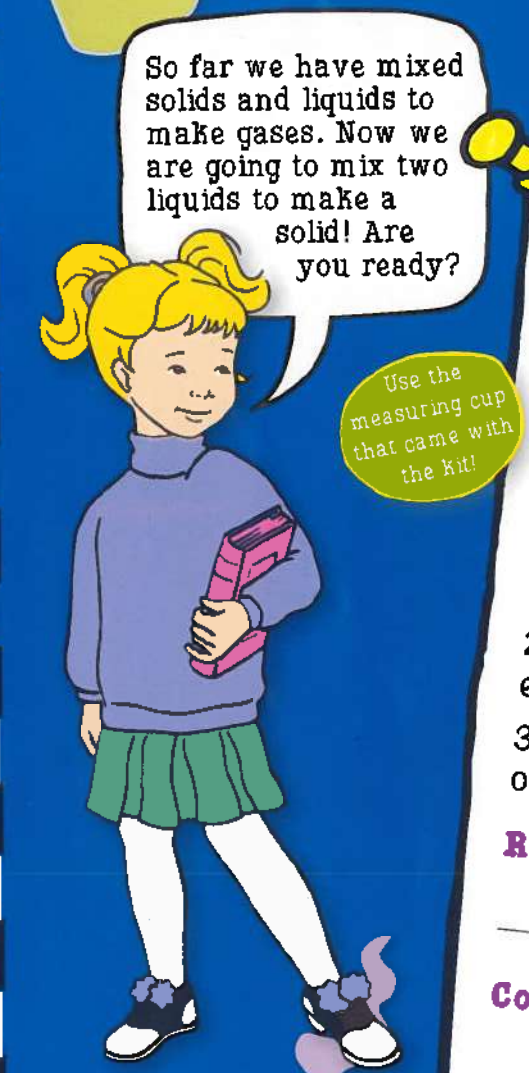
_____

Conclusion: _____

_____

_____

Did you see gas coming out of the tablet? This is because inside the tablet is baking soda (just like what we just used in the balloon experiment) and citric acid (which acts like the vinegar of the balloon experiment). When the baking soda and citric acid get wet they mix with one another and make a gas.



Experiment 4
Milk Goop

Materials: Skim or low fat milk (home), white vinegar (home), measuring cup, and glass (home)

Methods:

1. Use the enclosed measuring cup to add 100 ml (4 measuring cups) of skim or low fat milk to a glass.
2. Add 25 ml (1 measuring cup) of white vinegar to the milk.
3. Let the glass sit for about 10 minutes and observe what happens!

Results: _____

_____

Conclusion: _____

_____

The solid goop that you made is the protein casein that becomes a solid when vinegar is added to the milk. The vinegar separates out the casein from the liquid part of the milk. Let's make some gooey goop!

Experiment 5
Making Goop

Materials: Cornstarch (home), bowl (home), water (home), and measuring cup

Methods:

1. Add two measuring cups of cornstarch to a bowl.
2. Add one measuring cup of water.
3. Mix with your hands.
4. The mixture should feel solid when squeezed and become a liquid when released (if the mixture is too dry add a little water; if it is too wet add more cornstarch). Squeeze some of the mixture between two fingers and then release it.

Results:

Conclusion:

The casein goop made with the milk and vinegar was a kind of glue used many years ago by the Egyptians to glue furniture together.

Experiment 6
Making Slime

Materials: Glue, plastic cup (home), food coloring (home), craft stick, borax, water (home), cup (home), and measuring spoon (home)

Methods:

1. In a plastic cup, mix the glue (the whole container, which is about 1/4 cup) with 3 drops of food coloring.

2. In a cup or a glass, dissolve 1 tablespoon of borax with 1/2 cup of water. Add 2 tablespoons of this mixture to the glue mixture.

*Save the rest of the borax solution for the next experiment.

3. Using the craft stick, mix this all together for about 30 seconds. This forms your slime (it will be rather thick).

4. Remove the slime and play with it and then go directly to the next experiment.

*Be careful with the slime because it can get stuck in any fabric it touches.

*Slime is non-toxic but it should not be eaten.

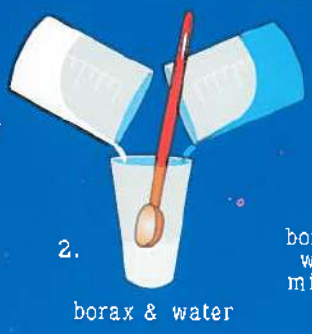
Results: _____

_____

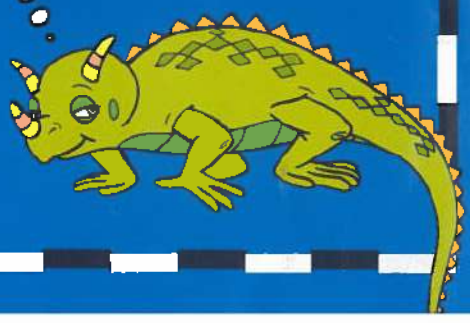
Conclusion: _____

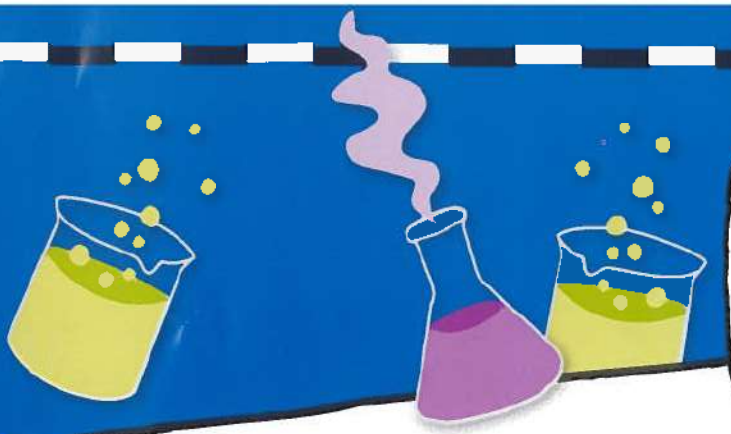
_____

What did you get? Is it a solid or a liquid? Did you notice that when you squeeze it, it behaves like a solid, and when you release it, it behaves like a liquid? In the next experiment we are going to mix two liquids and a solid to make slime.



Slugs make their own slime which helps them move and stick onto steep surfaces.





Isn't playing with slime a lot of fun! Did you know that you can use your slime to make a bouncy ball! Follow the directions below.

Experiment 7
Making a Bouncy Ball

Materials: Slime from experiment 6, measuring spoon (home), and borax solution from experiment 6

Methods:

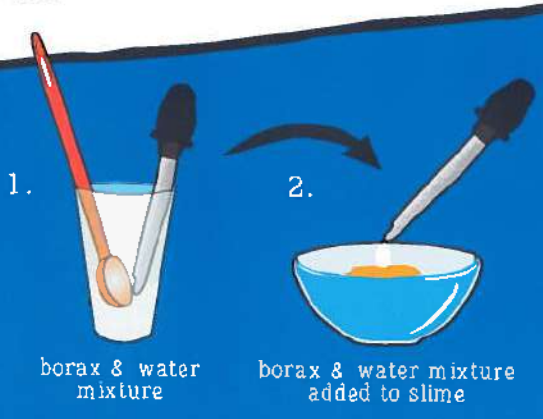
1. Stir the borax solution with a measuring spoon.
2. Add a couple of drops at a time to your slime.
3. Start rolling the slime between your hands until it is hard and dry enough so that when it is gently dropped, it bounces. You might need to add more drops of the borax solution if it is not turning into a ball.

*If the slime is too wet, dip your hands in the borax solution and then continue rolling the slime.

Results: A bouncy ball.

Conclusion: _____

_____



borax & water mixture

borax & water mixture added to slime

Instructions for the Supervising Adult

Purpose: To study the three phases of matter (solid, liquid, and gas) by comparing and contrasting the properties of these different phases and by mixing materials to create a different phase (e.g., mixing a liquid and a solid to produce a gas).

Note: The definitions for solids, liquids, and gases are simplified here so that they are appropriate for this age group.

Materials:

Included: balloon, raisins, craft stick, funnel, Borax powder, glue, measuring cup, and 1 fizz tablet

Needed (home): Seltzer/soda water (enough to fill a glass), baking soda, vinegar, 1/2-liter plastic bottle, a glass, measuring spoons, food coloring, water, 2 tablespoons of cornstarch, a plastic cup (or any other cup), skim or low fat milk, white vinegar, and a bowl.

EXPERIMENT 1 - Dancing Raisins

Materials: Raisins and seltzer water (home)

Methods: Add some raisins to a glass of seltzer water.

Results: The raisins move up and down in the glass. *If the raisins are not moving up and down, then they might be too big and heavy. Take a couple of small pieces of the raisins and try again.

Conclusion: When the raisins are added to the water, they sink because of their weight. At the bottom of the glass, gas bubbles attach to the bottom of the raisins. Because the bubbles are lighter than the water, they rise and carry the raisins up as well. Once the raisins reach the surface of the water, the gas bubbles disperse into the air and the raisins once again sink to the bottom. This cycle repeats itself until there is no longer a sufficient amount of gas bubbles in the water.

EXPERIMENT 2 - Making Gas

Materials: Baking soda (home), 1/2 liter bottle (home), vinegar (home), funnel, measuring cup, measuring spoon (home), and balloon

Methods:

1. Add 1 tablespoon of baking soda to the 1/2 liter bottle.
2. Have the balloon ready to put on top of the bottle.
3. Add 75 ml of vinegar (3 measuring cups full) to the bottle (use the plastic funnel to do this), remove the funnel, and then quickly attach the balloon to the bottle.

Results: The balloon inflates.

Conclusion: When the solid baking soda and the liquid vinegar are mixed together a gas (carbon dioxide) is created. This gas, which is heavier than air, displaces the air in the bottle, and as a result, the displaced air is pushed into the balloon. This causes the balloon to inflate.

EXPERIMENT 3 - Fizzing Tablet

Materials: Fizz tablet and glass of water (home)

Methods: Put the fizz tablet in a glass of water.

Results: There will be small gas bubbles escaping from the tablet when it is put in the glass of water. These bubbles will rise and escape into the air.

Conclusion: The fizz tablet contains citric acid and baking soda. When the tablet gets wet, these two substances mix and form a gas.

EXPERIMENT 4 - Milk Goop

Materials: Skim or low fat milk (home), white vinegar (home), measuring cup, and glass (home)

Methods:

1. Use the enclosed measuring cup to add 100 ml (4 measuring cups) of skim or low fat milk to a glass.
2. Add 25 ml (1 measuring cup) of white vinegar to the milk.
3. Let the glass sit for about 10 minutes and observe what happens!

Results: Solid white goop will start floating on the top.

Conclusion: Casein is a protein found in milk and when vinegar is added to the milk, it separates out from the liquid in the milk and is seen as curdled goop.

EXPERIMENT 5 - Making Goop

Materials: Cornstarch (home), bowl (home), water (home), and measuring spoons (home)

Methods:

1. Add two tablespoons of cornstarch to a bowl.
2. Add one tablespoon of water.
3. Mix.
4. The mixture should feel solid when squeezed and become a liquid when released (if the mixture is too dry add a little water; if it is too wet add more cornstarch).

Results: The mixture that your young scientist has made has both liquid and solid properties.

Conclusion: When the mixture is squeezed, it feels like a solid. When it is released, it acts like a liquid. *The goop that is made can be used over and over again. Just add some water if the goop dries out. Add more cornstarch if the goop is too wet.

EXPERIMENT 6 - Making Slime

Materials: Glue, plastic cup (home), food coloring (home), craft stick, borax, water (home), cup (home), and measuring spoon (home)

Methods:

1. In a plastic cup, mix the glue (the whole container, which is about 1/4 cup) with 3 drops of food coloring.
2. In a cup or a glass, dissolve 1 tablespoon of borax with 1/2 cup of water. Add 2 tablespoons of this mixture to the glue mixture.

*save the rest of the borax solution for the next experiment.

4. Remove the slime and play with it and then go directly to the next experiment.

*Be careful with the slime because it can get stuck in any fabric it touches. *Slime is non-toxic but it should not be eaten.

Results: By mixing glue, water, and borax you make slime.

Conclusion: By mixing two liquids (glue and water) with the solid borax we can create slime. When the borax is added, the polymer chains in the glue become linked together and it is harder for the polymer chains to move around so that slime is formed.

EXPERIMENT 7 - Making a Bouncy Ball

Materials: Slime from experiment 6, measuring spoon (home), and borax solution from experiment 6

Methods:

1. Stir the borax solution with a measuring spoon.
2. Add a couple of drops at a time to your slime.
3. Start rolling the slime between your hands until it is hard and dry enough so that when it is gently dropped, it bounces. You might need to add more drops of the borax solution if it is not turning into a ball. *If the slime is too wet, dip your hands in the borax solution and then continue rolling the slime.

Results: A bouncy ball.

Conclusion: As more borax is added, more polymers become cross-lined and the harder it is for them to move. This makes the slime more solid and turns it into a bouncy ball. *The bouncy ball will start flattening out when it is left sitting around. This is because although it looks like a solid, it is really a visco-elastic material which is something between a solid and a liquid.

Made in China