Explosive Foams

Science4you

PLAY MONSTER

⚠ WARNING:

CHOKING HAZARD - Children under 8 years can choke or suffocate on uninflated or broken balloons. Adult supervision required. Keep uninflated balloons from children. Discard broken balloons at once.

⚠ WARNING:

This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

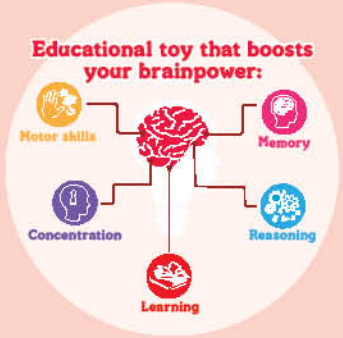
Dear parents and guardians:

Through play, children develop different cognitive skills. Scientific studies show that when we are having fun or making discoveries during an experiment, a neurotransmitter called Dopamine is released.

Dopamine is known to be responsible for feelings like motivation, reward and learning and that's why experiences are related to positive feelings. So, if learning is a positive experience, it will stimulate the brain to develop various skills.

Therefore, Science4you aims to develop educational toys that combine fun with education by fostering curiosity and experimentation.

Find out below which skills can be developed with the help of this educational toy!



The educational feature is one of the key strengths of our toys. We aim to provide toys which enable children's development of physical, emotional and social skills.

Find out more about Science4you toys at:

www.playmonster.com

Science4you

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PLAY MONSTER

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For more fun, visit playmonster.com

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SAFETY RULES

- Read these instructions before use, follow them and keep them for reference.
- Keep young children, animals and those not wearing eye protection away from the experimental area.
- Always wear eye protection.
- Store this experimental set out of reach of children under 8 years of age.
- Clean all equipment after use.
- Make sure that all containers and/or non-reclosable packaging are fully closed and properly stored after use.
- Ensure that all empty containers and/or non-reclosable packaging are disposed of properly.
- Wash hands after carrying out experiments.
- Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.
- Do not eat or drink in the experimental area.
- Do not allow chemicals to come into contact with the eyes or mouth.
- Do not apply any substances or solutions to the body.
- Do not replace food items back in their original container(s) or packaging. Dispose of immediately.

GENERAL FIRST AID INFORMATION

- In case of eye contact: Wash out eye with plenty of water, holding eye open if necessary. Seek immediate medical advice.
- If swallowed: Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
- In case of inhalation: Remove person to fresh air.
- In case of skin contact and burns: Wash affected area with plenty of water for at least 10 minutes.
- In case of doubt, seek medical advice without delay. Take the chemical and/or product together with the container with you.
- In case of injury always seek medical advice immediately .

ADVICE FOR SUPERVISING ADULTS

- Read and follow these instructions, the safety rules and the first aid information, and keep them for reference.
- The incorrect use of chemicals can cause injury and damage to health. Only carry out those experiments which are listed in the instructions.
- This experimental set is for use only by children 8 years and up.
- Because children's abilities vary so much, even within age groups, supervising adults should exercise discretion as to which experiments are suitable and safe for them. The instructions should enable supervisors to assess any experiment to establish its suitability for a particular child.
- The supervising adult should discuss the warnings and safety information with the child or children before beginning the experiments. Particular attention should be paid to the safe handling of acids, alkalis and flammable liquids.
- The area surrounding the experiment should be kept clear of any obstructions and away from the storage of food. It should be well lit and ventilated and close to a water supply. A solid table with a heat resistant top should be provided.
- This experimental set contains colorings. Colorings can stain. Keep them away from delicate objects and fabrics.

PROTECTIVE GOGGLES INSTRUCTIONS

General Aplications (EN 166:2002-04)
PROTECTIVE GOGGLES MODELS JG-101, JG-123, MERKOR 101, MEDOP 101 and WVC.S4Y.001: Can protect against basic impacts or low energy, but not against dust or liquid splashes or even against cast metals.

PANORAMICS: Against low or medium energy impacts, dust, liquid drops and cast metals. Not against liquid splashes or electric short-circuit.
FACIAL VISORS: Can protect against low, medium and high energy, liquids splashes, cast metals and hot solids. Not against dust and gases.

1 – IDENTIFICATION
- Manufacturer identification:
JI Justness, MEDOP, MERKOR, WEVINCO, or the anagram.
- Optical class, according with EN 166 (Just for neutral lens)

OPTICAL CLASS	SPHERICAL POWER D1+D2 / 2 (Dm⁻¹)	STIGMATIC POWER |D1 - D2| (Dm⁻¹)	DIFFERENCE IN PRISMATIC REFRACTIVE POWER (Δ, cm/m)		
			Horizontal		Vertical
			External Base	Internal Base	
1	±0.06	0.06	0.75	0.25	0.25
2	±0.12	0.12	1.00	0.25	0.25
3	+0.12 -0.25	0.25*	1.00	0.25	0.25

Notes: D1 and D2 are the refractive powers of the two main meridians.
*The main meridians axes of the two lenses will be parallel between ± 10°.

- Symbol of mechanical resistance, with the letters:
Without letter: Minimal robustness.
S: Robustness increased (steel ball from 22 mm to 5.1 m/s).
F: Impacts of high speed and low energy (steel ball from 6 mm to 45 m/s).
B: Impacts of medium energy (steel ball from 6 mm to 120 m/s).
A: High energy impacts (steel ball from 6 mm to 190 m/s).

- Marking of the frame:
- Identification of the manufacturer: JI, MEDOP, MERKOR, WEVINCO
- The number of Standard EN 166, which covers this protector
- A letter indicating the field of use (See table)
- Symbol of resistance to particles of high speed:
- Low energy impact: F
- Medium energy impact: B
- High energy impact: A

Note: If protection against high velocity particles and extreme temperature is required, the eye protector used must be marked with the letter T and immediately after the letter of impact (FT, BT, AT). If the letter of impact is not followed by the letter T, the eyewear should be used against particles at high speed and at room temperature.

2 – USE
It must be ensured that the risk present in the working environment corresponds to the field of use of this protective eyewear, which is deduced from the marks printed on them.
To adapt the protective eyewear to user dimensions, you only need to modify the length on the extension tabs. If the goggles have non-extendable tabs, you must change the curved position of each tab of the tab by hand: this operation is made easier by gently heating the tab first with warm air from a radiator, hot water, etc.
The helmet-adaptive visors are adjusted by inserting the frame at the edge of the helmet and securing it with the rear elastic closure.
All equipment is manufactured with materials that do not produce allergies, irritations, etc. However, they can produce allergic reactions in especially sensitive people.
They are for personal use and therefore should not be used by several users, even after they have been carefully cleaned.
The prescription glasses should be worn under the conditions for which they were prescribed.

Fields of use:

SYMBOL	DENOMINATION	FIELD OF USE DESCRIPTION
Without Symbol	Basic use	Mechanical hazard not specified
3	Liquids	Liquids (Drops and Splashes)
4	Thick dust particles	Powder particles larger than 5 microns
5	Gas and fine dust particles	Gases, vapors, sprays, smoke and dust particles with a size of less than 5 microns
8	Electric Short Circuit: Arc	Electric arc due to short circuit in electrical equipment.
9	Hot melt and solid materials	Splashes of molten metals and penetration of hot solids

3 -MAINTENANCE
3.1. Care and Cleaning
Full protective goggles should be cleaned at intervals with clean, soapy water. Then dry them carefully with a soft, clean and absorbent cloth. For greater cleaning (disinfection) use a dry cloth impregnated with alcohol. In no case should other types of solvents be used.

3.2. Replacement
With prolonged use, these protective goggles can be scratched and chopped and, in the case of plastic lenses, yellowing. Therefore, it is necessary to do a periodic review of the state of the protective eyewear and replace it if it exhibits these defects, although apparently still allow the vision, and replace the product. In any case, the product must be replaced every 5 years.

3.3. Spare Parts
Spare lenses are available for all face screens. There are also spare lenses for binocular glasses and welder glasses.

3.4. Conservation
Protective goggles should be stored in a naity and cool place, avoiding humidity, dirt and dust. It is recommended to use a protector or a plastic bag to transport the glasses.
Disposal considerations: must be handled in accordance with local regulations.

In case of poisoning by any of the components used in the experiments of this toy, contact your local poison control center or the nearest hospital. Please consult the following link for more information: https://www.poison.org/

In case of emergency dial:
9-1-1 or Poison Control: 1-800-222-1222

LIST OF SUBSTANCES SUPPLIED

Yellow Coloring

INGREDIENTS: CI 19140, POTASSIUM SORBATE, SODIUM BENZOATE

Precautionary Statements:
P202 Do not handle until all safety precautions have been read and understood.
P233 Keep container tightly closed.
P234 Keep only in original container.

Red Coloring

INGREDIENTS: CI 16255, POTASSIUM SORBATE, SODIUM BENZOATE

Precautionary Statements:
P202 Do not handle until all safety precautions have been read and understood.
P233 Keep container tightly closed.
P234 Keep only in original container.

Blue Coloring

INGREDIENTS: CI 42090, POTASSIUM SORBATE, SODIUM BENZOATE

Precautionary Statements:
P202 Do not handle until all safety precautions have been read and understood.
P233 Keep container tightly closed.
P234 Keep only in original container.

LIST OF CHEMICAL SUBSTANCES SUPPLIED

Citric Acid $C_6H_8O_7$ (CAS # 77-92-9)

Hazard Statements:
H319 Causes serious eye irritation.

Sodium Bicarbonate $NaHCO_3$ (CAS # 144-55-8)

Recommendations for substances and mixtures: Do not ingest. Avoid contact with the eyes and mouth. Use only according to the instructions. Store in tightly closed containers. Keep in a cool, dry place. Protect from moisture, direct sunlight and heat sources.

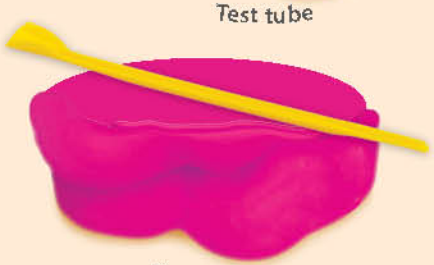
DISPOSAL OF USED CHEMICALS

Observe national regulations concerning the disposal of chemicals when disposing of chemical substances and / or mixtures. Do not dispose of substances and / or mixtures together with household or other waste. Please recycle packaging materials where local recycling programs exist.

KIT CONTENTS

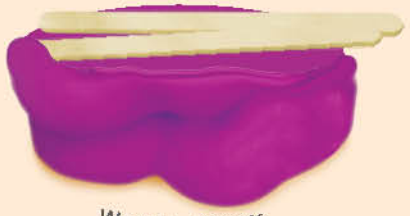
Protective goggles

Test tube



Plastic scoop

Large measuring cups



Wooden stirrers

Small measuring cup

Bowl

Sodium bicarbonate

Citric acid

Red coloring

Balloons

Blue coloring

Pipette droppers

Yellow coloring

EXTRA CONTENT

Lab bench

Look at the lab bench design! This will help you to always have your "lab" ready to work. Cut out the dashed lines and place the material that you will use during the experiments in the indicated spaces.

Suggested setup

What's an explosion?

An explosion results from the rapid and uncontrolled release of a given amount of energy.

Hello Scientist! Welcome to the most explosive adventure you could hope for!

I can't wait to figure out how explosions happen!

Take it easy, Galileo. First, let's learn the important safety rules of a lab!

1. Safety rules

1.1. Ground rules in the laboratory

OUTDOOR EXPERIMENT

All experiments labeled with this symbol, for having explosive and spectacular effects, must be performed outdoors and under adult supervision!

Every time you finish an experiment, you should wash and store all the materials.

During an experiment, do not use the same material for different reagents without washing them first.

Use the right quantities recommended in each step, so that you can make the most of your reagents.

Always wash your hands, before and after each experiment.

If you want to do an experiment, but the recommended material is being used in another experiment, you can use similar materials that you may find at home.

Before starting an experiment, you should cover your work table with an old towel or newspapers. This way, you make sure that it won't stain!

None of the foams you are going to produce are harmful to your health, but we recommend that you do not touch them without gloves.

Always wear your goggles whenever the image of them appears on the material list of an experiment.

Did you run out of sodium bicarbonate? You can replace it with common household baking soda!

Now, let's get started!

Before you prepare the experiments, learn how to use an instrument widely used by scientists – the Pipette dropper:

1st Squeeze out the air from the top of the Pipette dropper;

2nd Release the pipette inside the liquid to fill it;

3rd Squeeze gently until drops start falling one at a time.

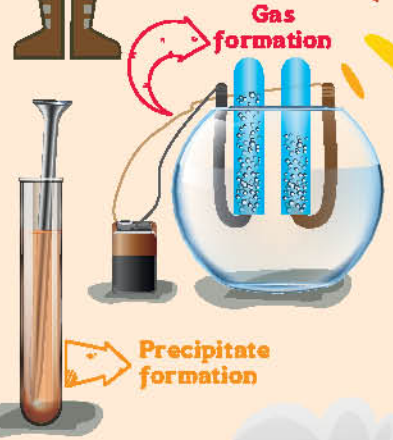
2. Chemistry and explosions

DID YOU KNOW...
Chemistry is the main science that explains why explosions occur?
Chemical reactions are the main cause of explosions!

Reaction products always have different characteristics from the reactants that gave them origin.

Do you know how we can detect that a chemical reaction is happening or has happened?

Chemical reaction indicators



But what kind of chemical transformations can occur?

HEAT action

LIGHT action

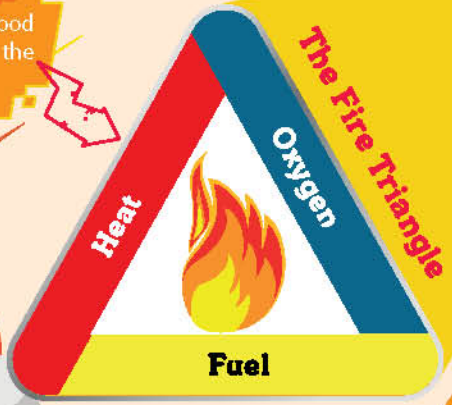
ELECTRIC CURRENT action

MECHANICAL action

JUNCTION OF SUBSTANCES

DID YOU KNOW...
An **explosion** can be understood as a form of **combustion** with the formation of a flame and bang?

For combustion to occur, the presence of a fuel and an oxidizer (normally oxygen) and heat (activation energy) is required.



Throughout this adventure you will be able to make several explosions that are at the base of the carbon dioxide release. Let's find out what this means!

3. Experiments

EXPERIMENT 1

Magic foam

What you will need:

Material included in the kit:

- Protective goggles
- Pipette dropper
- Plastic scoop
- Sodium bicarbonate
- Coloring (of your choice)
- Small measuring cup

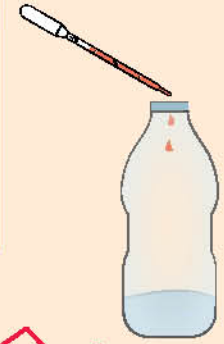
Extra items you will need:

- Hot tap water
- Cooking oil
- Vinegar
- Small plastic bottle

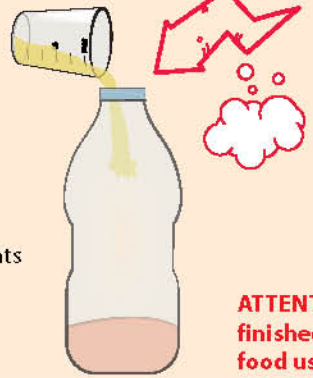
Ask an adult for help!

Steps:

1. Place 50 millilitres (ml) of hot tap water and 20 ml of vinegar in the small plastic bottle. Use the small measuring cup to measure these quantities. Ask an adult for help so that you don't burn yourself with the hot water.



2. With the Pipette dropper, add 2 drops of a coloring of your choice.

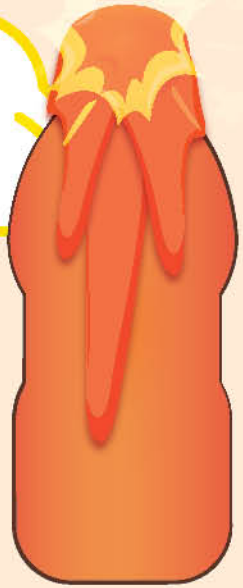


3. Add 40 ml of cooking oil to the mixture. Use the small measuring cup to help you to make 2 measurements of 20 ml each.

4. Finally, use the plastic scoop and add 3 spoons of sodium bicarbonate to the bottle.

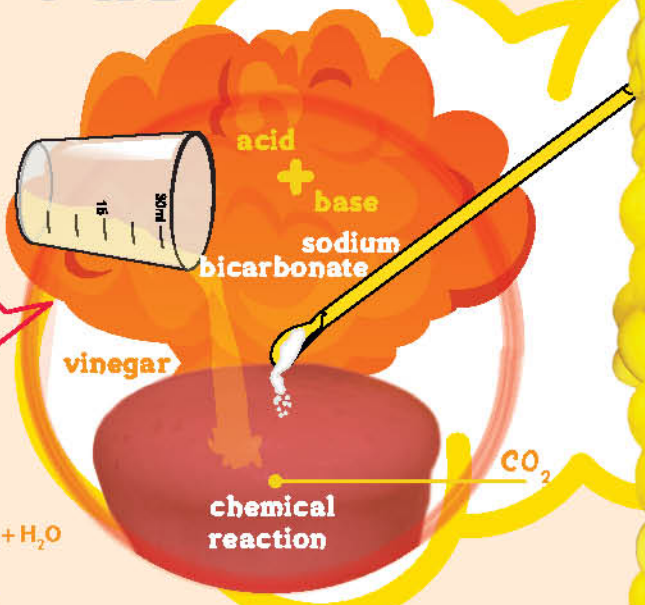
ATTENTION: When you have finished, throw away any food used during the experiment.

What do you see?



Explosive explanation:

The sodium bicarbonate moves slowly in the oil until it reaches the vinegar. When they do, a **acid-base reaction** occurs.



In this chemical reaction the release of carbon dioxide (CO_2) occurs:

$NaHCO_3 + Acid \rightarrow Na\text{-}Acid + CO_2 + H_2O$

SUPER SCIENTIST:

Do you know what density is? Try putting some oil in a cup and then add some water! What happens? The liquid on top will be the least dense!

EXPERIMENT 2

Foam with egg white

What you will need:

Material included in the kit:

- Bowl
- Protective goggles
- Pipette dropper
- Plastic scoop
- Sodium bicarbonate
- Coloring (of your choice)
- Small measuring cup

Extra items you will need:

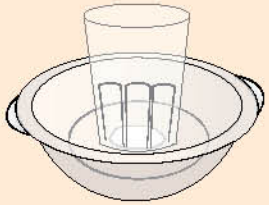
- Tall glass
- Egg (1 egg white)
- Water
- Vinegar
- Teaspoon

Ask an adult for help!

Steps:

1. Carefully separate the egg white from the egg. Discard the yolk.

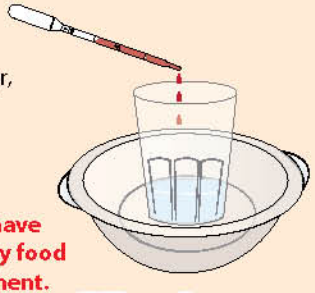
2. Pour half of the egg white into the tall glass and place the tall glass in the bowl.



3. With the small measuring cup, measure 25 ml of water and pour it into the tall glass.

4. With the teaspoon, add 2 spoons of sodium bicarbonate to the tall glass. Stir with the plastic scoop.

5. With the Pipette dropper, add 3 drops of coloring to the mixture.



6. With the small measuring cup measure 25 ml of vinegar and pour it into the glass.

ATTENTION: when you have finished, throw away any food used during the experiment.

Scientist, did you create foam?

What happens?

Egg white is not only used to make delicious desserts, it can also be used to fix the gas formed during an experiment!

When you add the vinegar, colored foam is formed and overflows the cup. Sometimes, when turning the cup upside down, the foam does not fall out because the egg white becomes stiff!

EXPERIMENT 3

Refrigerant foam

What you will need:

Material included in the kit:

Extra items you will need:

- Bottle of carbonated soda
- Mentos candy
- Clear tape
- Scissors

Ask an adult for help!

Steps:

1. Place the bottle on a flat and stable surface.

2. Open the Mentos package and think of a way to put them in the bottle all at the same time.

Tip: you can make a cylinder of Mentos: with the scissors (and the help of an adult), cut a strip of clear tape and one by one, fasten the sweets on their side, to the tape. Then add another strip of tape to the other side of the sweets, so that they are securely attached.

3. Open the bottle and drop the cylinder of Mentos inside.

4. Now, move away from the bottle!

Observe your geyser!

Explosive explanation:

In this experiment we can simulate a geyser because soft drinks with gas (carbonation) include a high quantity of dissolved carbon dioxide, in equilibrium and under pressure, ready to escape when the pressure at the surface (free from the solution) decreases.

This way, when we open the bottle, the gas tends to escape to the outside.

When we add sweets to a soft drink, we are creating a kind of release nuclei of carbon dioxide (which is dissolved).

This happens because these sweets are porous and rough. When we add any porous object to a liquid with gas (for example, salt), we can observe a higher release of carbon dioxide creating the effect of a geyser.

ATTENTION: when you have finished, throw away any food used during the experiment.

DID YOU KNOW...
Scientists can't yet define if this is a chemical or physical phenomenon!

EXPERIMENT 4

Colorful explosion race

What you will need:

Material included in the kit:

- Protective goggles
- Pipette droppers
- Plastic scoop
- Citric acid
- Sodium bicarbonate
- Colorings
- Small measuring cup

Extra items you will need:

- Dish soap
- Cups*
- Tray
- Water

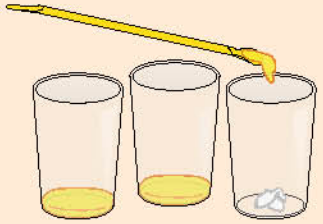
*for as many colors as you want to make; you can also use the large measuring cups of the kit.

Ask an adult for help!

Steps:

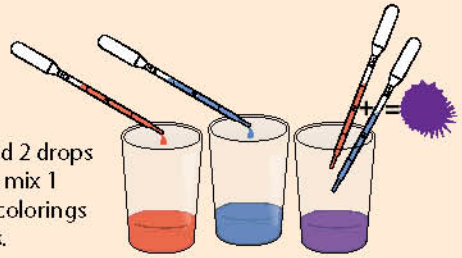
1. With the plastic scoop, add 2 spoons (with the larger side) of sodium bicarbonate to each cup.

2. Then add 2 spoons of dish soap.

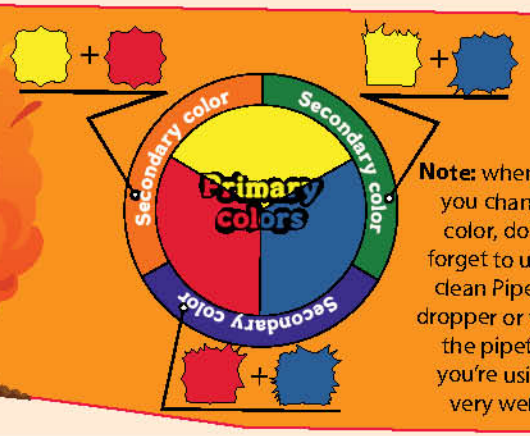


3. Now with the small measuring cup, add 25 ml of water to each cup and stir well, trying not to form foam, with the plastic scoop.

4. Finally, with the Pipette dropper, add 2 drops of each coloring, or mix 1 drop of 2 different colorings to make new colors.



Explosive tip:



Note: whenever you change color, don't forget to use a clean Pipette dropper or wash the pipette you're using very well.

5. Now we need to prepare a citric acid solution. To do this, put 50 ml of water in a clean cup (use the small measuring cup to help) and 2 spoons of citric acid, with the help of the plastic scoop.

6. Arrange the cups in line on top of a tray. Finally, pour a little of the solution prepared in the previous step into each one.

Are you ready for the most colorful explosion ever?

What happens?

Explosive explanation:

As you already know from previous experiments, when you mix an acid with a base, you give rise to a chemical reaction that releases CO_2.

It's this gas that, being in a solution with detergent, creates the explosive foam that you observe!

This reaction is explosively fun!

Explosive challenge:

Scientist, repeat the experiment but replace the citric acid solution with lemon juice. Does it work?

EXPERIMENT 5

Explosive bombs

What you will need:

Material included in the kit:

- Plastic scoop
- Protective goggles
- Small measuring cup
- Sodium bicarbonate
- Coloring (of your choice)
- Large measuring cup
- Pipette dropper
- Bowl
- Citric acid

Extra items you will need:

- Table salt
- Teaspoon
- Gloves

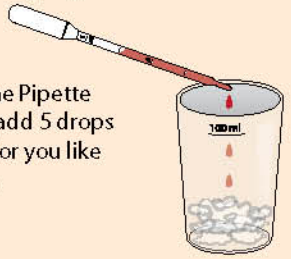
Ask an adult for help!

Citric Acid
WARNING
Hazard Statement: Causes serious eye irritation.

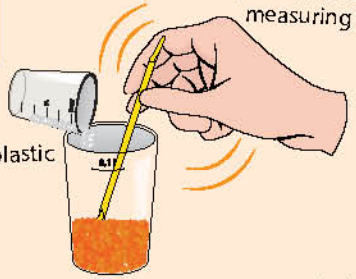
Steps:

1. Measure 5 ml of citric acid with the small measuring cup. Now, transfer it into the large measuring cup.

2. With the Pipette dropper, add 5 drops of the color you like the most.



3. Ask an adult for table salt and add one teaspoon of it to the large measuring cup.



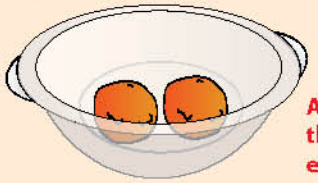
4. Mix well with the plastic scoop.

5. Measure 5 ml of sodium bicarbonate with the small measuring cup. Now, add it to the large measuring cup and stir with the plastic scoop.

6. The mixture of your explosive bomb must be dry, but slightly sticky. If it is too dry, add some droplets of water with the Pipette dropper.

7. With your gloves on, wet your hands and collect small amounts of the mixture to create little balls with your hands. Create two little balls and place them in the bowl, with some space in between them, so they don't get stuck to each other.

8. Let them dry overnight.



9. When dry, test your explosive bombs by putting them in water!

Note: you'll also use these explosive bombs in experiment 8.

ATTENTION: When you have finished, throw away any food used during the experiment.

Scientist, do you know why your explosive bomb is effervescent?

Explosive explanation:

Your bomb is effervescent because when it comes in contact with water, a chemical reaction between sodium bicarbonate ($NaHCO_3$) and citric acid happens, releasing carbon dioxide (CO_2)!

The release of the gas is characterized by the formation of little bubbles inside the liquid that causes the effervescence.

DID YOU KNOW...
This type of reaction is very common in certain medicines, like aspirin!

Aspirin in water.

EXPERIMENT 6

An ultra-fast foam

What you will need:

Material included in the kit:

- Protective goggles
- Plastic scoop
- Small measuring cup
- Sodium bicarbonate
- Coloring (of your choice)
- Large measuring cup
- Pipette dropper
- Bowl

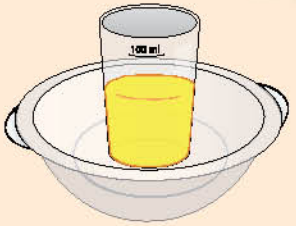
Extra items you will need:

- Water
- Vinegar

Ask an adult for help!

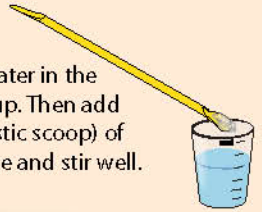
Steps:

1. Place the large measuring cup in the bowl and then add 50 ml of vinegar.



2. With the Pipette dropper, add 2 or 3 drops of coloring of your choice.

3. Place 20 ml of water in the small measuring cup. Then add 2 spoons (with plastic scoop) of sodium bicarbonate and stir well.



4. Start a countdown and pour the contents of the small measuring cup into the large measuring cup.

What happens?

As you do not use any product that gives fluidity or viscosity to the foam, you can observe the phenomenon of effervescence: the release of gases inside a liquid.

ATTENTION: When you have finished, throw away any food used during the experiment.

EXPERIMENT 7

Floury foam

What you will need:

Material included in the kit:

- Plastic scoop
- Small measuring cup
- Sodium bicarbonate
- Coloring (of your choice)
- Large measuring cup
- Pipette dropper
- Bowl

Extra items you will need:

- Water
- Vinegar
- Flour

Steps:

1. Repeat the steps of the previous experiment, but in step 1 also add 2 spoons of flour with the plastic scoop.

What does the foam look now?

Scientist, you must have noticed that in experiment 6 the foam was much faster and more explosive than in this experiment. Did you know that you just simulated different types of volcanic eruptions?

ATTENTION: when you have finished, throw away any food used during the experiment.

1. Explosive

Activity: Volcanian.
Lava viscosity: Very viscous.
Gas content: Rich.
Materials: Pyroclasts and formation of ash clouds (formed by incandescent gases and ashes that rolls down through the volcano hills, close to the ground).
Structure: High and very steep.

2. Mild explosive

Activity: Strombolian.
Lava viscosity: Fluid.
Gas content: Poor.
Materials: Characterized by regular and constant explosions that launch incandescent lava into the air. The explosions are accompanied by rivers of lava and gas emissions.
Structure: High and very inclined cone.

3. Effusive

Activity: Hawaiian.
Lava viscosity: Very fluid.
Gas content: Very poor.
Materials: Large lakes and rivers of lava; no pyroclasts.
Structure: Short and has smooth sides.

Science4you

EXPERIMENT 8

Almost a lava lamp

What you will need:

Material included in the kit:

- Protective goggles
- Plastic scoop
- Large measuring cup
- Small measuring cup
- Pipette dropper
- Coloring (of your choice)
- Explosive bomb (experiment 5)

Extra items you will need:

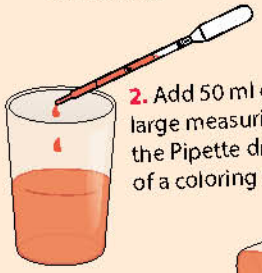
- Water
- Cooking oil
- Small plastic bottle
- Funnel

Ask an adult for help!

Note: if you do not have any fizzy bombs from experiment 5, you must conduct that experiment before this one

Steps:

1. Put cooking oil in the bottle until you fill ¾ of its volume.



2. Add 50 ml of water to the large measuring cup and, with the Pipette dropper, add 4 drops of a coloring of your choice.

3. Add, with the help of a funnel, the colored water to the bottle.

4. Place an explosive bomb inside the bottle.

If we look at 1 liter of water and 1 liter of oil under a microscope, we confirm that we have more water molecules than oil in the same volume of liquid. In other words, the oil is less dense than water and can therefore float in the water!

ATTENTION: When you have finished, throw away any food used during the experiment.

Explosive explanation:

When it comes in contact with water, the **explosive bomb** reacts spontaneously, originating a gas: carbon dioxide. When this gas is released, it "drags" with it the water stained on the surface of the oil. After the colored water flows down to the bottom it becomes denser than oil. This is the science of your your (almost) lava lamp.

EXPERIMENT 9

Foam that fills balloons

What you will need:

Material included in the kit:

- Protective goggles
- Sodium bicarbonate
- Small measuring cup
- Balloon
- Plastic scoop
- Test tube

Extra items you will need:

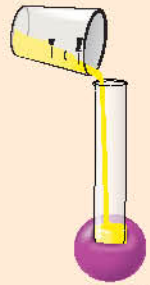
- Vinegar or lemon juice
- Modeling compound

Ask an adult for help!

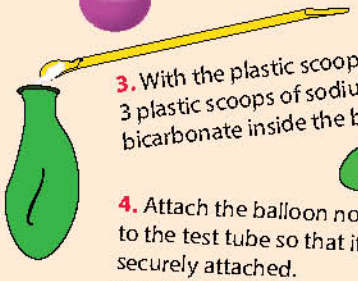
ATTENTION: when you have finished, throw away any food used during the experiment.

Steps:

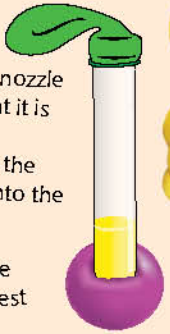
1. Make a little ball with the modeling compound. Place it on the work table and press the test tube into it. The ball will support the tube.



2. Use the small measuring cup and add 10 ml of vinegar or lemon juice to the test tube.



3. With the plastic scoop, place 3 plastic scoops of sodium bicarbonate inside the balloon.

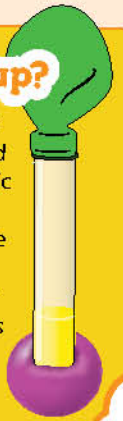


4. Attach the balloon nozzle to the test tube so that it is securely attached.
Be careful not to drop the sodium bicarbonate into the test tube!

5. Lift the balloon and drop the sodium bicarbonate into the test tube all at once.

Did the balloon fill up?

As you already know, the reaction of sodium bicarbonate with an acid (citric acid from lemon juice or acetic acid from vinegar), leads to the production of carbon dioxide, at the same time that a foam is formed. It is this gas that fills the balloon! If you try to modify the concentrations of the chemicals, you will see that the higher the concentration, the higher the production of the gas.



Science4you

EXPERIMENT 10

Rain of explosive colors

What you will need:

Material included in the kit:

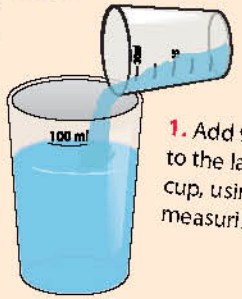
- Plastic scoop
- Protective goggles
- Small measuring cup
- Large measuring cup
- Pipette droppers
- Colorings

Extra items you will need:

- Water
- Shaving cream or hair foam

Ask an adult for help!

Steps:



1. Add 90 ml of water to the large measuring cup, using the small measuring cup.

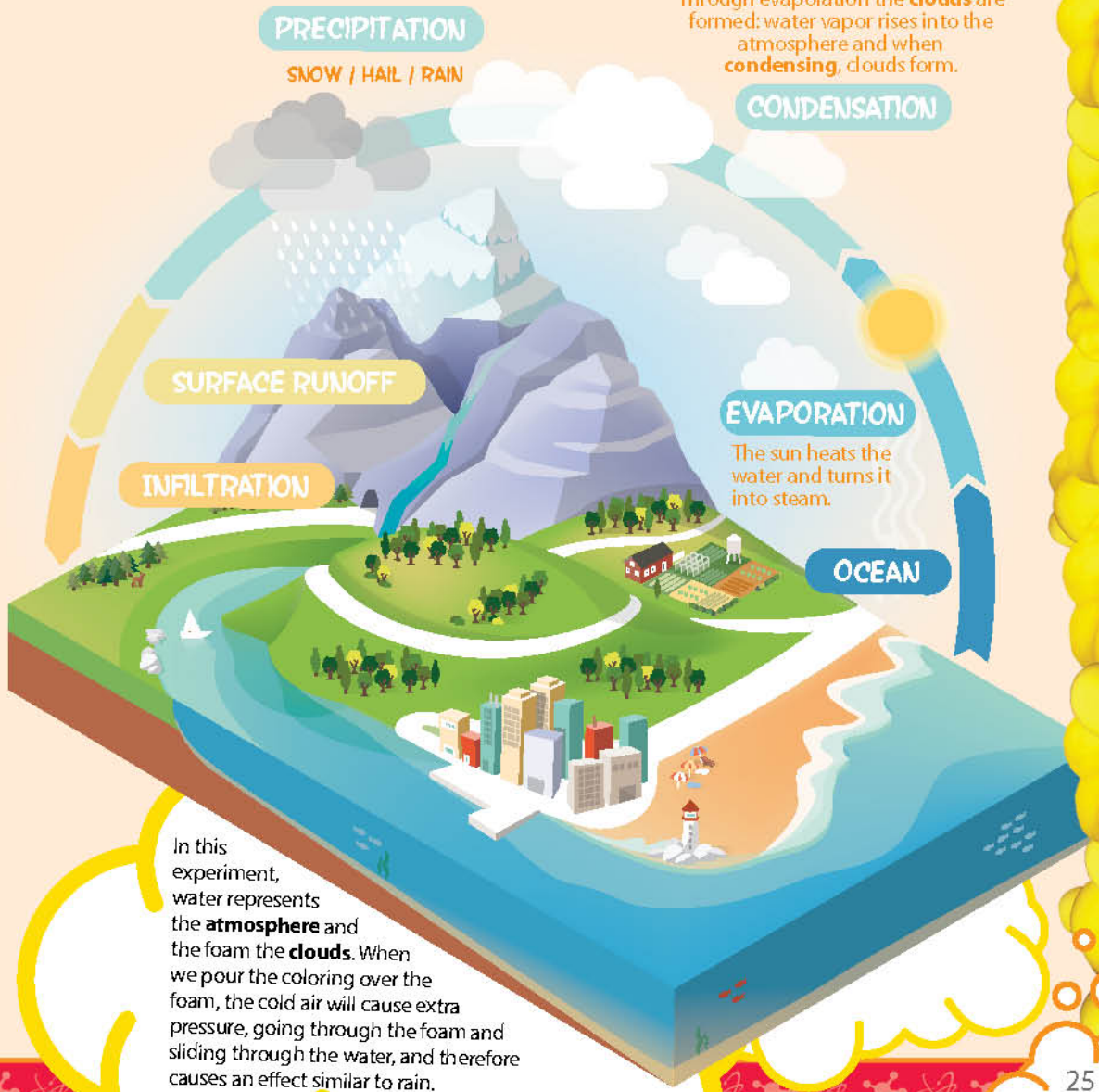
2. Ask an adult for some shaving cream or foam and carefully make a cloud on the surface of the water. Let the foam rest for a while.

3. Next, with the Pipette droppers, drop about 1 ml of each coloring in the foam cloud.

Water cycle

When cold air comes into contact with water vapor, it cools down and turns into drops of water that fall to the Earth in the form of rain, or when it is really very cold, like snow or hail.

Through evaporation the **clouds** are formed: water vapor rises into the atmosphere and when **condensing**, clouds form.



In this experiment, water represents the **atmosphere** and the foam the **clouds**. When we pour the coloring over the foam, the cold air will cause extra pressure, going through the foam and sliding through the water, and therefore causes an effect similar to rain.

Do different acids make different reactions?

Citrus fruit is obtained from trees of the *Citrus* species. Do you know what these fruits are?

Do you know what citrus is, Scientist?

EXPERIMENT 11

Citrus foam

What you will need:

Material included in the kit:

- Protective goggles
- Small measuring cup
- Wooden scoop
- Large measuring cup
- Sodium bicarbonate
- Plastic scoop

Extra items you will need:

- Different citrus fruits
- Cups
- Water
- Citrus juicer
- Dish soap

Ask an adult for help!

Steps:

1. With the help of an adult, squeeze the citrus fruits that you have chosen to use in this experiment. Keep each juice separate in a different cup and always wash the juicer when changing fruit.

2. Pour 50 ml of water into the large measuring cup, 1 spoon of sodium bicarbonate and 1 spoon of dish soap with the help of the plastic scoop. Mix well with the wooden stirrer.

3. Repeat step 2 for as many cups as you need to test the different citrus fruits.

4. Measure 25 ml of one of the citrus juices you prepared in step 1 and pour into the beaker containing the sodium bicarbonate solution.

ATTENTION: when you have finished, throw away any food used during the experiment.

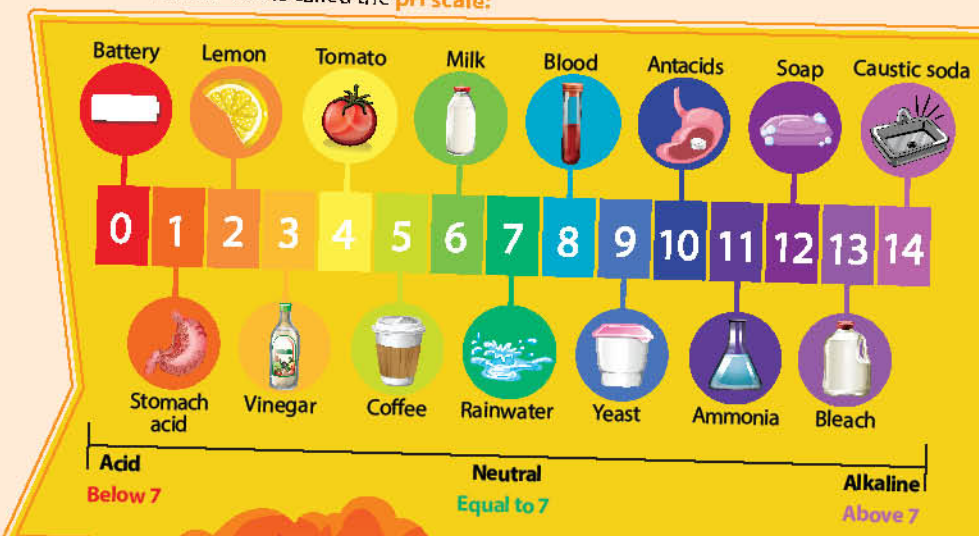
5. Repeat step 4 for all the other juices you want to test.

Can you make an explosion?

Do you see any differences between the reactions?

It is to be expected that the stronger the acid, the faster the reaction.

Did you know that there is a scale that indicates how acidic or basic the substances are? This is called the **pH scale:**



Explosive scientist:
Will there be more acid fruits with which we can make foams? Try the juice from other fruits and write down your results!

EXPERIMENT 12

Lemon volcano

What you will need:

Material included in the kit:

- Protective goggles
- Plastic scoop
- Pipette droppers
- Sodium bicarbonate
- Colorings (of your choice)
- Bowl

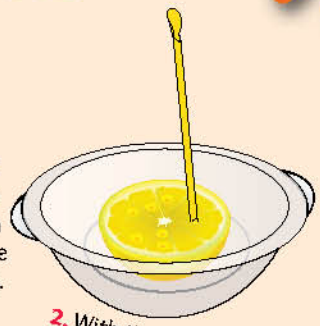
Extra items you will need:

- Half a lemon

Ask an adult for help!

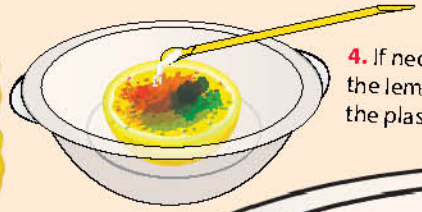
Steps:

1. Put half a lemon in the bowl and poke holes in the flesh with the end of the plastic scoop.



2. With the Pipette droppers, add a few drops of coloring over the volcano. If you want, you can add different colors.

3. Finally, with the plastic scoop, sprinkle sodium bicarbonate over the lemon.



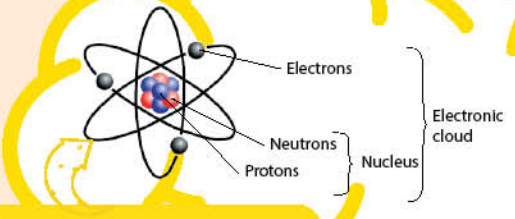
4. If necessary, press the lemon a little with the plastic scoop.

Did the lemon erupt?

ATTENTION: When you have finished, throw away any food used during the experiment.

What's this about chemistry, anyway?

Chemistry is a type of science that tells us what things are made of, the science of substances, their properties and what happens to **substances** when they are mixed with each other. Scientists who study chemistry study what a thing is made of and/or what they can do with it.



Substances are any kind of matter formed by atoms of specific elements.

We can say that the different substances can be formed by three different types of structural units:
- Atoms
- Molecules
- Ions

Atoms

Made up of fundamental particles:

- **Protons** — particles with positive electrical charge;
- **Neutrons** — electrically neutral particles;
- **Electrons** — particles with negative electrical charge.

Molecules

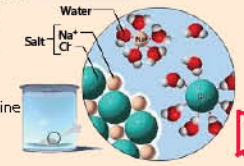
When atoms bind to each other through chemical bonds... They may be elements (simple substances) or compounds (compound substances).

Ions

They are charged species that are formed when electrons are added to or removed from a neutral atom or molecule.

The ions may be **positively** charged — **cations** or **negatively** charged — **anions**.

Salt, scientifically called sodium chloride, is a substance whose structural units are positive ions, sodium, (Na^+), and negative ions, chlorine (Cl^-), which bind through an ionic bonding.



EXPERIMENT 13

Foaming art

What you will need:

Material included in the kit:

- Small measuring cup
- Protective goggles
- Large measuring cup
- Plastic scoop
- Sodium bicarbonate
- Coloring (of your choice)
- Pipette dropper

Extra items you will need:

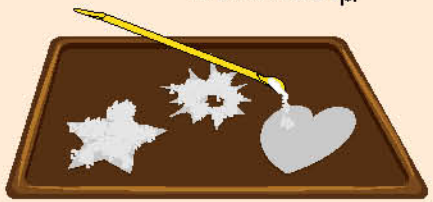
- Vinegar
- Tracing paper
- Scissors
- Pencil
- Tray

Ask an adult for help!

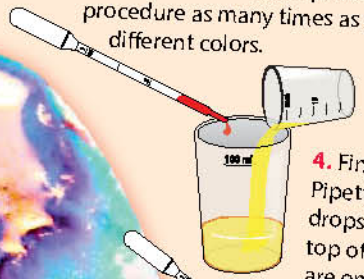
Steps:

1. Draw some shapes on a piece of paper: stars, hearts... Then cut them out with scissors.

2. Place the cut-out shapes on top of a tray and sprinkle them with sodium bicarbonate with the plastic scoop.



3. Measure 25 ml of vinegar with the small measuring cup, transfer it to the large measuring cup and finally add 2 or 3 drops of a coloring of your choice with the Pipette dropper. Repeat this procedure as many times as you want to make different colors.



4. Finally, with the same Pipette dropper, add drops of this solution on top of the shapes that are on the tray.

5. When you're done, let the shapes dry out.

How was the final result?

ATTENTION: When you have finished, throw away any food used during the experiment.

EXPERIMENT 14

Foam party

What you will need:

Material included in the kit:

- Pipette dropper
- Protective goggles
- Bowl
- Coloring (of your choice)
- Large measuring cup
- Small measuring cup

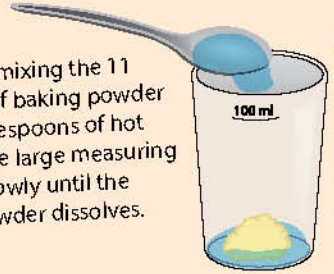
Extra items you will need:

- Small plastic bottle
- Dish soap
- Gloves
- Hydrogen peroxide
- Hot tap water
- 11g Baking powder
- Tablespoon

Ask an adult for help!

Steps:

1. Start by mixing the 11 grams (g) of baking powder with 4 tablespoons of hot water in the large measuring cup. Stir slowly until the baking powder dissolves.



2. Place the bottle in the bowl and add a tablespoon of dish soap. If you want, use the Pipette dropper and add a few drops of coloring.

3. With the small measuring cup — very carefully, wearing the gloves and protective goggles — measure 50 ml of hydrogen peroxide (take 2 measurements of 25 ml) and add it to the bottle.

4. Now, with the help of an adult, add the baking powder solution (step 1) to the bottle and move away!

ATTENTION: When you have finished, throw away any food used during the experiment.

How's this foam party?

Contrary to all previous experiments, this foam is formed by the release of oxygen. Yes, the element we use to breathe!

In this case, there was a **catalyst** reaction where for each 2 molecules of Hydrogen peroxide, 2 molecules of water and 1 molecule of oxygen are released.

$2H_2O_2$ Hydrogen peroxide → $2H_2O$ Water + O_2 Oxygen

EXPERIMENT 15

Explosive ice

What you will need:

Material included in the kit:

- Colorings (of your choice)
- Pipette droppers
- Large measuring cup
- Sodium bicarbonate

Extra items you will need:

- Vinegar
- Ice cube tray
- Marbles
- Cling wrap
- Freezer
- Teaspoon
- Tray
- Water

Ask an adult for help!

Steps:

1. Place a marble in each space of the ice cube tray. Then, place a piece of cling wrap in each space as well, as you see in the illustration.

2. In the large measuring cup(s) prepare a solution of 100 ml water and 1 teasspoon of sodium bicarbonate. Add coloring of your choice with the Pipette dropper.

If you want to make several colors, repeat step 2.

3. Pour the solution into the ice cube tray and place it in the freezer for 1 hour.

4. When the ice is solid, remove the cubes from the ice cube tray and separate them from the marbles. Then place them on a tray.

5. Put some vinegar in a clean large measuring cup and with the Pipette dropper squirt it over the holes where the marbles were!

Explosive science...

States of matter

Materials can change between solid and liquid, between liquid and gas, and gas and solid. We call these **processes changing states of matter**!

ATTENTION: when you have finished, throw away any food used during the experiment.

EXPERIMENT 16

Jelly explosion

What you will need:

Material included in the kit:

- Bowl
- Small measuring cup

Extra items you will need:

- Flavored gelatin packet
- Water
- Teaspoon
- Baking powder
- Muffin tin
- Vinegar

Steps:

1. Prepare the gelatin as directed, but in the first step, when adding the hot water, also add 1 teaspoon of baking powder.

2. Pour the liquid gelatin in the muffin tin.

3. Let the gelatin cool down until it solidifies.

4. Place the already solid gelatin in the bowl and pour 20 ml of vinegar on top, using the small measuring cup.

What do you observe?

Do you hear the sound?

Touch the gelatin, do you feel the effervescent effect?

ATTENTION: When you have finished, throw away any food used during the experiment.

EXPERIMENT 17

Foam that glows in the dark

Citric Acid
WARNING
Hazard Statement: Causes serious eye irritation.

What you will need:

Material included in the kit:

- Protective goggles
- Small measuring cup
- Sodium bicarbonate
- Citric acid
- Large measuring cup
- Bowl
- Plastic scoop

Extra items you will need:

- Table salt
- Container
- Fluorescent markers
- UV flashlight
- Water

Ask an adult for help!

Steps:

1. Repeat experiment 5, but use a fluorescent marker ink solution instead of coloring. In this experiment, you just need to make the reaction in a dark place while pointing a UV flashlight at the cup.

Fluorescent marker ink solution:

a. Start by removing the load (sponge) that is inside the marker. Ask an adult to help you do this.

b. Then, place the load in a glass of water and wait a few minutes until the ink dissolves and colors the water.

c. Stir a little with the plastic scoop and the solution is ready to use.

Under a UV light many **fluorescent** colored items emit a bright glow.

This happens because they all contain **phosphors** — a substance that absorbs energy and re-emits it as visible light.

Under a black light, phosphors convert the UV radiation they receive into visible light.

And if you repeat experiment 6, the result is identical?

DID YOU KNOW...

That phosphorus is the sixth most abundant element in living organisms?

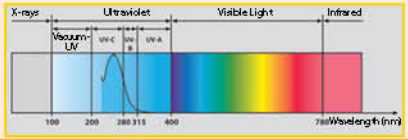
As it is a highly reactive element, phosphorus is never found in free form on Earth.

When exposed to air, white phosphorus glows in the dark.

Phosphorus is essential for life. Phosphates (compounds containing phosphorus) are contained in DNA, RNA, ATP and the phospholipids, which form all cell membranes.

Learning more...

The UV light emits is in the ultraviolet (UV) range of the spectrum, which is invisible to the human eye.



EXPERIMENT 18

Foaming serpentines

What you will need:

Material included in the kit:

- Wooden stirrer
- Bowl
- Pipette droppers
- Large measuring cup
- Colorings (of your choice)
- Small measuring cup

Extra items you will need:

- Water
- Dish soap
- Rubber band
- Plastic bottle
- Kitchen towel (or old sock)
- Scissors or box cutter

Ask an adult for help!

Part 1: Solution for soap bubbles

Steps:

1. With the help of the small measuring cup, measure 40 ml of water into a large measuring cup. For example, you have to take 2 measurements of 20 ml each.

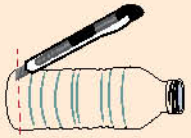
2. Also add 20 ml of dish soap to the cup with the help of the small measuring cup.

3. Mix everything slowly with the wooden stirrer.

Part 2: Foaming serpentines

Steps:

1. Ask an adult to cut the bottom of the empty bottle with the help of scissors or a box cutter.



2. Put the kitchen towel or the old sock over the bottom of the bottle. Use the rubber band to secure it.

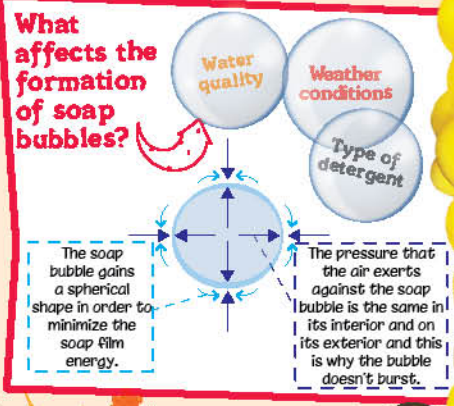
3. In the bowl, put the solution prepared in part 1 of this experiment.

4. Wet the bottle with the cloth in the solution you have in the bowl, blow through the neck of the bottle and have fun!

5. To make colored serpentines, add colors to the cloth with the Pipette droppers.

Dip the cloth back in the solution, blow and have fun.

What affects the formation of soap bubbles?



I hope you had a lot of FUN while you were learning with these explosive foams!

Good experiments, Scientist!

Check out more COOL experiments!

Science4you

Learn about these kits and more at www.playmonster.com!

Play MonSter

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