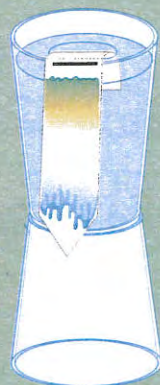
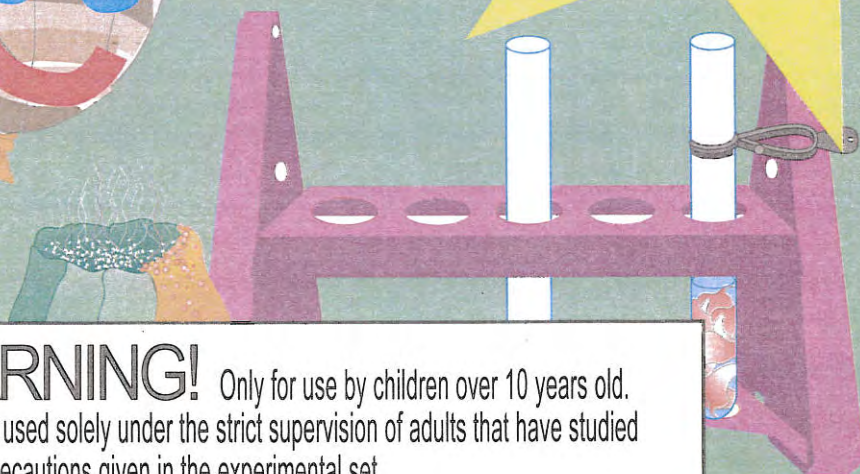


GO chem

10+

60
activities!



WARNING! Only for use by children over 10 years old.
To be used solely under the strict supervision of adults that have studied the precautions given in the experimental set.

CAUTION! contains some chemicals which are classified a safety hazard. Read the instructions before use, follow them and keep them for reference. Do not allow chemicals to come into contact with any part of the body, particularly the mouth and eyes.
Keep small children and animals away from experiments.
Store the chemistry set out of reach of small children.
Eye protection for supervising adults is not included.



WARNING:

Use under the direct supervision of an adult when handling parts with sharp points or edges. Keep away from children under three years of age.

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Advice for supervising adults.

- a). Read and follow these instructions, the safety rules and the first aid information and keep them for reference.
- b). The incorrect use of chemicals can cause injury and damage to health. Only carry out those experiments which are listed in the instructions.
- c). This chemistry set is for use only by children over 10 years.
- d). 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.
- e). The supervising adult should discuss the warnings and safety information with the child or children before commencing the experiments. Particular attention should be paid to the safe handling of acid, alkalis and flammable liquids.
- f). 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.

Safety rules.

- Do read these instructions before use, follow them and keep them for reference.
- Do keep young children, animals and those not wearing eye protection away from the experimental area.
- Do always wear eye protection.
- Do store experimental sets out of reach of young children.
- Do clean all equipment after use.
- Do make sure that all containers are fully closed and properly stored after use.
- Do wash hands after carrying out experiments.
- Do not use equipment which has not been supplied with the set.
- Do not eat, drink or smoke in the experimental area.
- Do not allow chemicals to come into contact with the eyes or mouth.
- Do not replace foodstuffs in original container. 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 5 minutes.
- In case of doubt seek medical advice without delay. Take the chemical together with the container with you.
- In case of injury always seek medical advice.
- Disposal of chemicals should be in accordance with local regulations.
- Other materials should be flushed down the toilet.

Local poison center or local hospital telephone number should be inserted here by the supervising adult.

Telephone.....

Address.....

INTRODUCTION

Dear Parent or Supervising Adult

The GO CHEM Kit includes 60 safe and fun activities, allowing your child to learn and play at the same time. There is no fear of working with dangerous chemicals or poisons. The topics covered in the kit deal with chemical reactions, acids and bases, chromatography, crystal growing, surface tension, solutions and colloids, expansion of gases, magnetism, optics, growing plants and more.

The equipment included is easy to work with and will enable your child to work independently. However, certain activities do require adult supervision and are marked with this sign.

Colours of some of the objects may differ slightly from the drawings. Ordinary household items are necessary and appear on the list of required equipment at the beginning of each activity.

The chemical Sodium Hydrogen Carbonate, commonly known as baking powder, is used for cooking.

Each activity is colourfully illustrated in order to give a visual explanation of what to do, as well as simple and easy to follow instructions. Read the text with the child, and if need be, go over the steps together. Make sure that the child has identified and prepared all of the equipment before starting.

Children often help out in the home, especially in the kitchen.

This kit provides the opportunity for children to discover how scientific concepts are used at home daily. The activities with these simple scientific concepts enable your child to increase his scientific knowledge and to further arouse his innate curiosity. We are certain that learning about science in the home will be a fun and rewarding experience for the whole family.

Parts included:

1. Sodium Hydrogen Carbonate.
 NaHCO_3 (Baking Soda)
25 grams (1 container of 25 grams)
CAS NO. 144-55-8.
EINECS NO. 205-633-8.

2. Iron Powder
Fe 5 grams
CAS NO. 7439-89-6.
EINECS NO. 231-096-4.
R11. Highly Flammable
S16. Keep away from sources of ignition



3. Sand 25 grams
4. test tube rack (4 pcs.)
5. 2 test tubes
6. test tube holder
7. stopper

8. magnifying glass
9. green felt tip pen
10. plastic beaker
11. measuring cup with lid
12. goggles
13. measuring spoon
14. eye dropper
15. funnel
16. tweezers
17. magnet in holder
18. washers
19. paper clip
20. pH scale
21. pH paper
22. filter paper
23. sewing thread
24. mirror
25. drinking straw

26. play dough
27. rubber band
28. piece of polystyrene
29. instruction book

ACTIVITY 1

Egg Prints

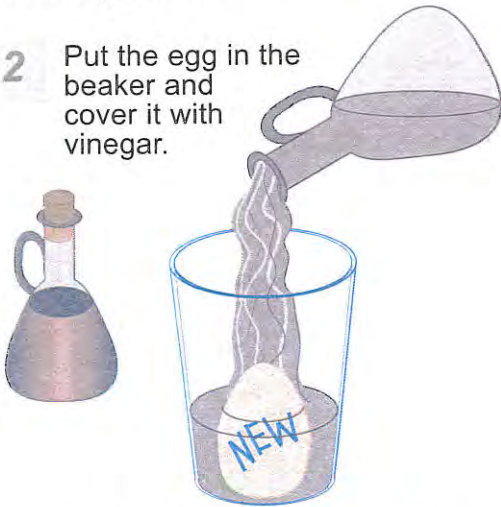
Equipment:

hard boiled egg in shell
wax crayon
beaker
vinegar
soft brush
scouring powder

- 1 Using a waxy crayon, write your name or any short message on the shell of a hard boiled egg.



- 2 Put the egg in the beaker and cover it with vinegar.



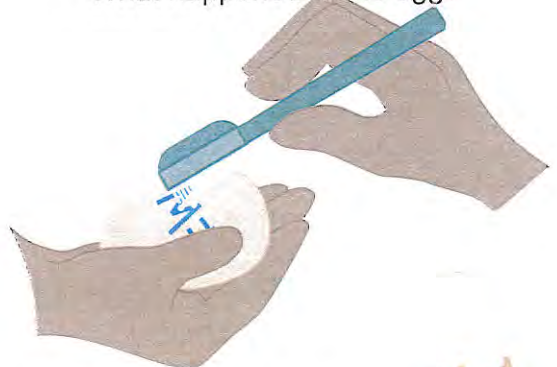
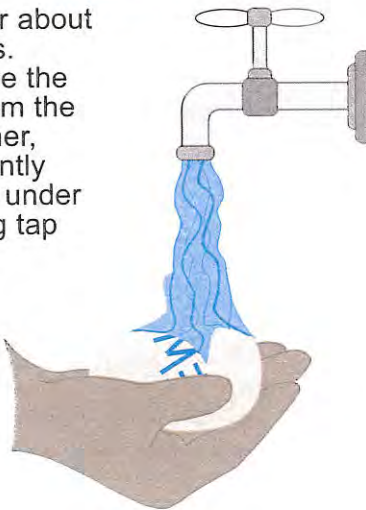
- 3 Note that bubbles will soon appear. This is the reaction between the vinegar and the shell's chemical structure.



- 4 Wait for about 2 hours, or until the bubbling stops. Remove the "old" vinegar and refill the container with fresh vinegar.

- 6 Very, very carefully, using the scouring powder and soft brush, remove the wax from the name or message that you had written earlier. What happened to the egg?

- 5 Wait for about 4 hours. Remove the egg from the container, and gently rinse it under running tap water.



Explanation: Your message stands out and should be quite clear.

The part of the shell under the waxy crayons letters has been protected from the action of the acid in the vinegar.

NEW

ACTIVITY 2

Assembling the test tube rack

- 1 Identify the four red plastic pieces illustrated below. Connect them to each other as shown:



ACTIVITY 3

Testing For Acids



Adult supervision
is required for this
activity

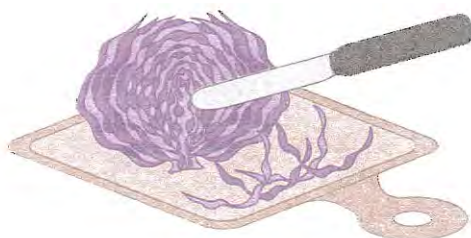
Equipment:

test tube rack
2 test tubes
eye dropper
measuring spoon
funnel
knife
cutting board
stove
small metal pot
stirrer
red cabbage
lemon juice
baking powder
water

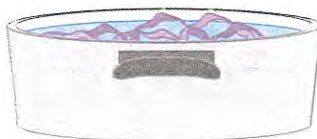
- 3 Heat the water and the cabbage until it begins to boil. Stir while heating.



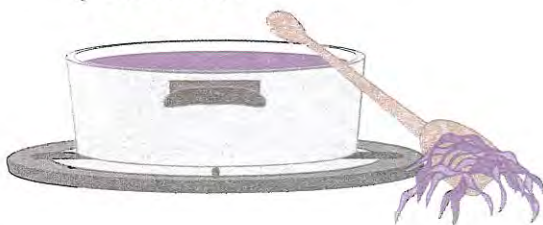
- 1 Cut the cabbage into small pieces carefully using the knife and cutting board.



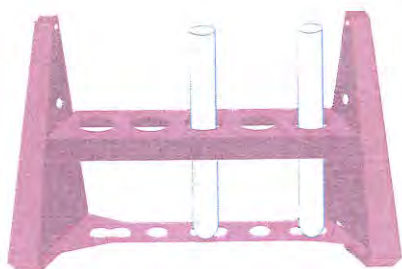
- 2 Put the small pieces of cabbage into the pot. Add some water to cover the cabbage. Light the stove.



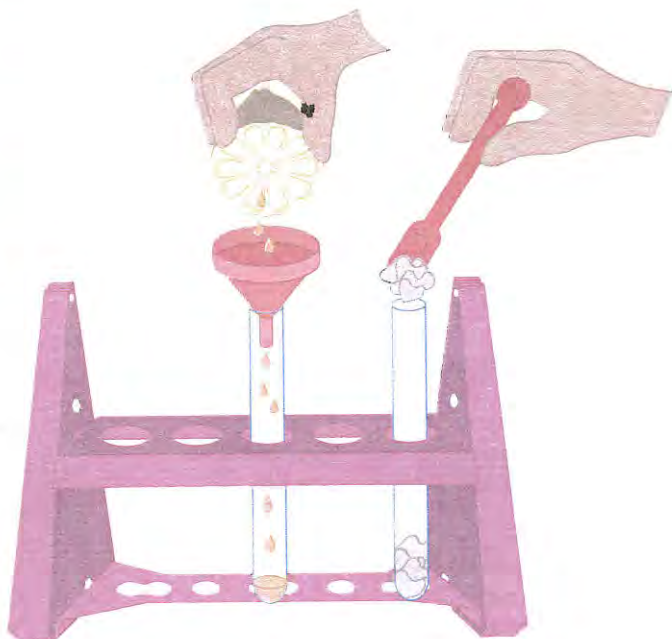
- 4 Turn off the heat. Let the pot of cabbage cool down for about half an hour. Carefully remove the cabbage from the pot keeping only the juice inside.



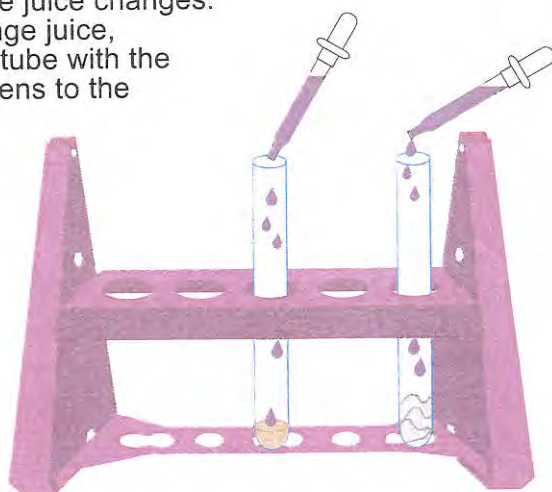
- 5 Place two test tubes in the test tube rack.



- 6 Squeeze some lemon juice into one of the test tubes. Carefully place two spoonfuls of baking powder into the second test tube.



- 7 Fill your eye dropper with the cabbage juice you prepared. Observe its colour. Squeeze all of it into the test tube with the lemon juice. Notice how the colour of the cabbage juice changes. Again fill the eye dropper with cabbage juice, but this time squeeze it into the test tube with the baking powder. And now, what happens to the colour of the cabbage juice?



Explanation: You produced two chemical reactions:
When cabbage juice (our indicator) comes in contact with the lemon juice (our acid), its colour turns pink.
When it comes in contact with the baking powder (our base) it becomes pale.
Continue to test other household materials to discover whether or not they are acids or bases. For example, you can try toothpaste, laundry detergent and vinegar.

ACTIVITY 4

What is pH?

pH is the value that indicates whether or not a substance is an acid or a base.

pH values range from 1 to 14:

- substances with a pH lower than 7 are acidic (pH 1 is the most acidic)
- substances with a pH equal to 7 are neutral
- substances with a pH higher than 7 are basic (pH 14 is the most basic)

Equipment:

pH indicator paper

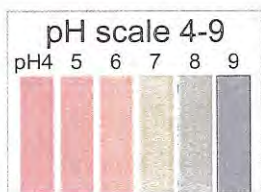
pH scale

tweezers

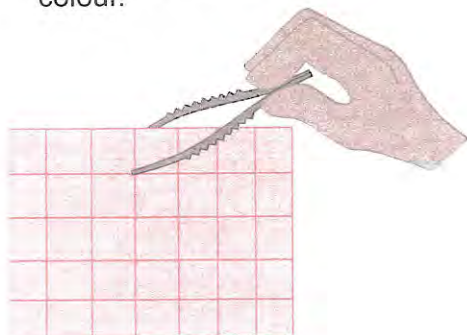
eye dropper

household materials

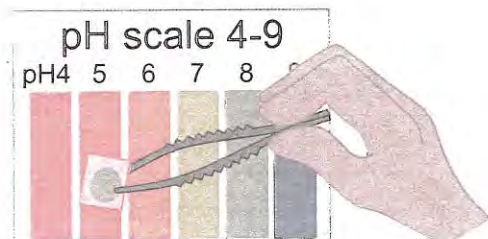
- 1 Look carefully at the pH scale. This pH scale ranges only from 4 to 9. Notice the different colours for each number.



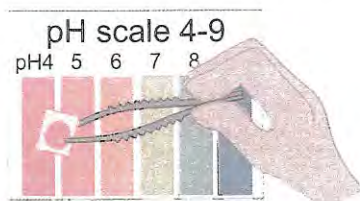
- 2 The pH indicator paper will change its colour when it comes into contact with an acid or a base. Always handle the pH indicator paper with the tweezers, as even the moisture on your fingertips can change its colour.



- 3 By comparing the colour on the pH paper to the coloured stripes on the scale, you can determine the pH of the substance you are testing.



- 4 Check several household substances. Try: vinegar, toothpaste, milk, liquid soap, lemon or orange juice, cola, soil from a potted plant or from the garden, baking powder, melted butter...etc.
- 5 Cut small pieces of the pH indicator paper. Remember to use your tweezers! Place the pH indicator paper onto the substance your are checking. Wait for the colour to change. Compare it to the colours on the pH scale.



ACTIVITY 5

Acid Rain is the result of chemical changes in the atmosphere, which are produced by air pollution. These chemical changes cause certain gases in the atmosphere to become acidic. When it rains, these gases are washed into bodies of water and forests, reducing the pH of soil and water.

The pH of water should be neutral (7). It may be interesting to check the water in your area.

Equipment:

pH indicator paper
pH scale
tweezers
eye dropper
various types of water
empty jam jars

- 1 Collect as many different samples of water as you can: tap water, rain water, water from an aquarium, from a lake, from a river, from the ocean...

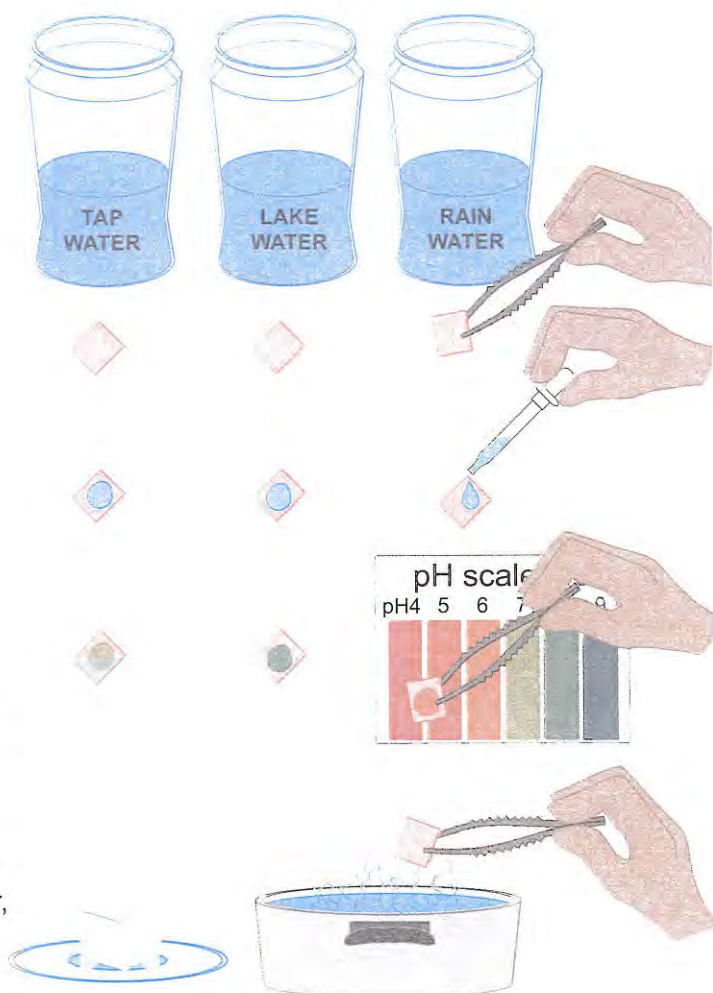
- 2 Place each sample in a separate jar and label them.

- 3 Handle the pH indicator paper with the tweezers. Cut it in small pieces and place each one near the labelled jar.

- 4 Place a few drops of each water sample on the pH paper.

- 5 Wait a few minutes and compare the colour of the pH paper to the different colours of the pH scale. Define the pH of each water sample.

- 6 You could also check the pH of another two forms of water, an ice cube and steam. Be careful!



Explanation: If the pH of rain water reaches 5, it is considered to be acid rain. This is dangerous. If it would become even lower, living things will die in it.

ACTIVITY 6

Can you write a magic message?

Equipment:

measuring spoon
beaker
eye dropper
plain paper
Tincture of Iodine
lemon
paint brush
bowl

- 1 Fill a bowl half way with water. Add 10 drops of Tincture of Iodine to the water.



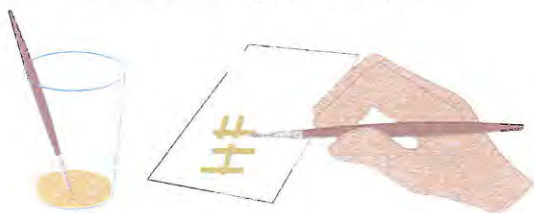
- 2 Use your measuring spoon to stir.



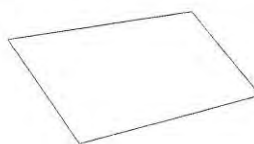
- 3 Squeeze some lemon juice into the beaker.



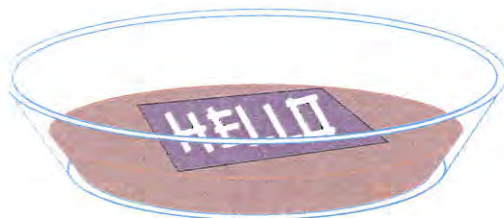
- 4 Cut out a piece of plain paper so that it fits in the bowl.
- 5 Dip the brush into the lemon juice. Using the juice as your paint, write a message on the paper.



- 6 Let the "juice-ink" dry on the paper. You will no longer see your message.



- 7 Once the paper has dried, place the paper into the bowl. Make sure that the paper is covered by the solution. Wait a few minutes. What do you see?



Explanation: The paper absorbed the Iodine-water solution and your message became visible again. This is due to the chemical reaction between the vitamin C in the lemon juice and the Iodine-starch solution. A **chemical reaction** is any change which alters the chemical properties of a substance or which forms a new substance.

ACTIVITY 7

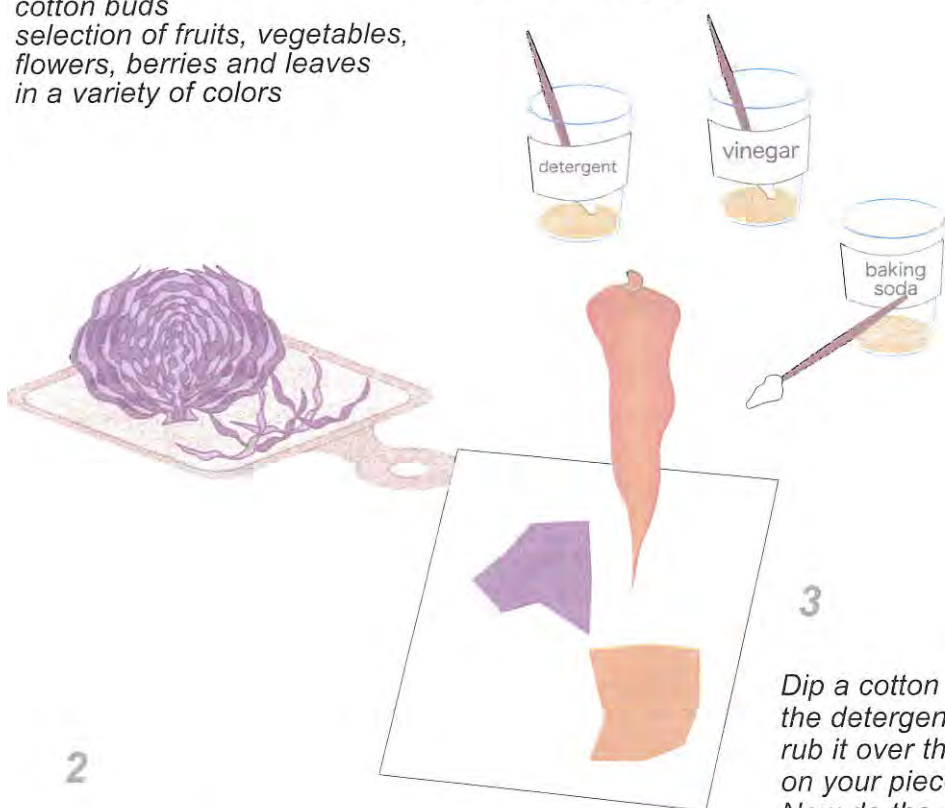
Plant dyes

Equipment:

3 disposable cups
piece of white paper
felt pen
teaspoon
liquid detergent
vinegar
baking soda
cotton buds
selection of fruits, vegetables,
flowers, berries and leaves
in a variety of colors

1

Create a picture on the piece of paper using all the plants you collected. You may need to cut some in half to release the juices before rubbing them on the paper



2

Prepare the cups. Into the first cup pour 6 teaspoons of vinegar. Into the second cup put 2 teaspoons of detergent. Into the third cup put 1 teaspoon of baking soda together with 6 teaspoon of water and mix well.

3

Dip a cotton bud into the detergent and gently rub it over the colors on your piece of paper. Now do the same with the vinegar and the baking soda. See how the colors change and how many different shades and hues you have created.

ACTIVITY 8

Sand pictures

Equipment:

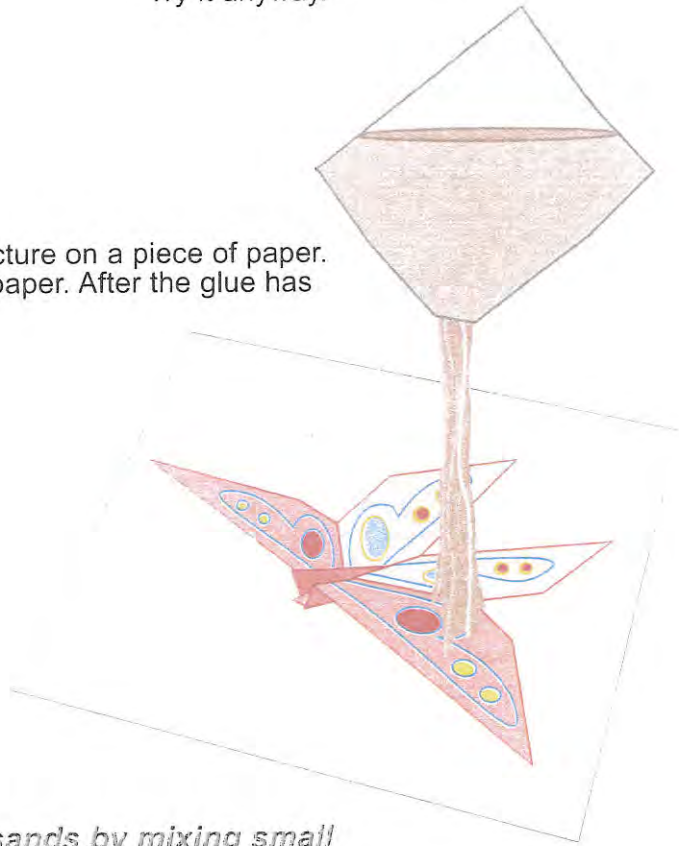
glue
paper
sand
water color paints

1

This experiment has very little to do with geology. It also has very little to do with science! In fact, you can hardly call it an experiment. Try it anyway.

2

Use your glue as ink and draw a picture on a piece of paper. Now, sprinkle some sand onto the paper. After the glue has dried, blow off the excess sand.



You can easily make colored sands by mixing small quantities of sand with the water colors you made in the last experiment. Using colored sands, you can make a real work of art!

ACTIVITY 9

Pasta Power

Equipment:

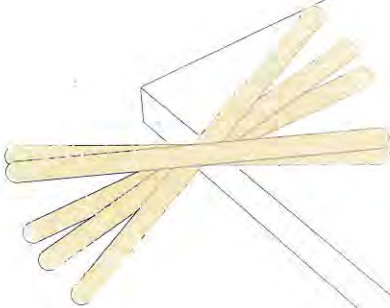
raw spaghetti and other similiar pasta
small paper cup
masking tape
ruler
small coins (all the same size)
string

1

Make 2 holes in the cup just below the top rim and opposite each other. Attach the string to each hole to make a handle.

2

Place a piece of spaghetti on the table so that 12cms hangs over the edge of the table. Tape the spaghetti to the table and also fold a piece of tape over the end of the spaghetti hanging off the table.



3

Hang the cup at the end of the spaghetti next to the tape and start adding coins to the cup. Record how many coins you add before the spaghetti breaks. Try with a thicker piece of pasta and then try with 3, 4 or 5 pieces of pasta taped together. Record how many coins are needed to break the pasta in each experiment.

ACTIVITY 10

Absorption and dyes

Equipment:

a white flower
a pair of scissors
different food colourings
(red and blue)
2 glasses

1

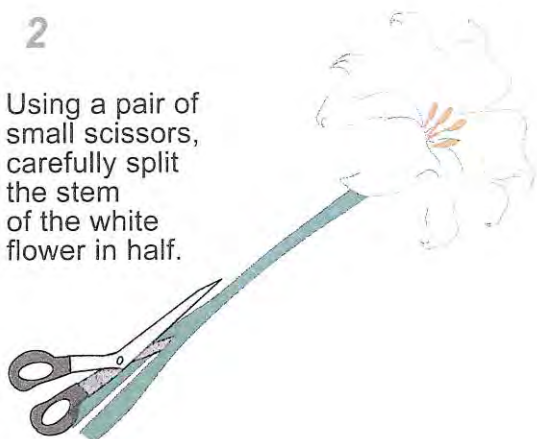


Fill the two glasses almost to the top with water.

Pour a few drops of the red food colouring into one of them, and a few drops of blue food colouring into the second one.

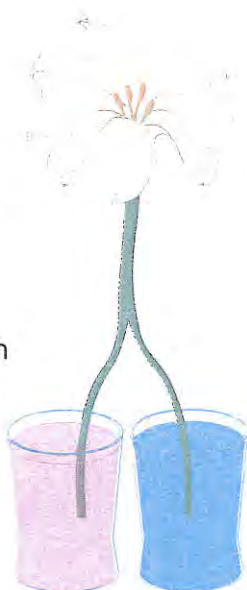
2

Using a pair of small scissors, carefully split the stem of the white flower in half.



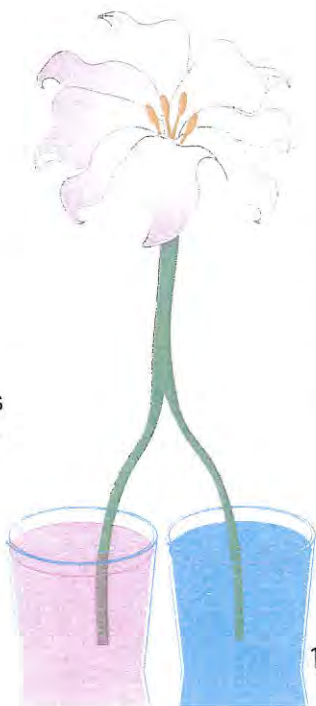
3

Place the two glasses very close to each other. Put each half stem of the flower into each one of the two glasses, as shown:



4

Keep the whole set up in a warm room for few days. Each day you will be able to see how the white flower becomes more and more colourful.



Explanation: A dye is a substance, either natural or synthetic, that adheres its colour to any material which has the ability of absorbing it. Food colourings are dyes.

In this activity, the dyes are absorbed by the plant with the water and help to visualize how they travel from the roots of the plant, through the stem, to its leaves and petals.

Question: How many absorbent materials can you find in your house? Do all materials absorb liquids?

ACTIVITY 11

Sticky Ice

Equipment:

ice cubes
salt
string
saucer

- 1 Put an ice cube on a saucer. Sprinkle some salt on top of the ice cube.

- 2 Place a second ice cube on top of the salty side of the first ice cube.



- 3 Press the top ice cube onto the bottom one for about one minute. Try and lift the top ice cube. What happens?

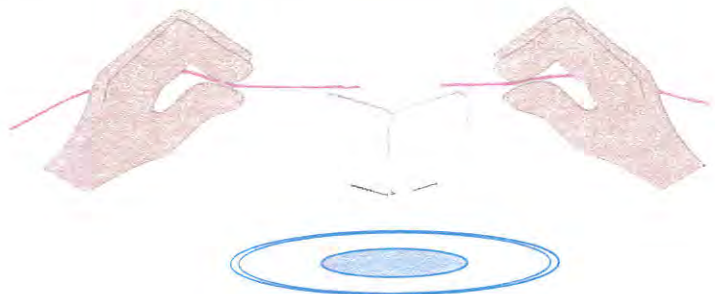


ACTIVITY 12

- 1 Wet a piece of string in tap water. Place the ice cube on a saucer and the string on the top.

- 2 Sprinkle salt all along the top of the ice cube and string. Wait about one minute.

- 3 Pick up the string on both ends with your fingers and lift.



Explanation: When you sprinkle salt on ice, the ice quickly begins to melt. This is due to the fact that salty water freezes at a lower temperature than tap water.

Can you now guess why we sprinkle salt on icy roads and sidewalks?

ACTIVITY 13

Volcanic Reactions

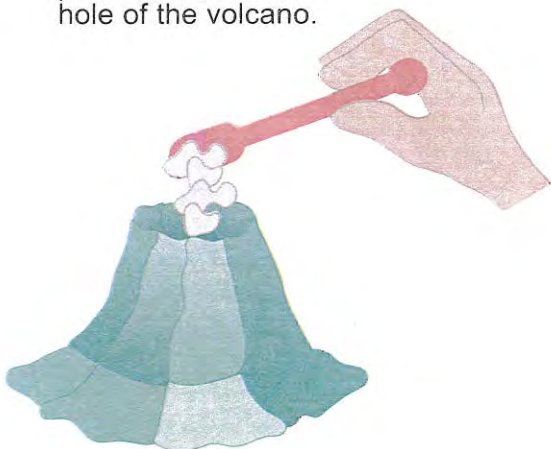
Equipment:

plasticine
eye dropper
measuring spoon
baking powder
vinegar
food colouring (red)

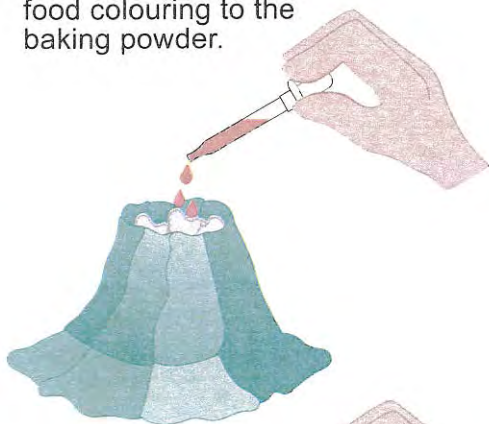
- 1 Use the plasticine to form the shape of a volcano.



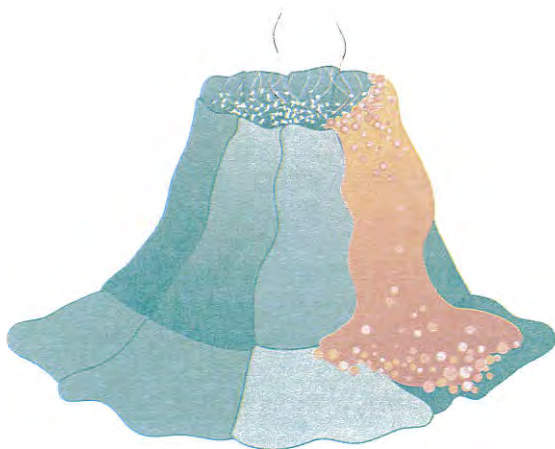
- 2 Put a few spoons of baking powder in the middle hole of the volcano.



- 3 Add a few drops of red food colouring to the baking powder.



- 4 Finally using the eye dropper, add a few drops of vinegar, to the mixture. What happens?



Question: Where did the "red lava" come from?

Explanation: You produced a quick chemical reaction between the baking powder and the vinegar, causing the lava to form and bubble down the volcano.

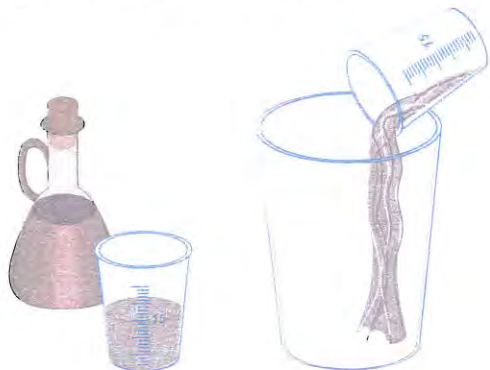
ACTIVITY 14

Cleaning Old Coins

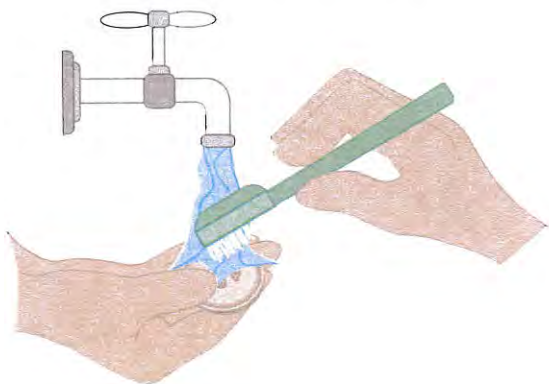
Equipment:

beaker
tweezers
measuring spoon
measuring cup
salt
vinegar
2 old "dull-looking" pennies

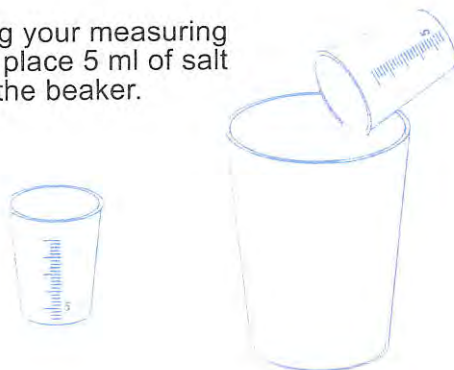
- 2 Add 15 ml of vinegar.



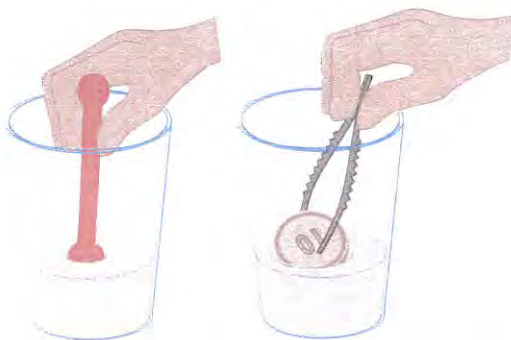
- 4 Wash the second coin with ordinary soap and water.



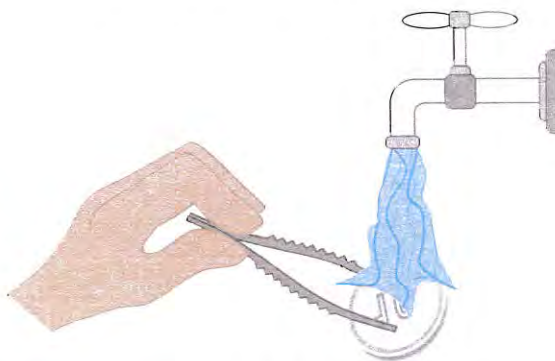
- 1 Using your measuring cup, place 5 ml of salt into the beaker.



- 3 Use your measuring spoon to mix well.
Place one of the coins into the mixture with the tweezers.
Let this sit for few minutes.



- 5 Using the tweezers, remove the coin from the beaker and rinse it with water.
Compare the two pennies.



Explanation: When salt and vinegar are mixed together, Hydrochloric Acid is formed. This acid is very often used to clean metals and metallic objects. The penny is made out of a copper metal and is cleaned to look like new after it has been in the salt and vinegar solution.

ACTIVITY 15

Making perfume



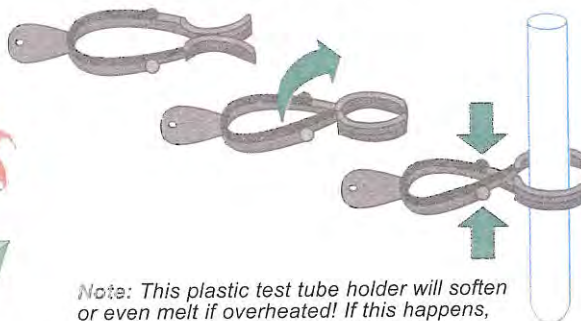
Adult supervision
is required for this
activity

Equipment:

test tube
test tube rack
test tube holder
funnel
stopper
beaker
water
rose petals

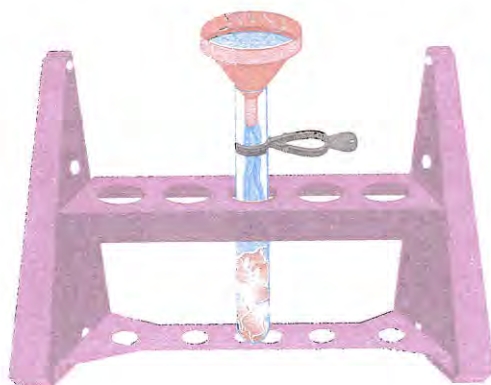


- 1 Your test tube holder works like a pair of cooking tongs. Get it ready for use by following the steps below:



Note: This plastic test tube holder will soften or even melt if overheated! If this happens, let it cool and it will reharden. If it is overheated and doesn't hold the test tube securely in place, while still hot, carefully press the two ends together and let them cool. The holder will be as good as new.

- 2 Fill 1/2 of a test tube with the petals. Secure the test tube into the holder and place it in the test tube rack.
- 3 Boil some water. Using your funnel, carefully add just enough boiling water into the test tube to cover the petals.



- 4 Remove the funnel and close the test tube with the stopper.
- 5 Fill the beaker 3/4 full with boiling water. Place the closed test tube inside the beaker. Let it remain for at least 15 minutes.
- 6 You have produced perfume inside the test tube. Pour your perfume into a small and clean container. If you like, separate the petals with a strainer.



ACTIVITY 16

- 1 Secure each candle to a piece of cardboard with the plasticine.

Burning Candles

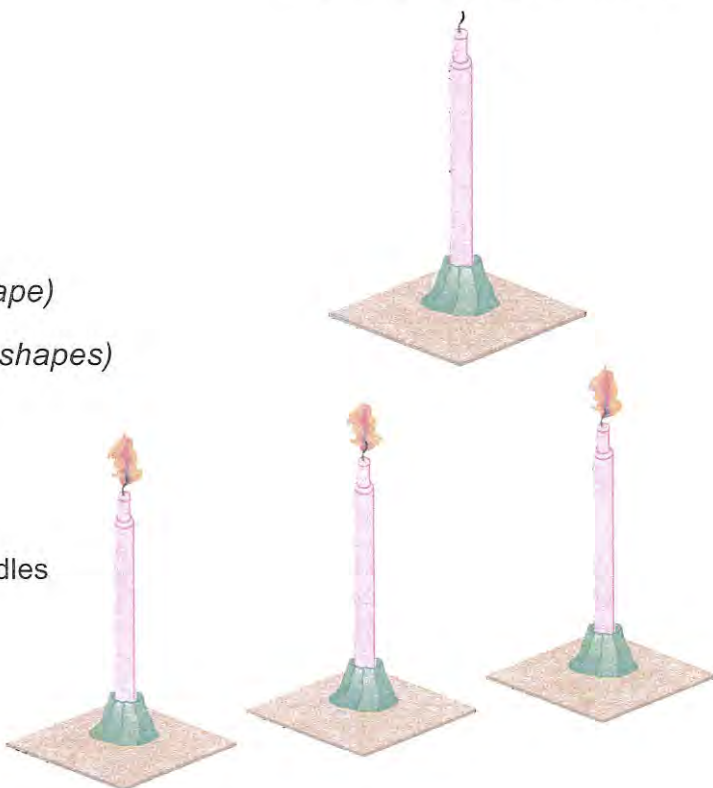


Adult supervision
is required for this
activity

Equipment:

- 3 identical candles
(of same size and shape)
- 3 different glass jars
(of various sizes and shapes)
- 3 pieces of cardboard
- plasticine
- matches

- 2 Carefully light the candles with the matches.



- 3 Immediately, one after the other, cover each candle with the jars. Note how long each candle burns.



Explanation: When the candles were covered with the jars, they used up all of the oxygen inside and then stopped burning. Oxygen is needed in order to allow the candles to burn. This is the chemical reaction called **combustion**.

The candles are identical in size, but the sizes of the jars are different. Did the candle covered with the largest jar burn the longest? Why?

ACTIVITY 17

How to remove gas (to be done outdoors)

Equipment:

bottle of soda
balloon
rubber band

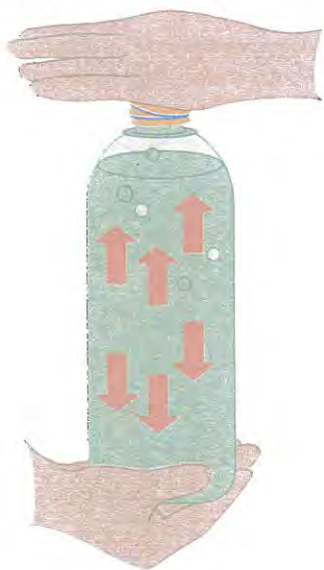
- 1 Take off the cap from a bottle of soda and quickly, stretch the opening of the balloon over the mouth of the bottle.



- 2 Keep the balloon securely in place using the rubber band.



- 3 Put your hand on the mouth of the bottle, over the balloon, and gently shake the bottle a few times.



- 4 Place the bottle on a table or on the ground.



Question: What happens to the balloon? What happens inside the bottle?

Explanation: The bubbles formed within the bottle of soda cause the balloon to inflate. The soda consists of a gas called Carbon Dioxide. When you first opened the soda bottle, undissolved gas from the top of the bottle "escaped" into the attached balloon. When you shook the bottle, more gas "escaped" and you could see the bubbles within the soda rising. The Carbon Dioxide gas rose into the balloon and caused it to inflate.

ACTIVITY 18

Can you hear and see gas expand?

Equipment:

empty 2-litre soda bottle

beaker

coin

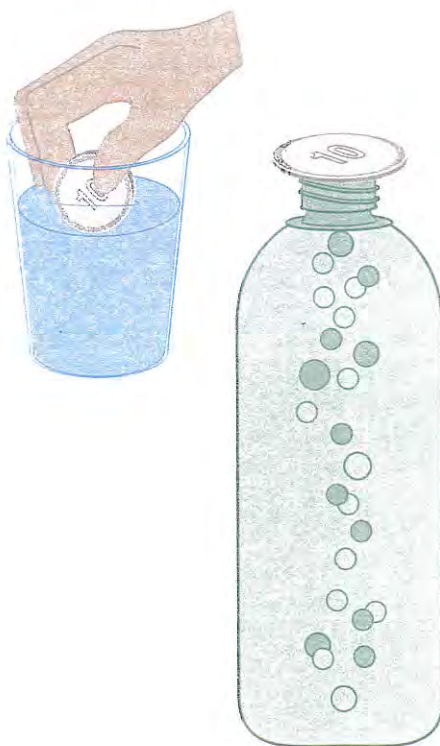
- 1 Put some water in the beaker and dip the coin in it.



- 2 Place the empty soda bottle without its lid in the freezer for about 5 minutes.



- 3 Remove the bottle from the freezer and very quickly, cover the opening of the bottle with the wet coin. Carefully look at the coin and listen to it.



Question: What really happened?

Explanation: The air in the soda bottle contracted while it was in the freezer. When you removed the bottle from the freezer, the cold air started to heat up and to expand. This caused the coin to "jump" up and make a clicking sound. This repeats itself until the temperature within the bottle equals the temperature on the outside of the bottle.

Note: If the coin jumps too much, place it again directly over the opening of the bottle.

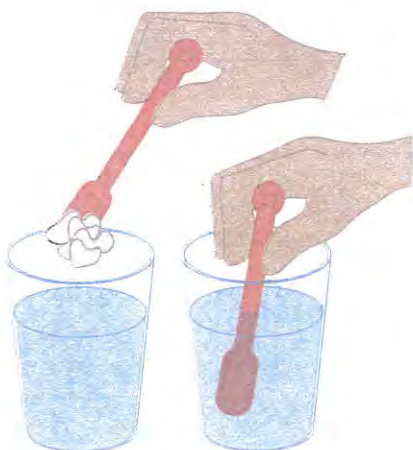
ACTIVITY 19

Grow Your Own Salt Crystals

Equipment:

measuring spoon
beaker
magnifying glass
salt
hot water
paper clip
pencil
string

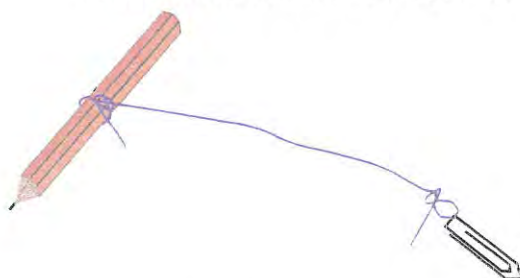
- 2 Add several spoonfuls of salt to the hot water. Stir with the measuring spoon until it has all disappeared. Add more salt and stir again.



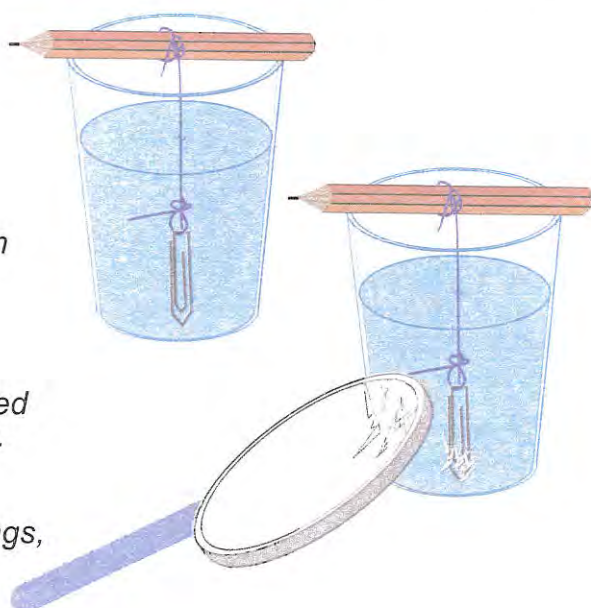
- 1 Fill a beaker 3/4 full of hot water.



- 3 Tie a paper clip on to one end of a piece of thread. Tie the other end around a pencil.



- 4 Drop the end of the thread with the paper clip into the beaker. Set the beaker aside for a few days. Watch as the crystals grow.



Question: What happens to the paper clip after a few days? You can use your magnifying glass to better examine the phenomenon.

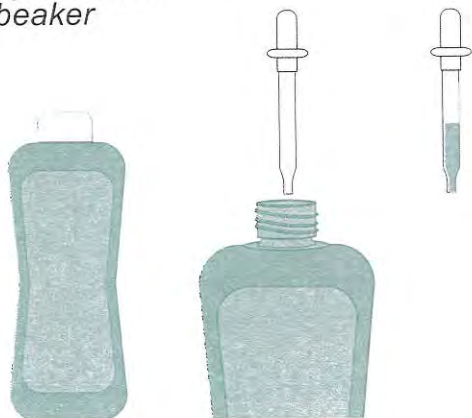
Explanation: Crystals are solids with regular geometric shapes, formed by regular arrangements of particles. Each crystal has its own shape. Substances that form crystals are described as crystalline. Lots of things, such as salt, sugar and sand, are crystals.

ACTIVITY 20

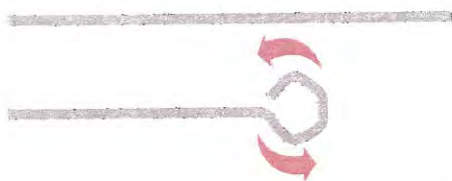
Crystal bubbles

Equipment:

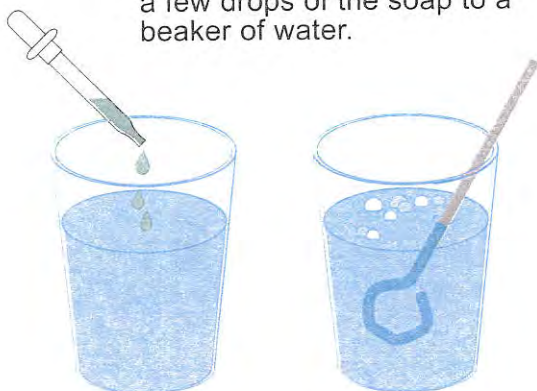
bubble blower or flexible wire
liquid soap
water
magnifying glass
eye dropper
beaker



- 1 If you do not have a bubble blower, make one by simply bending some flexible wire.

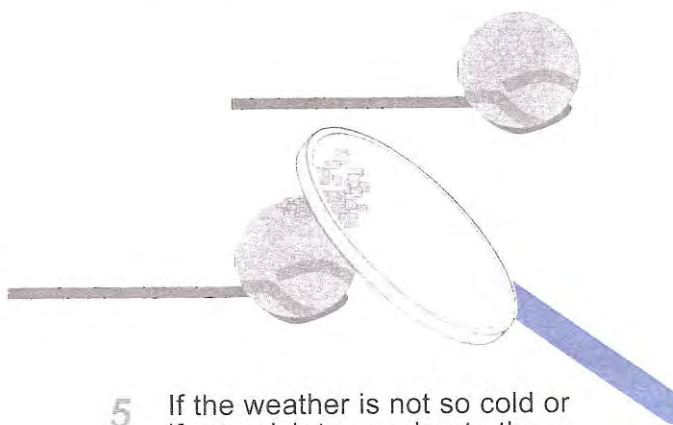


- 2 Make a liquid soap mixture by adding with your eye dropper, a few drops of the soap to a beaker of water.



- 3 Take your bubble blower and soap mixture outside on a cold day. Dip the the blower into the mixture and blow a large bubble. Try this a few times until you have a sturdy and large bubble.

- 4 Let the bubble begin to freeze. Examine the bubble with your magnifying glass. Do you notice any tiny crystals forming on the bubble's surface?



- 5 If the weather is not so cold or if you wish to accelerate the freezing process, place your bubble inside the freezer. After few minutes, take it out and examine again with your magnifying glass.

ACTIVITY 21



Try to produce stalactites

Equipment:

2 glasses
1 plate
measuring spoon
2 washers
3 lengths of string
(each about 25 cm long)
baking powder
hot water

3 Carefully fill the two glasses with very hot water.

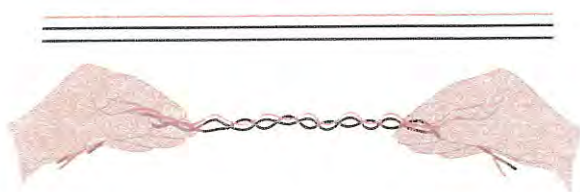
4 Add several spoonfuls of baking powder into each glass. Quickly stir the solution in order to dissolve as much baking powder as you can.

Please note:

Once the water cools, it will not be possible to add baking powder to the solution and successfully dissolve it.

5 Put the plate between the glasses. Drop the ends of the string into the glasses creating a set up as shown below. Leave it for several days.

1 Twist together the three lengths of string to make one thick string.



2 Tie a washer to each end of the thick string.



Question: What do you notice happening to the middle of the string after several days?

Explanation: Stalactites are long thin columns of minerals hanging from the roofs of caves. They form over many centuries as the water drips and deposits the minerals.

In this activity, the water and baking powder from the glasses move along the string and drip down the middle.

After few days, you will notice that stalactites form in the centre of the string.



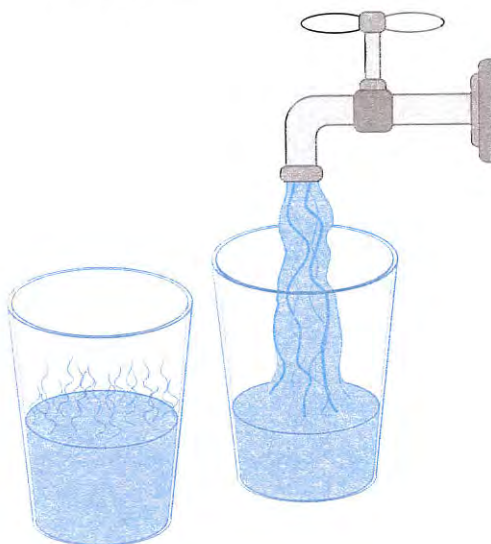
ACTIVITY 22

Make your own rock candy (Sugar Crystals)

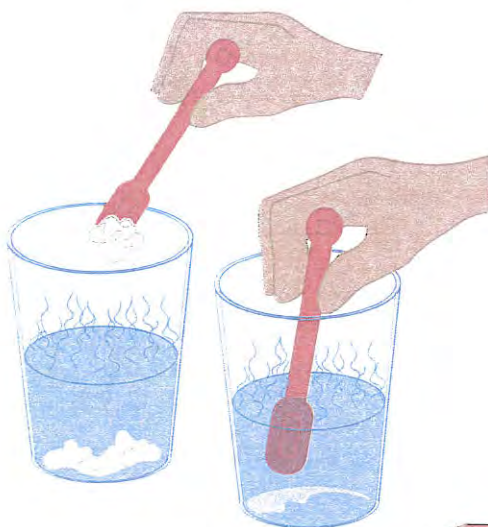
Equipment:

measuring spoon
magnifying glass
beaker
string
pencil
sugar
hot water

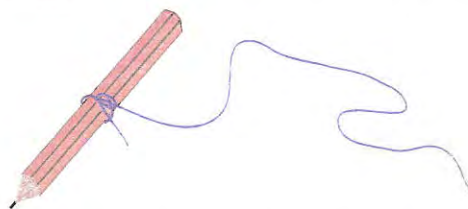
- 1 Fill up the beaker half way with hot tap water.



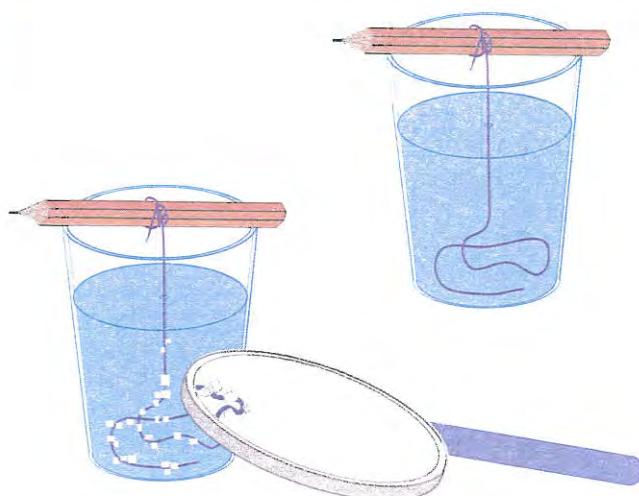
- 2 Dissolve several spoonfuls of sugar into the hot tap water.



- 3 Tie a length of string to a pencil.



- 4 Drop the free end of the string into the beaker. Let this remain as is overnight.



- 5 Notice how sugar crystals formed overnight. Your rock candy is edible!!

ACTIVITY 23

Test the flow of fluids

Equipment:

water
cooking oil
glycerine
syrup
vinegar
empty jam jars
marbles

- 1 Fill the jars with the different substances.
- 2 Drop a marble into each jar. Carefully observe how the marbles "dive" to the bottom of the jars. Note the differences in the speed.



Explanation: You are testing the viscosity of the various substances. The slower the marble falls, the higher the viscosity. Viscosity is the ease of flow of a fluid.

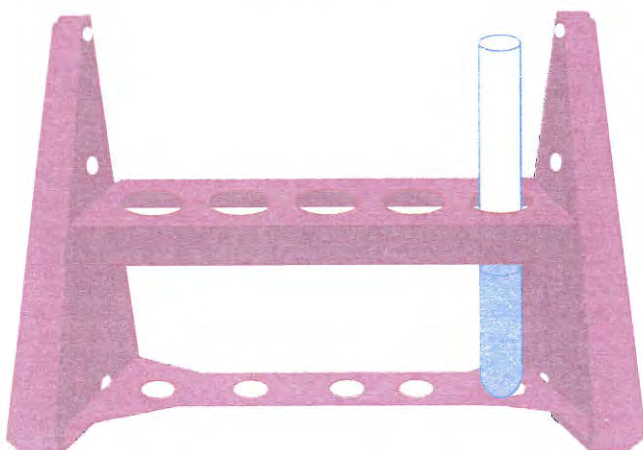
ACTIVITY 24

Separating Materials

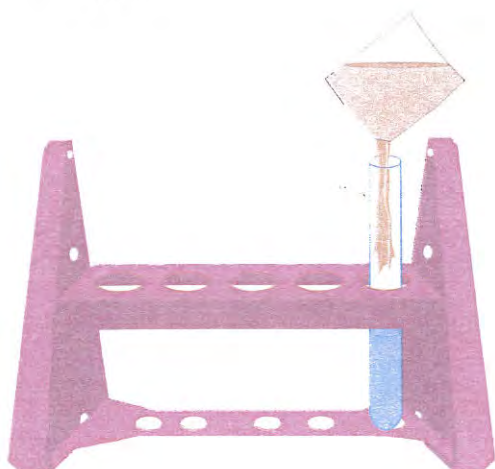
Equipment:

test tube
sand
magnet
plastic tubing
test tube rack
measuring spoon
funnel
stopper
iron powder
filter paper
saucer
water

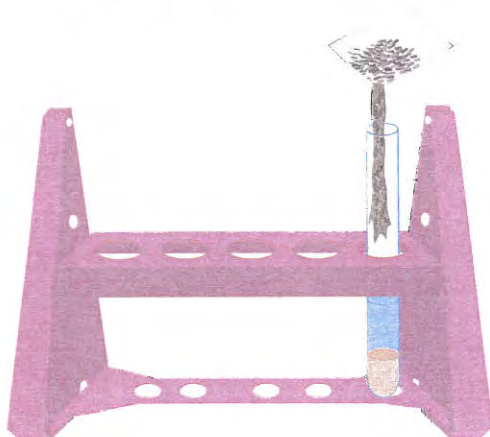
- 1 Fill the test tube half way with water and place it in the rack.



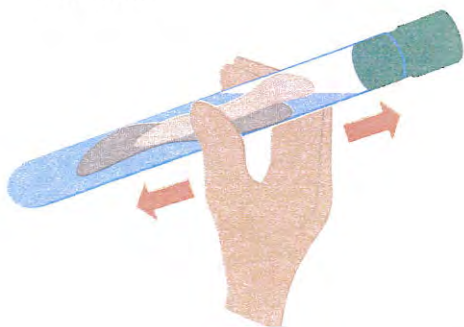
- 2 Add some sand to the test tube.



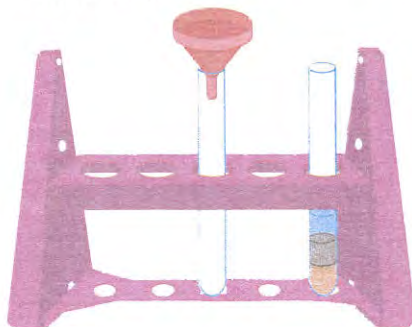
- 3 Add some of the iron powder to the test tube.



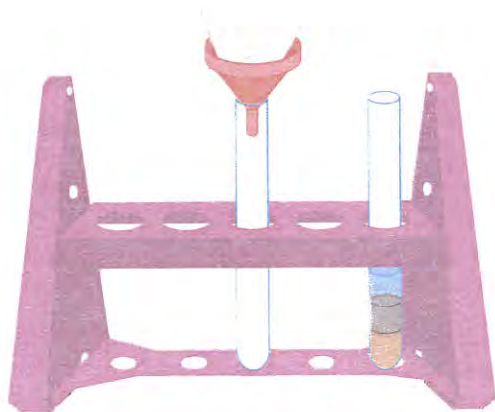
- 4 Close the test tube with the stopper and shake it, mixing the contents.



- 5 Place a second test tube in the rack. Put the funnel inside the test tube.



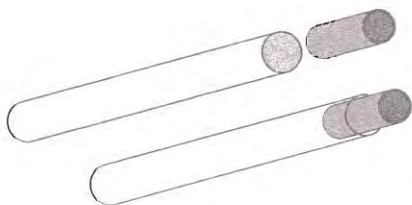
- 6 Fold the filter paper like a small cone and place it into the funnel.



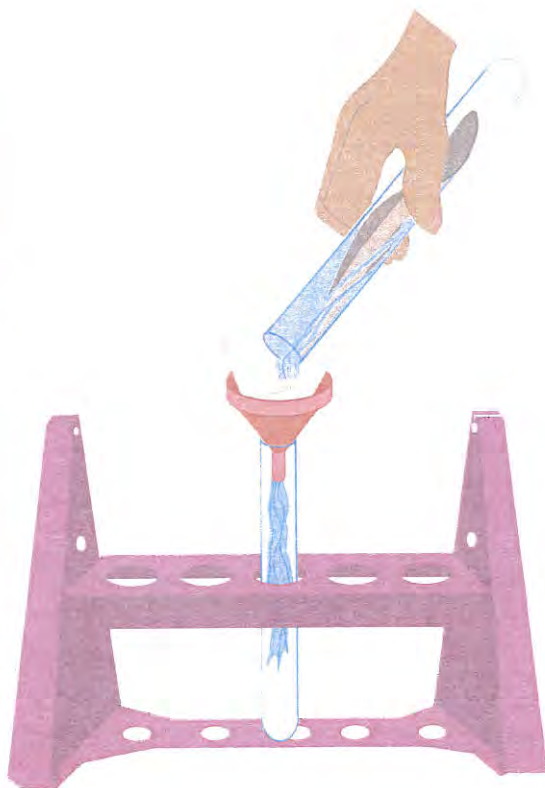
- 8 Pour the contents of the funnel onto a saucer. Let it dry in the sun.



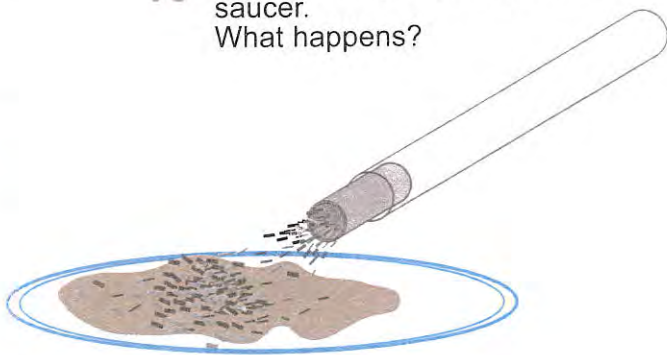
- 9 Connect your magnet to the plastic tubing as shown:



- 7 Pour the contents from the first test tube into the second one.
Note: Only the water seeps through the filter paper into the test tube, the sand and the iron powder remain in the funnel.



- 10 Hold the magnet just above the saucer. What happens?



Explanation: You have separated the liquid (water) from the solids by filtering. By using magnetic attraction you have separated the solids (sand and iron powder) from one another.

ACTIVITY 25

Indian rope trick

Equipment:

test tube

magnet

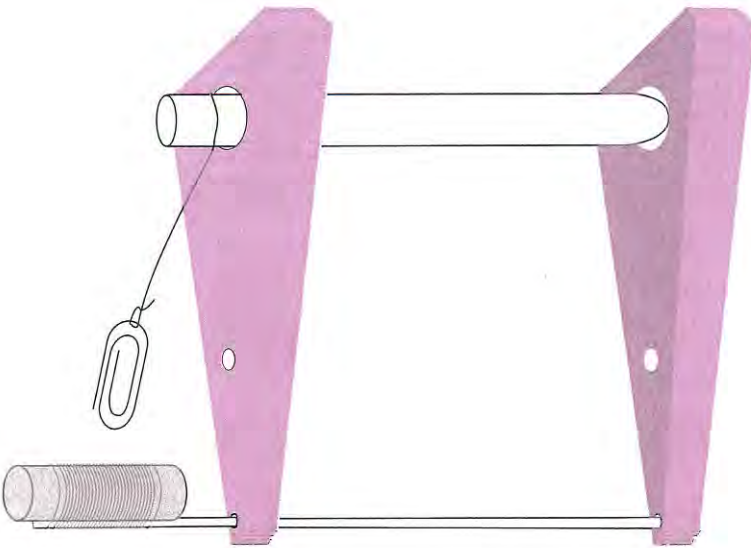
plastic tubing

test tube rack

sewing cotton

paper clip

elastic band



plastic tubing

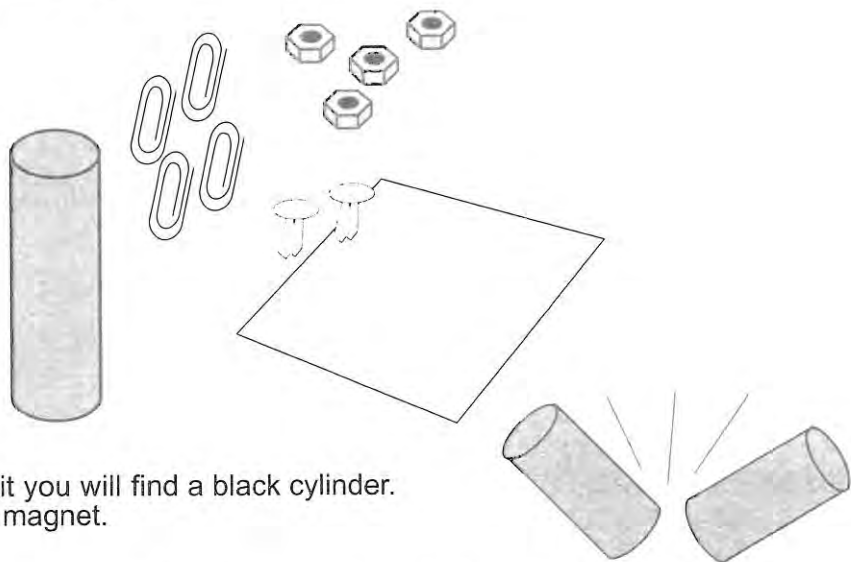
1 Set up your experiment stand by taking two triangles, clipping them together with a 12 cm plastic tube, and your plastic test tube as shown in the drawing. Attach one of the magnets with an elastic band to the tubing. Attach a piece of sewing cotton to a paper clip and the test tube. Now, as you lift the paper clip close to the magnet, wind up the slack slowly on the test tube and then let go of the paper clip. The cotton should now be taut, and the paper clip suspended in the air. Slowly wind a bit more cotton onto the plastic test tube. The gap between the paper clip should be longer. Keep on doing this until you reach the maximum gap before the clip falls. You now have a better way of measuring the strength of the magnet.

ACTIVITY 26

Examining a magnet

Equipment:

- magnet
- paper
- plastic
- washer
- nail



- 1 In your kit you will find a black cylinder. This is a magnet.
- 2 Magnets can break if you drop them; in which case each piece will become a magnet in its own right. We know that certain objects stick to magnets. Experiment with the parts in your kit and complete the following table.

item	sticks to magnet	does not stick
paper clip		
iron powder		
paper		
plastic		
washer		
mirror		

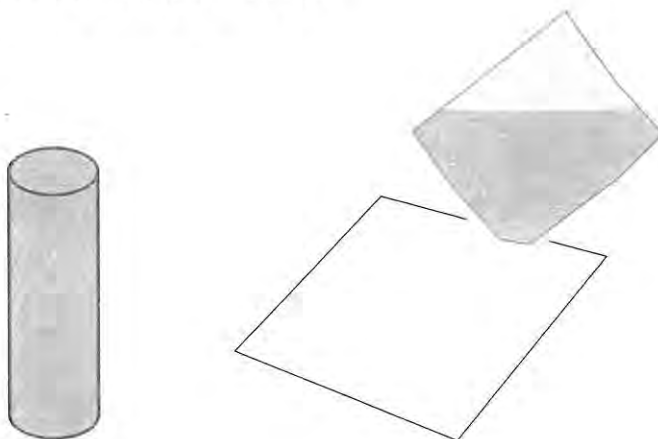
Look round your home and add other objects to your list.

ACTIVITY 27

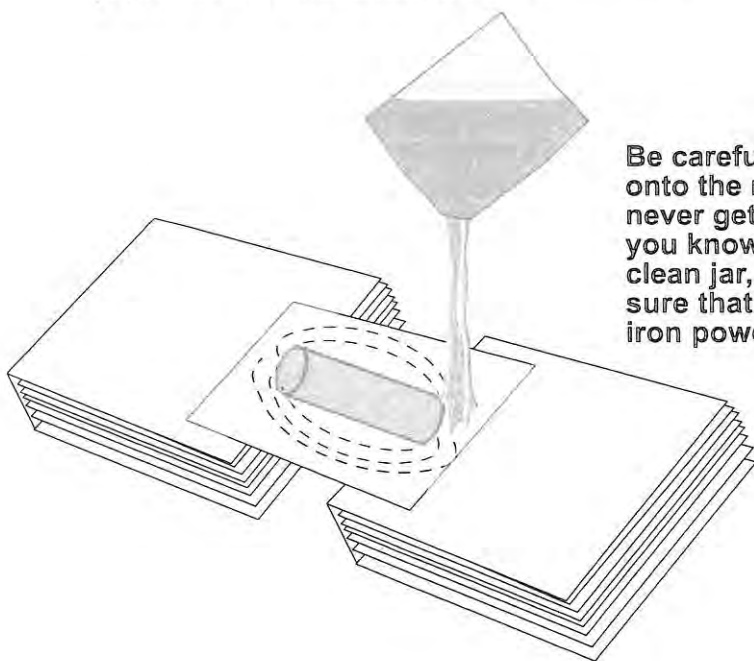
Create magnetic lines of force

Equipment:

magnet
paper
books
iron powder



- 1 Take a piece of clean paper about 9 inches square. Place it between two flat books of the same size. Put the paper on the magnet so that the magnet is in the middle of the underside of the paper. Take the small bag of iron powder from your kit. Cut a very small part of one of the corners and lightly sprinkle a very small amount onto the middle section of the paper, all around the magnet. Gently tap the paper. Suddenly, you will see the iron powder forming a pattern around the ends of the magnet. This is the pattern that you will get with all magnets. These patterns are called Lines of Force.



Be careful not to spill the iron powder onto the magnet, because you will never get the powder off, and by now, you know the reason why. Find a small clean jar, or plastic bag at home. Make sure that it is very dry and keep your iron powder in it for further use.

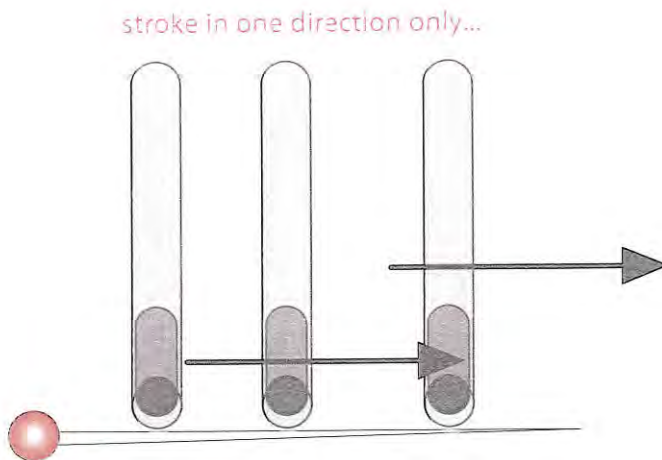
ACTIVITY 28

Create a nail magnet

Equipment:

magnet
nail

- 1 Take a nail and rub it hard on the magnet several times.
Now try and pick up a pin or a paper clip. You should have a weak magnet.



lift magnet well above nail at the end of each stroke

How did this happen? Rubbing the nail on the magnet caused the atoms to arrange themselves in such a way that the magnetic forces remained in the nail and turned it into a magnet.

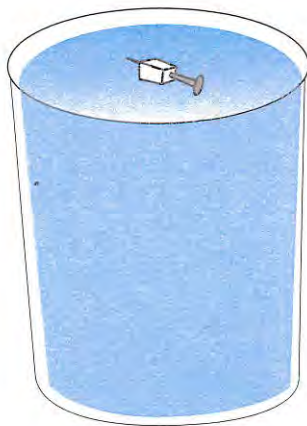
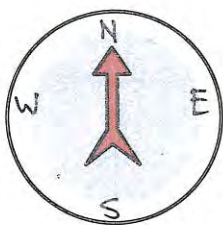
ACTIVITY 29

Make a compass

Equipment:

magnet
polystyrene pellet
cup
pins

- 1 Find a few pins from a sewing box. Take your magnet and rub a pin as you did with the nail in Activity 28, making sure the point of the pin is rubbed towards the north part of the magnet. Take a small ball of polystyrene, push the magnetized pin through the middle, and put it into a saucer of water. Check and see that the pin will slowly turn towards the North.



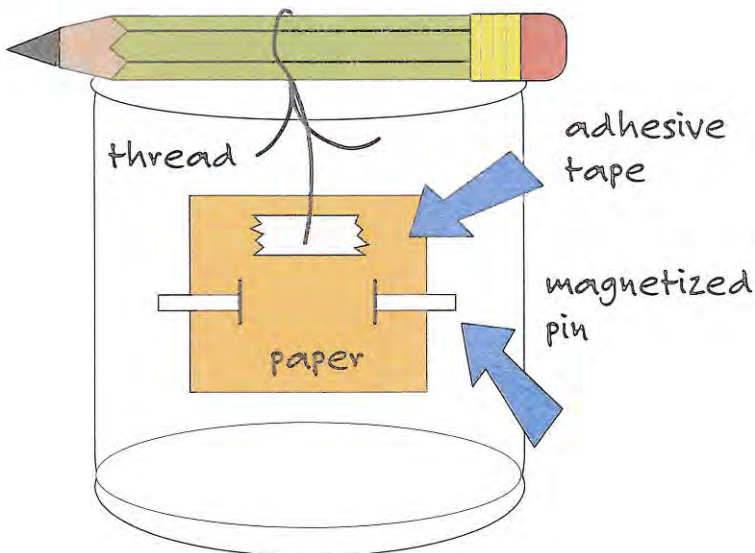
ACTIVITY 30

Make a better compass

Equipment:

magnet
beaker
pin
thread
adhesive tape
paper
pencil

- 1 Take a beaker or glass, and a pencil. Use another magnetized pin and thread it through a small piece of paper. Take a length of cotton thread and attach one end to the paper with the pin, using adhesive tape, and the other end to the pencil so that if you place the pencil on top of the glass, the pin will hang in the middle of the glass. You have a perfect compass. Check and see if it is as exact as all the other compasses you have.



ACTIVITY 31

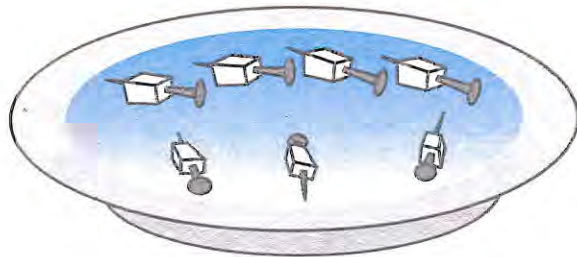
Mass attraction

Equipment:

magnet
pins
polystyrene pellets
plate

- 1 Get hold of several more pins and break off an equal number of polystyrene pellets from the tray of this kit. Magnetize these pins and insert them in the pellets. Now, take a large bowl and fill it with water. Float all the pins in the water so that they do not touch one another. Watch what happens after several minutes! Can you explain this?

pins lined up north to south



bowl or soup plate filled with water

Explanation:

The Earth is like a big bar magnet - one end the North Pole, and the other end, the South Pole. Any magnet suspended between these poles will line up with the lines of the magnetic force. Your compass, being a magnet, will always align itself so that it points to the North or South. However, there is one small difference. A compass points to the Magnetic North Pole, which is a distance from the true North Pole. All navigators have to keep this in mind and they therefore make the correction or variation in the calculation when navigating.

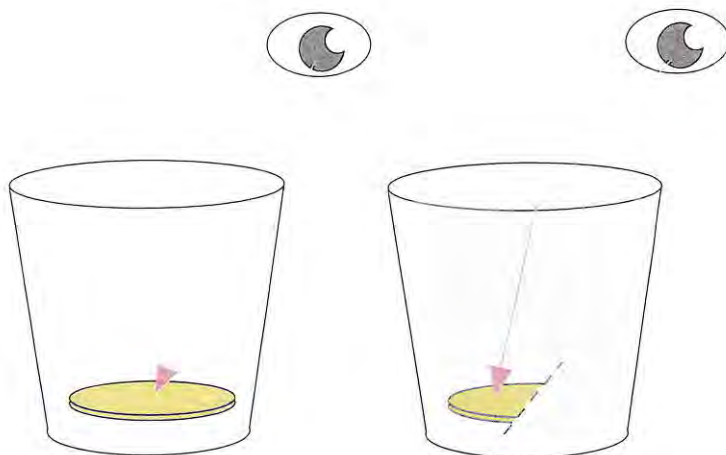
ACTIVITY 32

The reappearing coin

Equipment:

coin
beaker or glass cup
water

- 1 Place a coin at the bottom of an empty glass. Continue looking at the coin through the opening of the glass while you move your head away. Move away until you can see only a small part of the coin. Slowly and without moving your head, pour water into the glass. As the glass fills with water the rest of the coin will gradually appear! Why?



Explanation:

Light is "bent" when it passes from one medium, such as air, to another, such as water. Scientist call this bending effect refraction of light. When you looked at the coin in the empty glass you could see only a part of it, but once the light rays were bent by the water, you could see all of it.

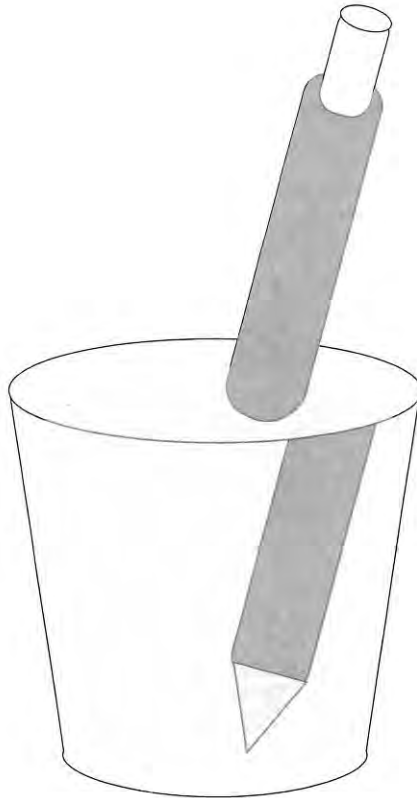
ACTIVITY 33

The broken pen

Equipment:

pen
beaker or glass
water

- 1 Place a pen in a glass filled with water. Observe the pen from the side. It appears to be “broken” at the water line. This “break” is caused by the refraction of the light rays as they pass from the water to the air.

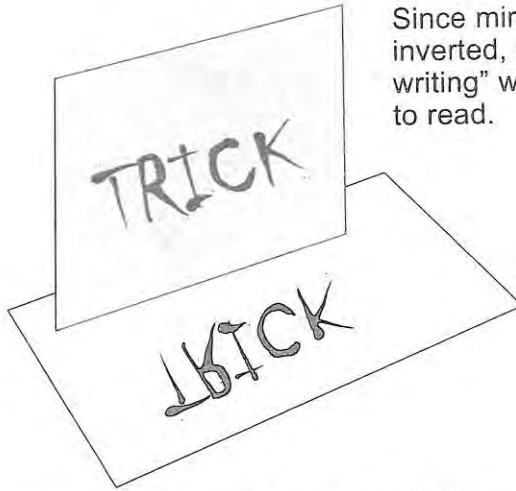


ACTIVITY 34

Mirror writing

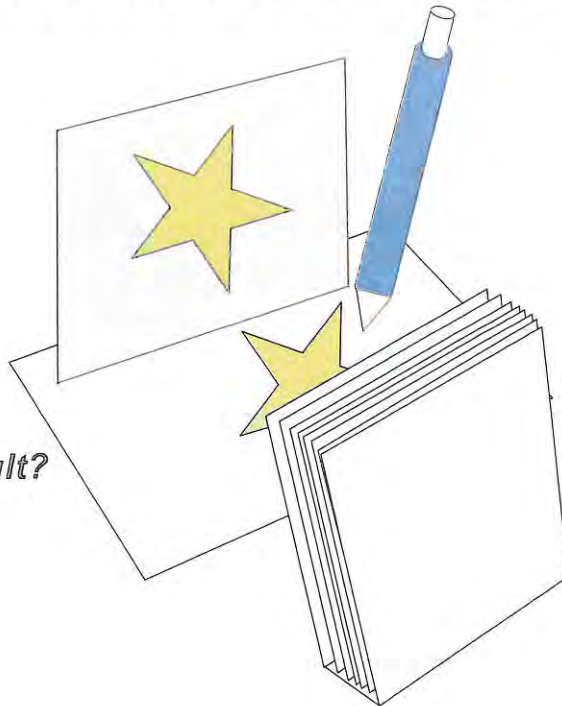
Equipment:

pen
paper
mirror



Since mirror images are laterally inverted, you can produce "mirror writing" which is very difficult to read.

- 1 First, write a message normally. Now place it in front of a mirror and copy the message as it appears in the mirror. To read back your message, place the mirror writing in front of the mirror. Look into the mirror to read the writing normally again.



ACTIVITY 35

Why is it so difficult?

Equipment:

pen
paper
mirror

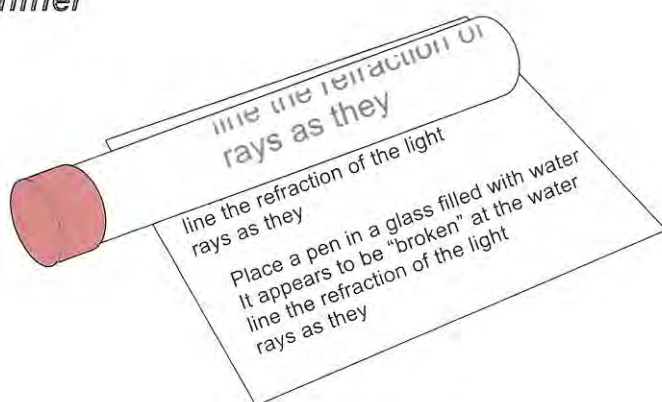
- 1 Draw a small figure, like a star, and place your mirror upright next to it. Place a book so that it blocks your vision of the figure on the paper, but so that you can still see the image in the mirror. Now trace the figure with a pencil by looking only at the image in the mirror. Difficult, isn't it?

ACTIVITY 36

Test tube magnifier

Equipment:

test tube
water
stopper



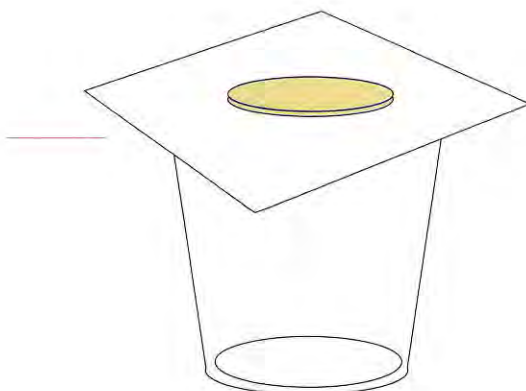
- 1 A magnifier enlarges the apparent size of an object. It bends rays of light so you perceive an object as larger than it actually is. To see how this works, completely fill your test tube with water. Stop it up with the plastic stopper. Now hold it over a line of print in this book. The test tube acts as a magnifying glass.

ACTIVITY 37

A magic coin

Equipment:

coin
paper
glass



- 1 Can you transfer the coin from the cardboard into the glass without touching the glass or the coin? Easy! Give the cardboard a sharp flick with your finger. The cardboard will move forward, but the coin will remain in midair and then fall straight into the glass!

The coin is "victim" of inertia. If you moved the cardboard slowly, then the coin would move along with it because the force of gravity which presses the coin to the cardboard would be stronger than any inertia.

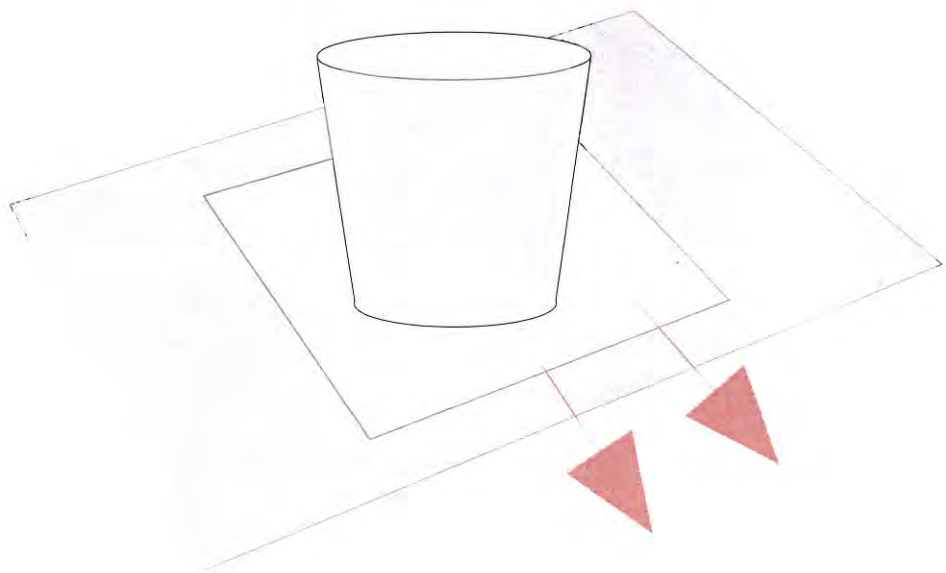
ACTIVITY 38

Paper under the glass

Equipment:

glass
water
paper

- 1 Fill a glass nearly full with water. Place this on a sheet of paper. Sharply jerk the paper out from under the glass. The glass should remain in its place because it tends to resist being moved.



ACTIVITY 39

Soapy Tricks

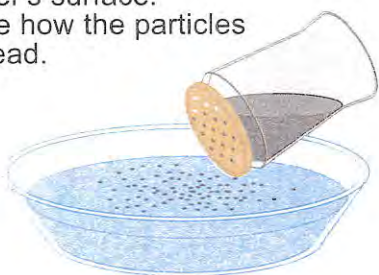
Equipment:

shallow dish with water
black pepper or talcum powder
liquid soap or detergent
string

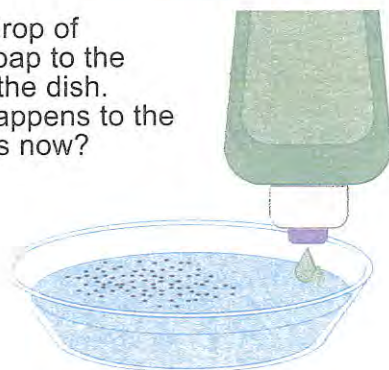
- 1 Fill a shallow dish with cold, clean water.



- 2 Sprinkle some black pepper or talcum powder on the water's surface. Note how the particles spread.



- 3 Add a drop of liquid soap to the side of the dish. What happens to the particles now?

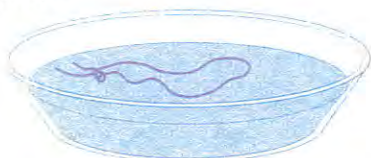


Explanation: The liquid soap dissolves and then breaks the surface tension in that area. The floating particles move to the side opposite the soap because the surface tension of the rest of the surface pulls them.

ACTIVITY 40

Can you break surface tension?

- 1 Empty out the dish and rinse it. Fill it with clean water. Tie a piece of string into a loop, and float it on the surface of the water.



- 2 Add a drop of liquid soap inside the loop. What happens to the loop of string?



Explanation: The string forms a circle due to a change in the surface tension caused by the soap. See what happens with ordinary household items such as a paper clip or needle. The items should float in tap water, and then will sink when you add the liquid soap, reducing the surface tension.

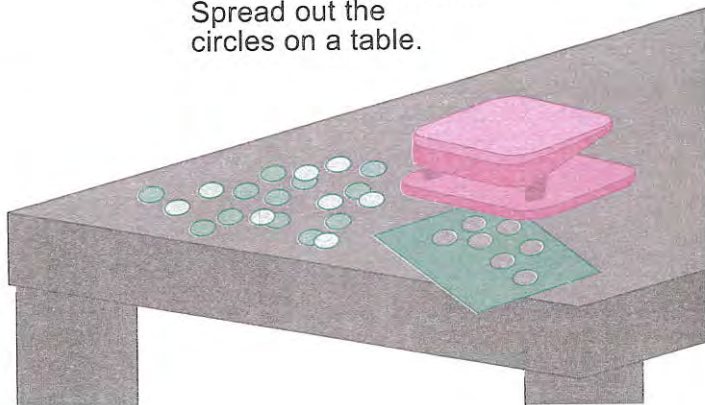
ACTIVITY 41

Can you make paper jump?

Equipment:

*piece of paper
hole puncher
balloon
table*

- 1 Punch out about 20 small circles with the hole puncher. Spread out the circles on a table.



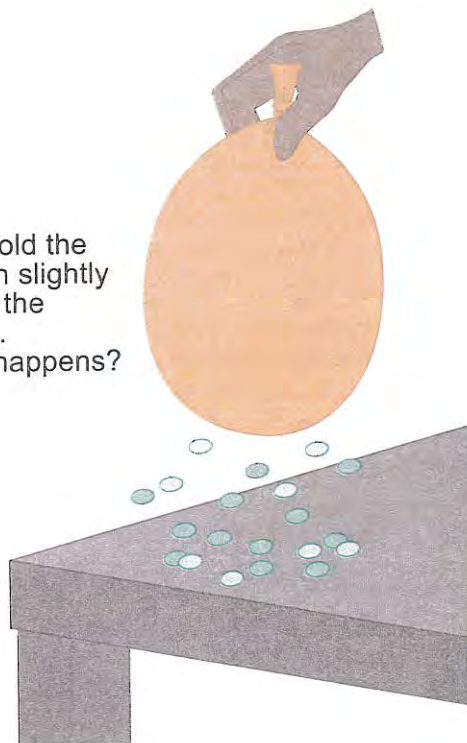
- 2 Blow up an average sized balloon and tie a knot.



- 3 Rub the balloon a few times on your hair. Make sure that your hair is oil-free.



- 4 Now hold the balloon slightly above the circles. What happens?



Explanation:

The paper is made up of atoms. Positive (protons) and negative (electrons) charges are found within an atom. These charges are usually balanced and the atom is then electrically neutral. By rubbing the balloon on your hair, you disrupt this electrical balance, creating an electric charge. This is called *static electricity*. Static electricity overcomes the force of gravity and allows the paper to jump towards the balloon.

ACTIVITY 42

Can you squeeze a hard boiled egg into a bottle?



Adult supervision
is required for this
activity

Equipment:

several peeled hard boiled eggs
bottle with opening slightly
smaller than size of egg
cooking oil or margarine
matches
piece of paper

1

Boil several eggs until
they are hard-boiled.
Cool them with cold water,
and then peel off their
shells.



3

Fold a 4 x 4 inch
piece of paper into an "accordion-like"
shape.
Using the matches
light the paper.



2

Smear
cooking oil or
margarine
around the
mouth of
the bottle.



4

Quickly (and carefully)
place the burning
paper inside the bottle.
Place the egg over
the opening of the
bottle.
What happens?



Explanation: The gases within the
bottle are heated by the burning
paper and expand.
When the flame goes out, the gases
contract.
A partial vacuum is then formed
inside the bottle.
The air pressure around the bottle
opening and the egg do the rest,
working like a valve, and plop! -
the egg falls into the bottle.

ACTIVITY 43

Can you remove the egg from the bottle?



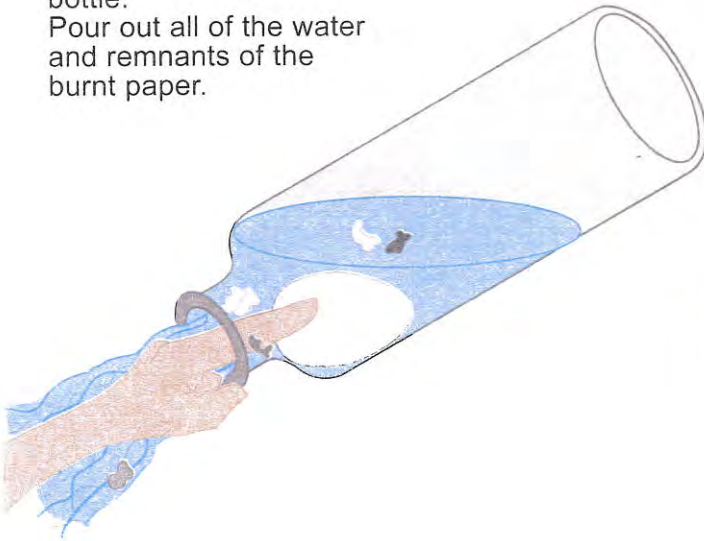
Adult supervision
is required for this
activity

Equipment:

water
the bottle and
the egg from
the previous
activity

2

Turn the bottle to its side. With your finger push the egg to one side of the bottle. Pour out all of the water and remnants of the burnt paper.



Explanation: The air pressure inside the bottle rises as you blow air inside. The higher air pressure behind the egg slowly forces it out of the bottle.

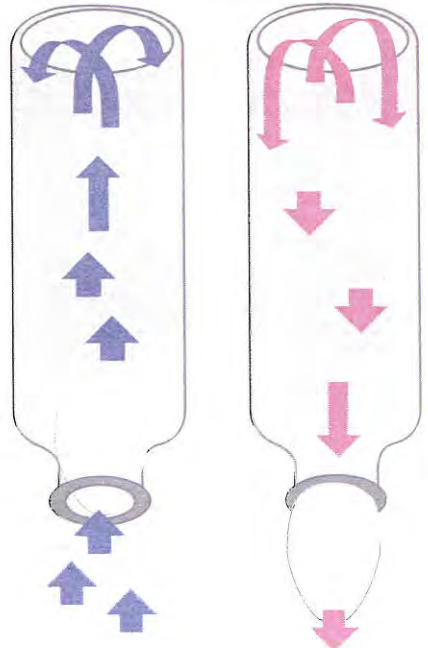
1

Fill up the bottle with water.



3

Turn the bottle upside-down, so that the egg blocks the bottle opening from the inside. Hold the bottle upside-down and blow as hard as you can into the bottle. Release your mouth from the bottle. The egg should fall out.



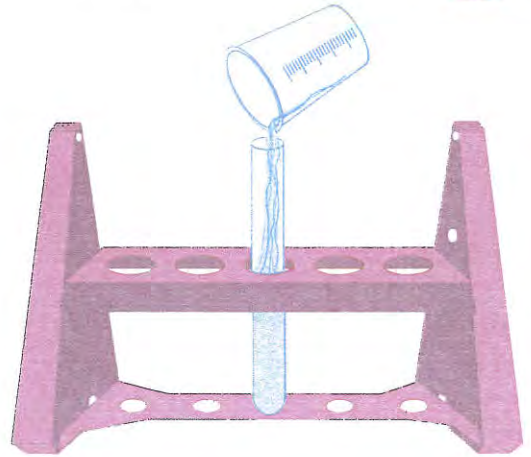
ACTIVITY 44

Can you mix oil and water?

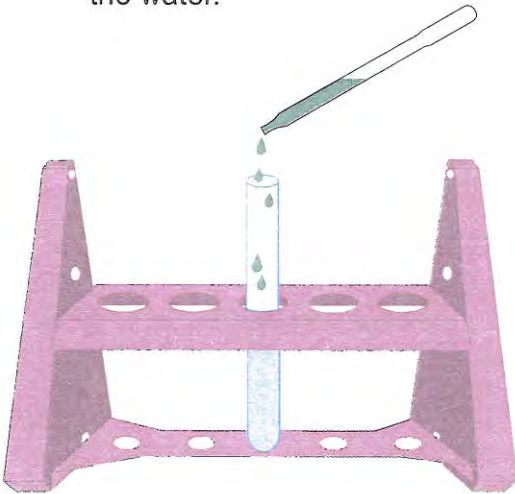
Equipment:

test tube
test tube rack
measuring cup
measuring spoon
stopper
eye dropper
liquid food colouring (green)
oil
water

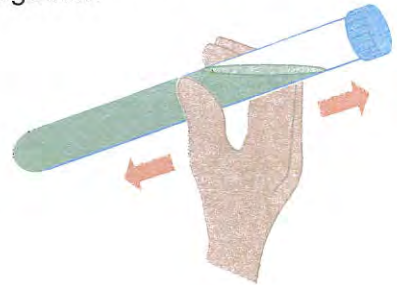
- 1 Measure 15 ml of water in your measuring cup. Pour it into the test tube.



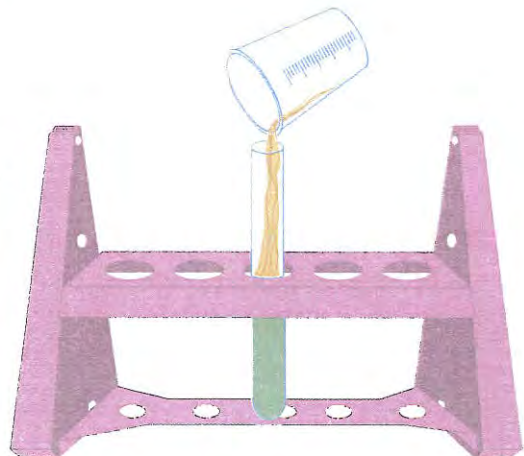
- 2 Use your eye dropper to add 5 drops of the food colouring to the water.



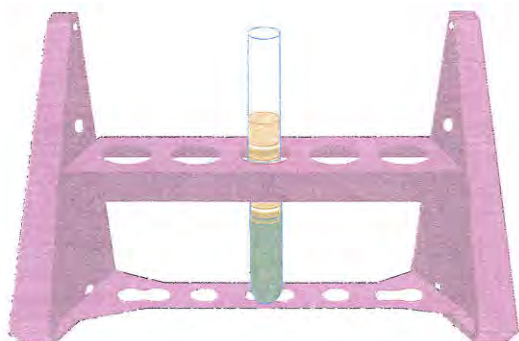
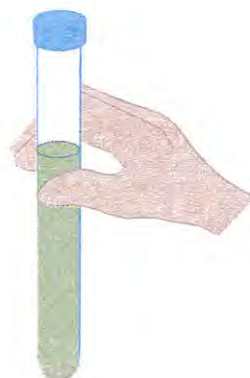
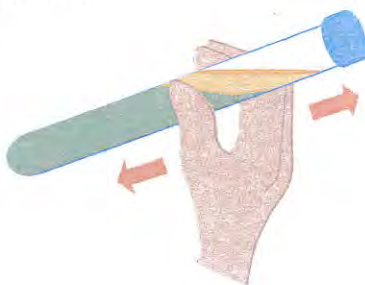
- 3 Close the test tube with the stopper. Carefully shake the test tube a few times. Observe how nicely they mix together.



- 4 Remove the stopper, replace the test tube in the rack and add 5 ml of oil to the test tube.



- 5 Securely close the test tube again and shake it well, about 10 to 12 times. Observe the results.

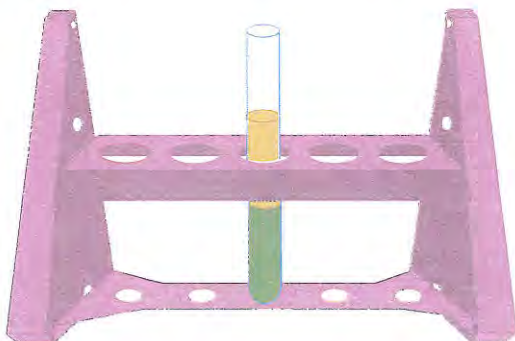


- 6 Leave the test tube in the rack for a few minutes. What do you see?

Explanation:

Water and food colouring mix together creating, by definition a *solution*. Oil and water do not mix with one another, creating an *immiscible solution*.

More explanation: The oil and water do not really mix together, and the two substances start to separate from one another as soon as you let them sit still. After a few minutes, you will notice a few layers in the jar. The water is heavier and sinks to the bottom. The middle layer is a combination of oil and water. The top layer is almost all oil. After several hours, all of the oil will rise to the top, and all of the water will sink to the bottom.



ACTIVITY 45

How can milk be separated?

Equipment:

milk
vinegar
beaker
measuring cup
measuring spoon

- 1 Make sure the beaker is clean. Fill it with fresh milk.



- 2 Using your measuring spoon, add 20 ml of vinegar to the milk.



- 3 Mix together with your measuring spoon.



- 4 Leave the jar alone for a few minutes. What happens?



Explanation: You have separated the milk into two parts - a clear liquid and a white solid. Milk is a **colloid**, a mixture of liquids and tiny particles spread evenly throughout the liquid. When you added the vinegar, this caused the tiny particles to join together into a solid called **curd**. The liquid portion is called the **whey**. Does this remind you of any nursery rhyme?

ACTIVITY 46

Soapy Substances

Equipment:

2 jars with lids
2 small rags
laundry detergent
grease
water

- 2 Add some laundry detergent to only one of the jars.



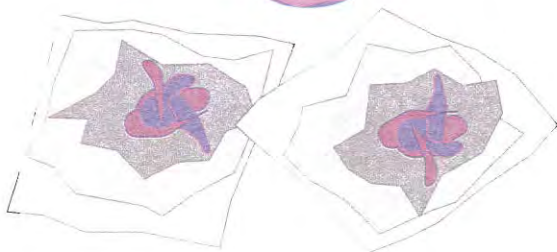
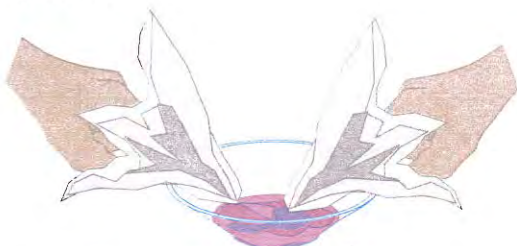
- 4 Place one rag into each jar and cover them with the lids.



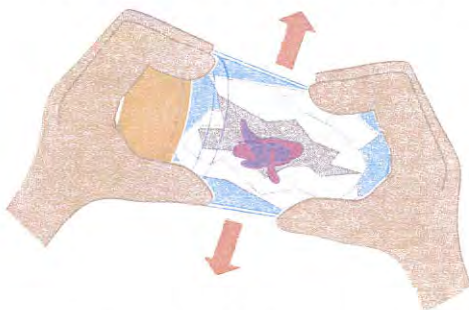
- 1 Fill up both of the glass jars with water.



- 3 Dip both rags into the grease so that each rag has the same amount of grease.



- 5 Shake each jar for about five minutes. Open the jars and remove the rags.



Question: Do you notice the same amount of grease left on each rag?

Explanation: The soapy water removed most of the grease from the rag, while the plain water did not. This is due to the fact that the grease contains oil and oil cannot dissolve in water. The soap has a different molecular structure which can break down and remove the grease.

ACTIVITY 47

Different kinds of water *Is tap water hard or soft?*

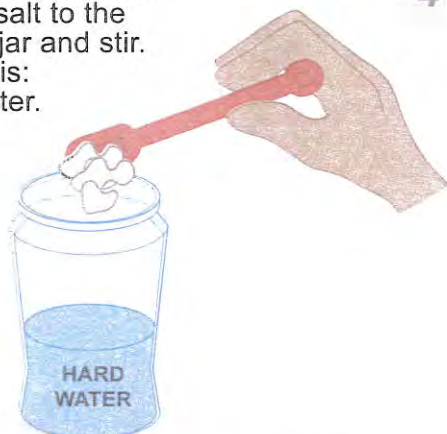
Equipment:

3 clean transparent jars with lids
tap water
Epsom salt
detergent
measuring spoon

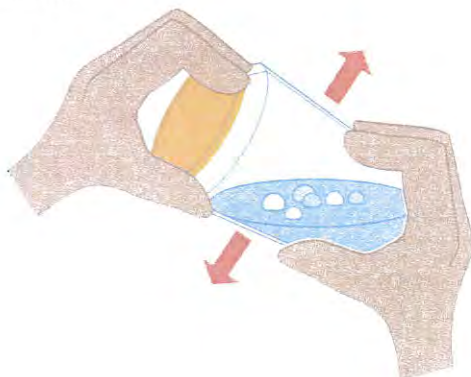
- 2 Put one jar aside.
Label this:
soft water.



- 3 Add two spoonfuls of
Epsom salt to the
second jar and stir.
Label this:
hard water.



- 5 Now add a bit of detergent to each
jar.
Cover each jar and shake them
about 20 times.



- 1 You will need to wait for a rainy
day to perform this experiment.
Collect enough rainwater so that
you can fill two jars halfway.



- 4 Fill the third jar
halfway with
ordinary tap water.



Question: Is there a
different amount of soap
bubbles in each jar?

Explanation: Hard water
contains minerals, soft
water does not. The best
source of soft water is
directly from the rain.
The softer the water
(meaning with the fewest
minerals), the better it
reacts with the detergent.

ACTIVITY 48

Descending Chromatography

Equipment:

strip of filter paper
pencil
beaker
glass or glass jar
water
green felt tip pen

1

Cut a piece of filter paper 14 cm long and 2 cm wide.

2

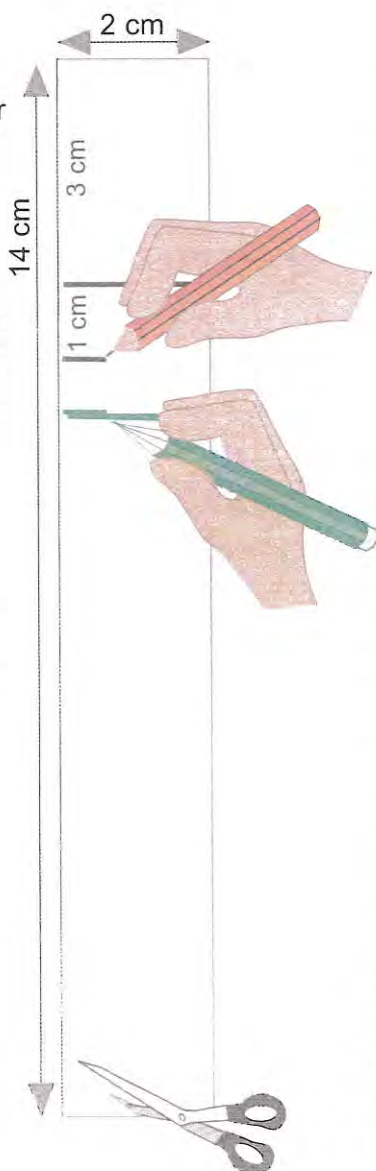
Draw a pencil line 3 cm from the top of the paper, and another line 1 cm below.

3

Make a green pen mark below the second pencil line.

4

Trim the paper at the bottom edges to form a triangle.



5

Fill the beaker almost to the top with water. Place it on top of an inverted glass.



6

Bend the paper on the two pencil lines and hang it from the beaker, as shown:



7

Watch patiently as you see the chromatogram develop. Notice how the blue ink from the green pen has separated from the mixture. In due time, the blue ink will reach the tip of the paper and drip down.



Explanation: Chromatography is the method which enables us to separate coloured substances. It is often used in laboratories to obtain pure substances from a mixtures. "Chromo" means colour in greek.

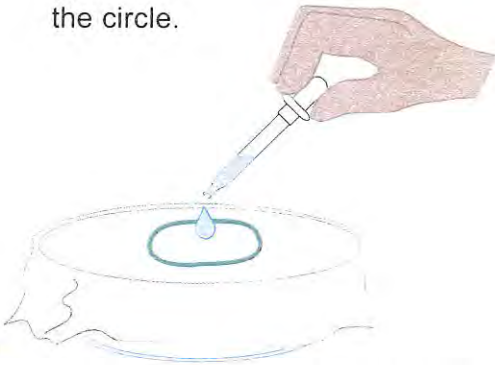
ACTIVITY 49

Textile Pop Art

Equipment:

eye dropper
green felt tip pen
bowl
handkerchief or old white "T" shirt
(get adult permission before
using an article of clothing)

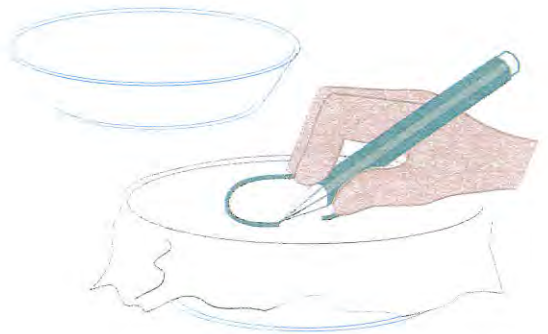
- 2 Using the eye dropper, place a drop of water into the middle of the circle.



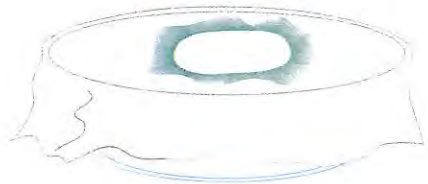
- 4 As the circle expands, continue adding water, drop by drop, in the middle of the circle. Stop adding the drops of water when you are pleased with the design.



- 1 Spread a handkerchief or a white "T" shirt over a kitchen bowl. Use the material as if it were a piece of paper. Draw a circle with a green pen. Draw a circle with a green pen.



- 3 The cloth will absorb the water and the circle will grow.



- 5 Let the cloth dry. Show your new garment to friends. You created a "magic" design. You can wash the cloth and it will be as good as new.



Now try this: If you have another water-based pen of a different colour, you can repeat the above procedure and get an even more colourful handkerchief.

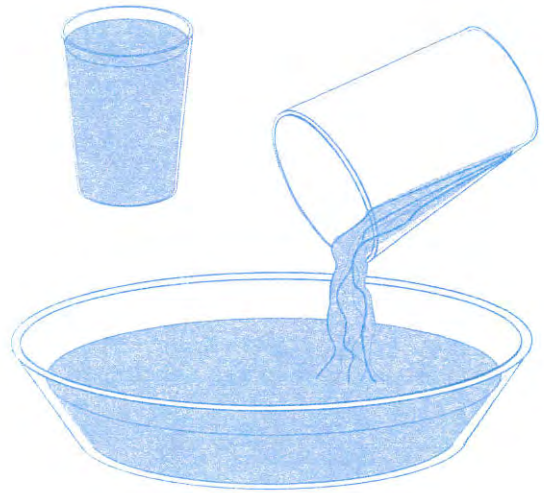
ACTIVITY 50

Cornstarch monster

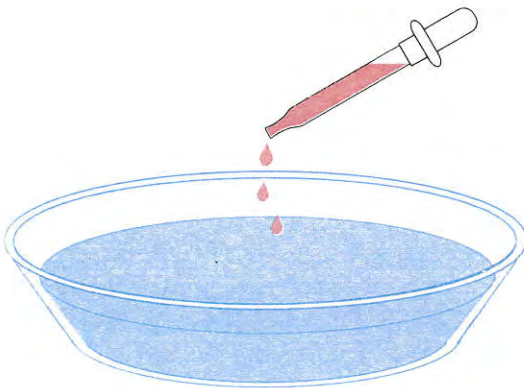
Equipment:

beaker
bowl
stirrer
2 marbles
cornstarch
food colouring
water

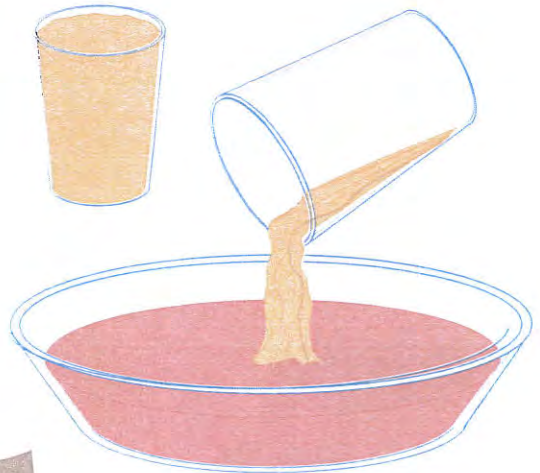
- 1 Fill the beaker half way with water and pour it into a bowl.



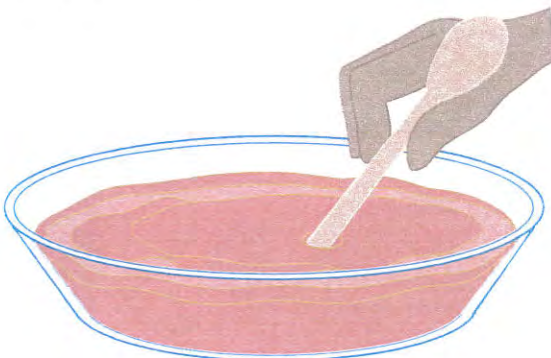
- 2 Using your eye dropper, add five drops of food colouring to the water.



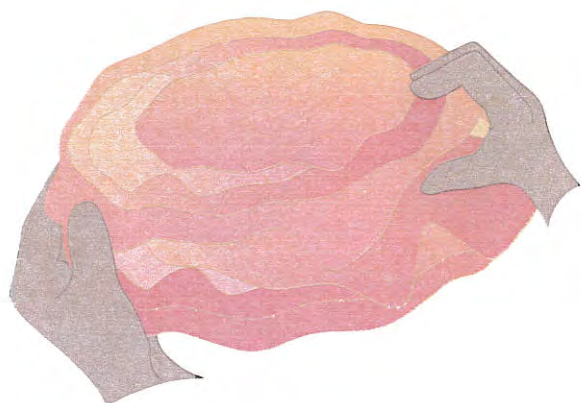
- 3 Dry the beaker. Fill it up with cornstarch, and pour into the bowl.



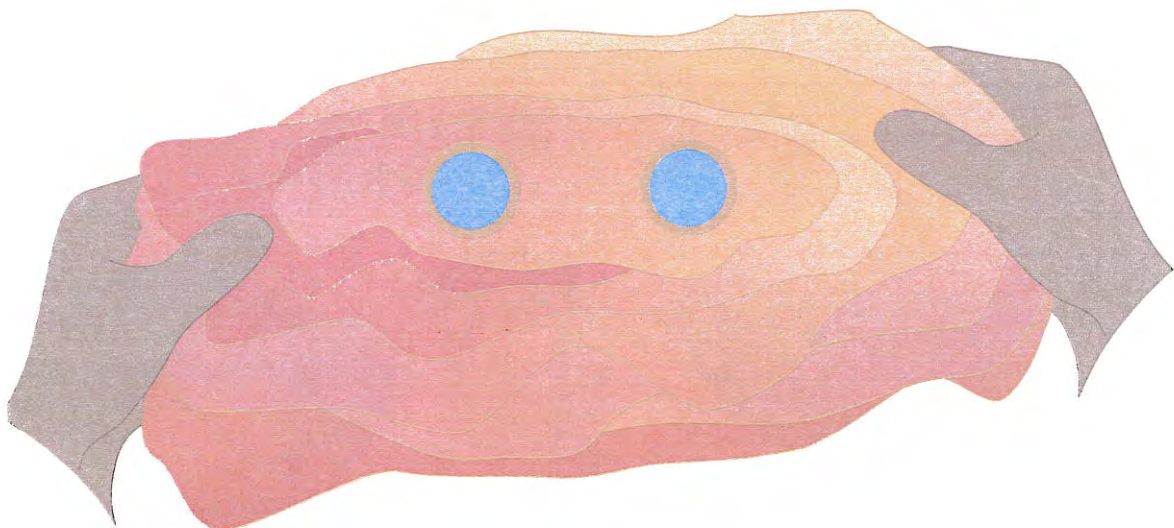
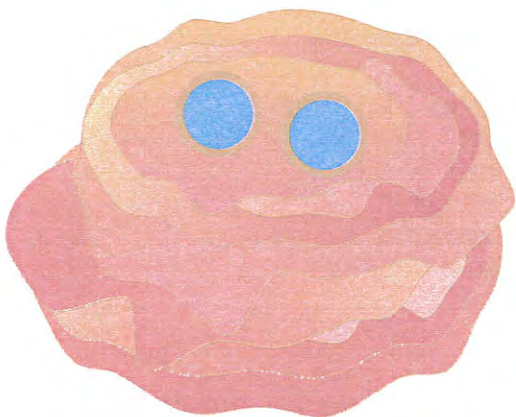
- 4 Mix the ingredients well with the stirrer.



- 5 Start to roll the dough.
It should feel drier and sticky.



- 6 Now place the marbles into the dough, and you will see that have made a "cornstarch monster."



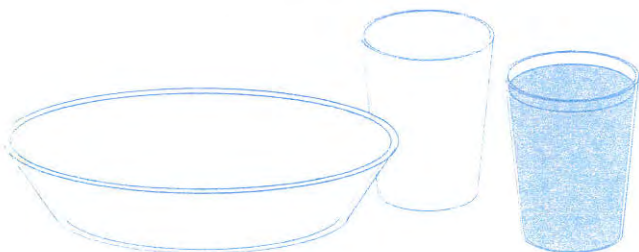
ACTIVITY 51

Home-Made Paste for Home-Made Decorations

Equipment:

bowl
stirrer
beaker
paints
paint brush
old newspapers

- 1 Combine in a bowl 1 beaker of flour with 1 beaker of water and mix until creamy.
(For a longer lasting paste, use half a beaker of flour and 1 beaker of boiling water.)



2 Stir until shiny.



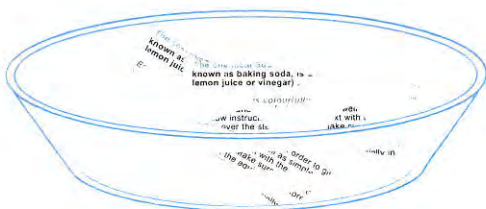
3 Cover the bowl with a towel and store in a cabinet for a few hours.



4 This home-made paste is good for paper-maché-projects. Tear the newspaper into strips about two fingers wide.

Each activity is colourfully illustrated in order to give visual explanation of what to do, as well as simple and easy to follow instructions. Read the text with the child, and over the steps together. Make sure that the child is prepared all of the equipment before starting the activity. Each activity is colourfully illustrated in order to give visual explanation of what to do, as well as simple and easy to follow instructions. Read the text with the child, and over the steps together. Make sure that the child is prepared all of the equipment before starting the activity.

5 Dip the newspaper strips into the paste you made.



6 Blow up a balloon and use it as the base. Put the damp newspaper strips over the balloon. Make a few layers, covering the whole balloon.



7 Paint and decorate.



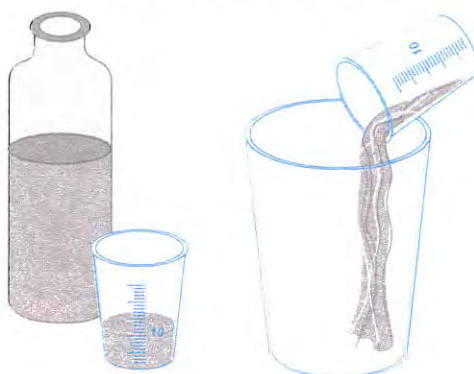
ACTIVITY 52

Making Gook

Equipment:

measuring spoon
measuring cup
eye dropper
plastic bag with ziploc
Borax solution
food colouring (green)
white glue

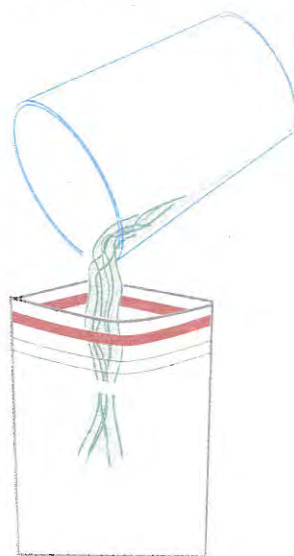
- 1 Using your measuring cup, measure 10 ml of Borax solution and pour it into the beaker.



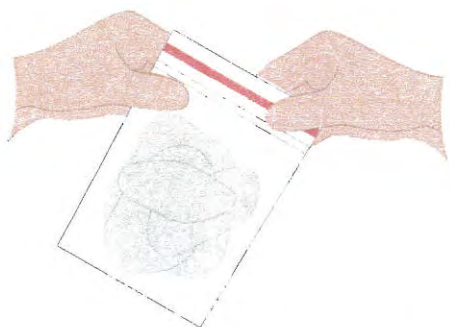
- 2 Fill the measuring cup up to the top (30 ml) tap water and add it to with the beaker.
- 3 Using your eye dropper, add 5 drops of food colouring.



- 4 Now add 20 ml of white glue. Stir well.
- 5 Pour the mixture into a small plastic ziploc bag.



6 Close the plastic ziplog bag tightly.



7 Using both of your hands, start kneading the material in the securely closed plastic bag. Keep on doing this for about 10 minutes. The mixture will gradually get a uniform consistency.



8 To remove the gook, just turn the bag inside out. Now you are ready to play with your own homemade gook. When you are finished, store it in a plastic bag for playing with again later.



ACTIVITY 53

Making Plastic From Milk

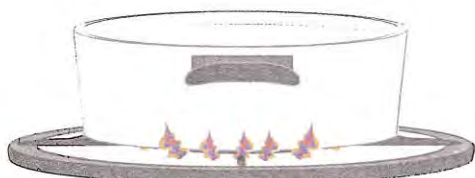


Adult supervision
is required for this
activity

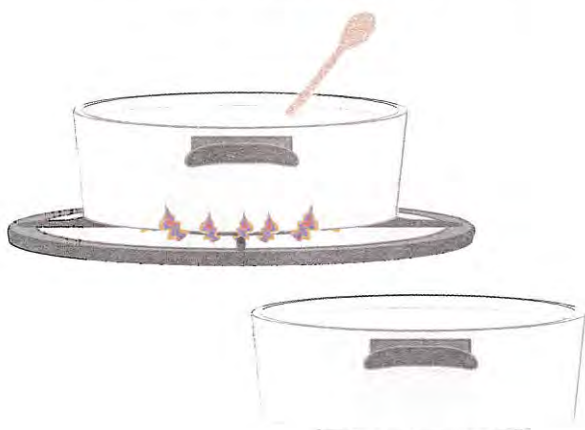
Equipment:

measuring cup
stirrer
small metal pot
heavy cream
vinegar

- 2 Heat up 150 g of heavy cream in a small pot.



- 4 Stir until the contents of the pot become rubbery. Remove the pot from the heat.



Explanation: In your mixture, the acidic chemicals in the vinegar react with the organic milk chemicals, producing the plastic.

- 1 Fill up your measuring cup with vinegar and set it aside.



- 3 When the cream begins to boil, add the vinegar.



- 5 When the rubber cools down, rinse it for a few minutes under running water. You now have your own homemade plastic.



ACTIVITY 54

Make a rainbow

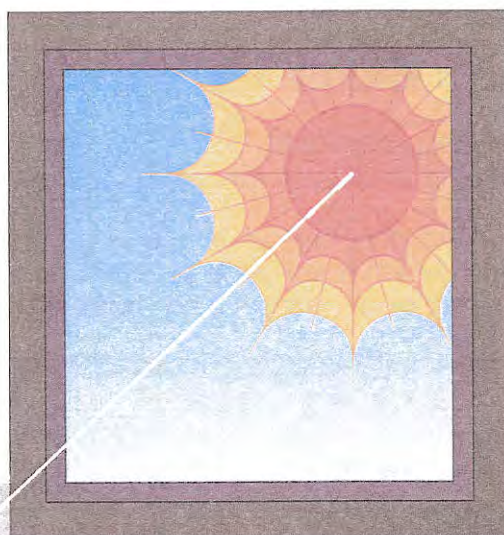
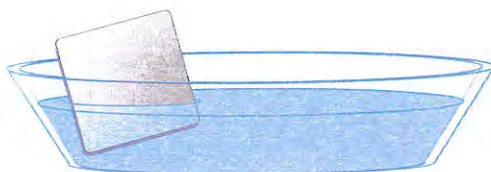
Equipment:

dish
water
mirror
white paper
a sunny day

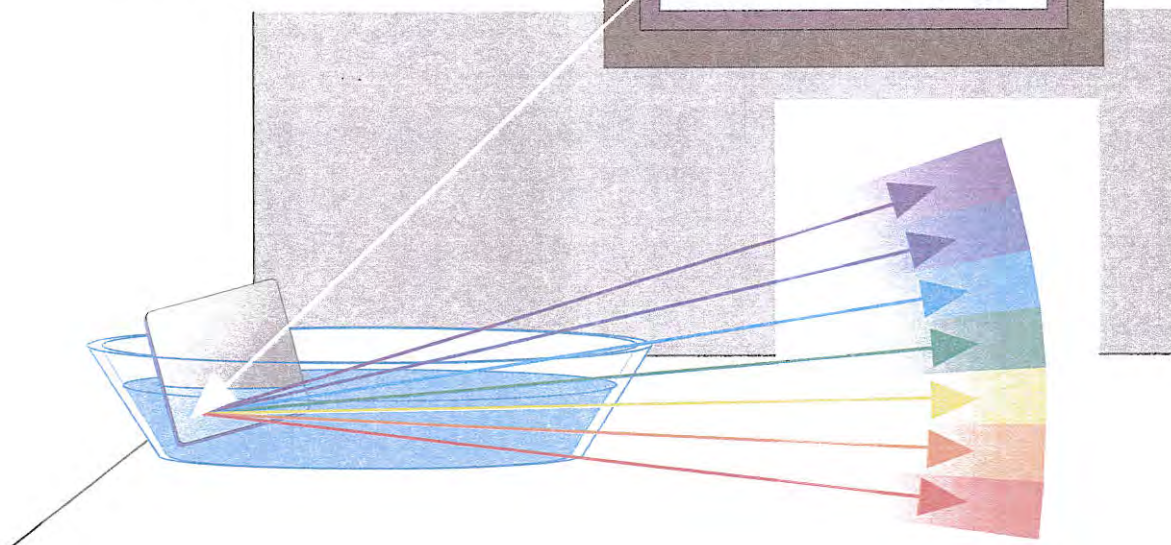
Note:

The mirror in your kit is protected with a thin covering. Peel this off before use.

- 1 Fill a dish with water.
Stand a flat mirror in the dish.



- 2 Place the dish so that the sun shines onto the mirror.
- 3 Hold up a sheet of white paper facing the mirror and move it until rainbow colours appear on it.



Explanation:

Rainbows appear in the sky when there is bright sunlight and rain. When the sunlight enters a water drop, the water drop acts like a mirror. The white sunlight is split up into the seven colours of the rainbow, and the rays are dispersed, creating the form of a bow.

Note: You will only be able to see a rainbow if the sun is behind you, and you are standing facing the rain.

ACTIVITY 55

Reading
and learning
activity

About photosynthesis

Photosynthesis is the chemical process by which the green plants make their food.

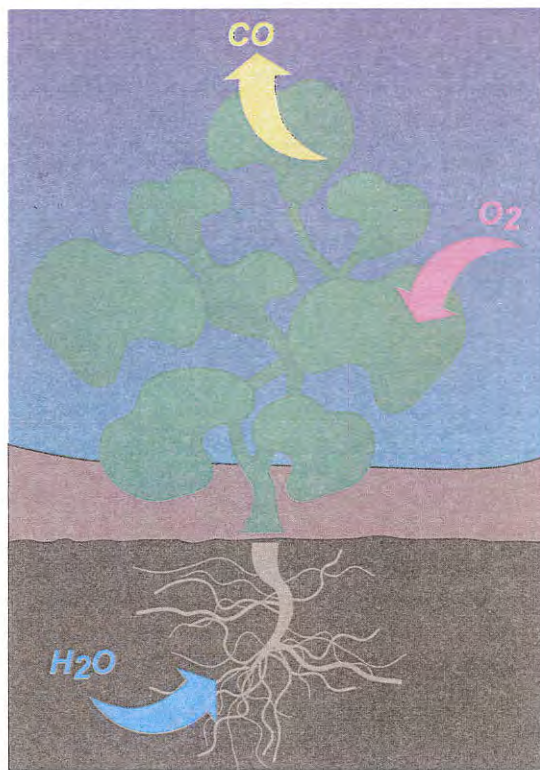
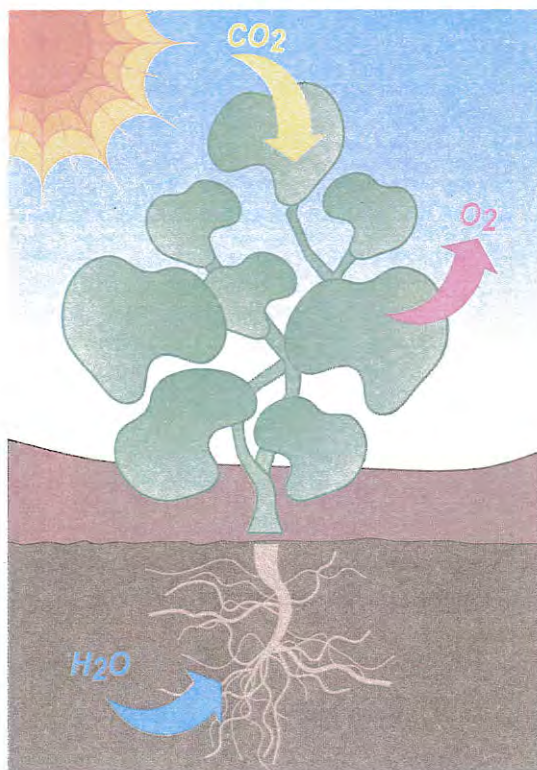
Photo means light. During the day, in the presence of **sunlight**, photosynthesis occurs.

Green plants absorb **Carbon Dioxide (CO_2)** from the air and use it, together with **water (H_2O)** and nutrients they absorb from the soil, in order to synthesize the food they need for growth and energy.

This chemical process releases **Oxygen (O_2)** to the air.

As you probably know, animals breathe Oxygen in order to stay alive. They breathe in Oxygen and expel Carbon Dioxide back to the air.

These facts prove to us how important plant life is in order to maintain the balance of Oxygen and Carbon Dioxide in the air, and how plants and animals interact, helping each other to survive on our planet.



Observation:

In the absence of sunlight, photosynthesis cannot occur.

During the night, the plants, as do the animals, breathe in Oxygen and release Carbon Dioxide.

ACTIVITY 56

Green leaves under the Sun

Equipment:

young and healthy green plant
paper clip
a little piece of paper



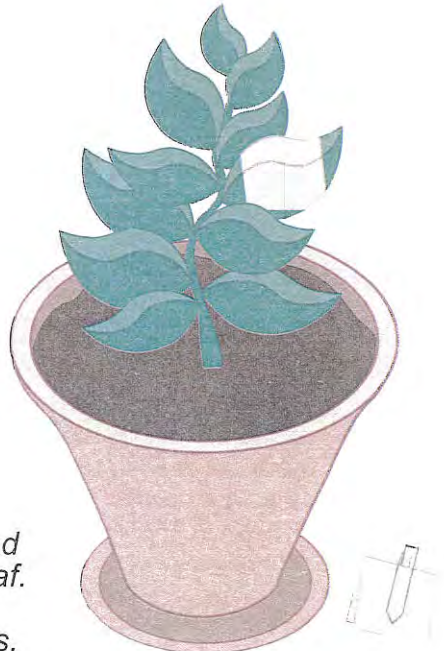
1 Place a plant in a sunny spot.

2 Using a paper clip, attach the paper to the leaf, as shown.



3 Leave the plant in the same place for a week.

4 A week later, remove the paper from the leaf.
Can you see the difference of colour between the covered leaf and the uncovered ones?



Explanation:

Chlorophyll is the green pigment found in green leaves.

In order to produce chlorophyll, the leaf needs sunlight.

By placing the paper on the leaf you prevented the sun's rays from reaching this particular leaf. It was not able to produce chlorophyll and therefore it is not as green as the other leaves.

ACTIVITY 57

Do plants sweat?

Equipment:

young and healthy plant
magnifying glass
petroleum jelly (or any hand cream)
water



- 1 Spread petroleum jelly on both surfaces of one leaf of a healthy and young plant.
- 2 Water the plant and place it in a sunny spot for a few days.



- 3 Check your plant during the next few days. What happened to the leaf? Use your magnifying glass to study the changes daily.



Explanation:

Transpiration is the loss of water as a result of exposure to heat.

To transpire is to sweat. When we sweat, tiny drops of water leave our bodies, preventing overheating.

*The plants sweat through many tiny holes in the leaves called **stomata**.*

By spreading the petroleum jelly, you close most of these tiny holes, and almost prevent the leaf from transpiring.

The leaf, unable to release water and heat, withered and died.

ACTIVITY 58

Inside a seed...

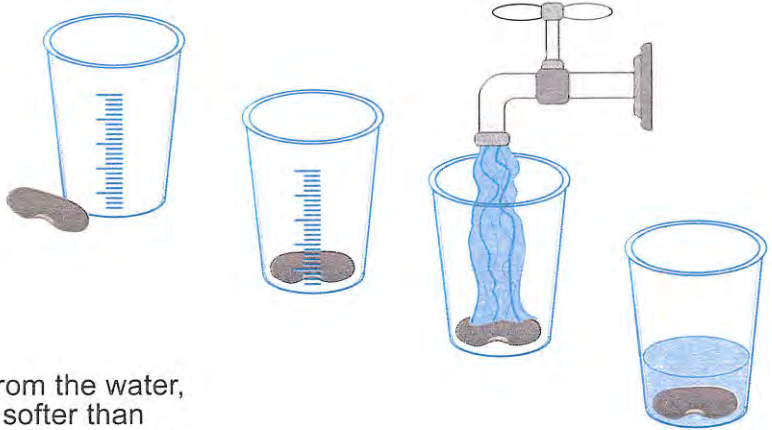


Adult supervision
is required for this activity

Equipment:

measuring cup
magnifying glass
blunt knife
bean seed
water

- 1 Place a bean seed into your measuring cup. Add tap water to it so it covers the seed completely. Let it soak overnight.



- 2 Remove the seed from the water, it should feel much softer than when you first placed it in the cup. It should also be bigger and its covering has probably loosened.



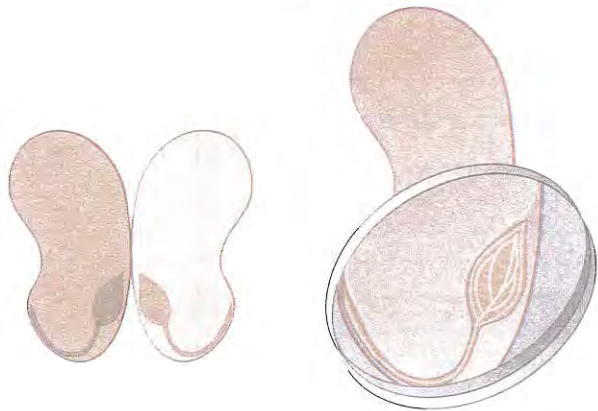
- 3 Gently peel off the seed's covering, which is called **testa**.



- 4 Carefully use a blunt knife to split the bean into half.



- 5 Using your magnifying glass, examine the seed inside.



Explanation:

The seed absorbed water overnight and started to grow and develop. This tiny plant inside the seed is called an **embryo** and could grow to be the next plant. The remaining material in the seed is called **cotyledon** and provides the food for the young plant when it begins to grow.

ACTIVITY 59

Sunlight and growth

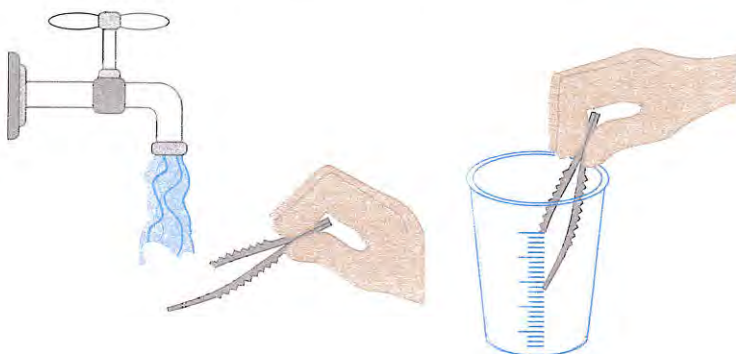


Adult supervision
is required for this
activity

Equipment:

2 measuring cups
tweezers
scissors
adhesive tape
2 bean seeds
cotton wool
black cardboard
18 X 18 cm (7 X 7 in)
water

- 1 Wet two lumps of cotton wool and place each one into separate measuring cups.

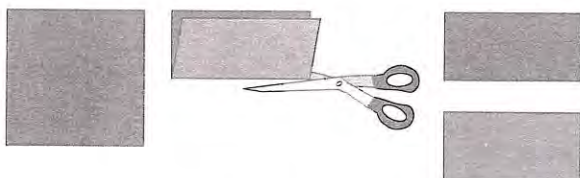


- 2 Heat up some water until steam appears. Carefully dip two bean seeds in it and let them soak for about 15 minutes. Using your tweezers, take the seeds out of the warm water and place each one of them into a measuring cup, above the wet cotton wool.

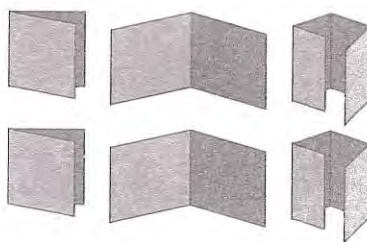


- 3 Using the black cardboard square (18 X 18 cm or 7 X 7 in), do the following:

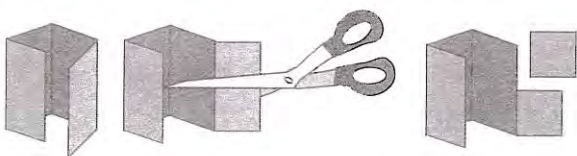
- 4 Cut the cardboard into two equal pieces.



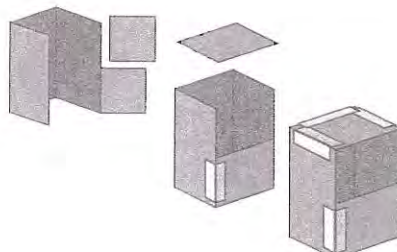
- 5 Fold each piece in four, as shown:



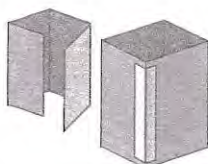
- 6 Cut one of the two cardboard pieces, as below:



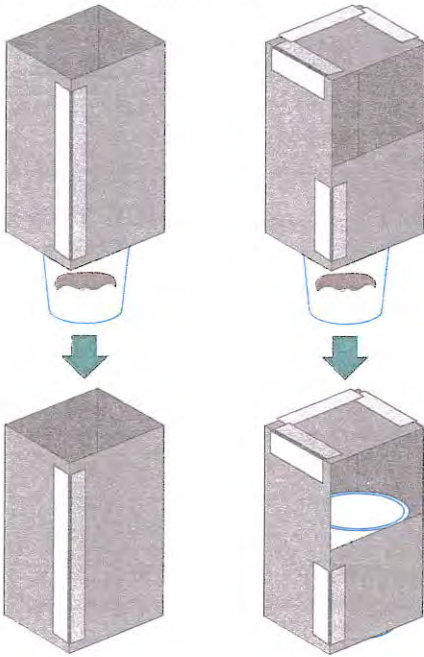
- 7 Using adhesive tape, and the cardboard you just cut, build this:



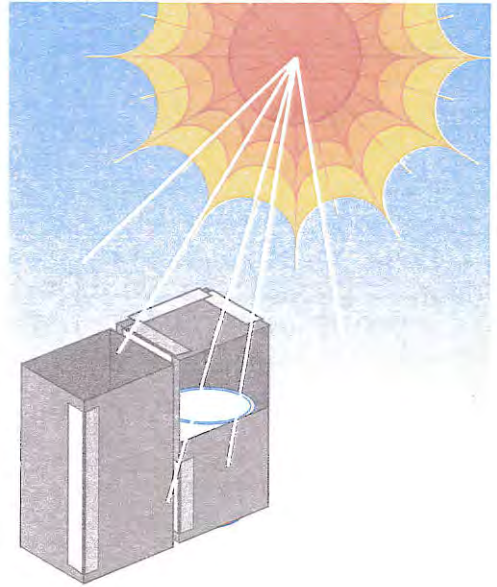
- 8 Again, using adhesive tape, and the other piece of cardboard, build this:



- 9 You have built 2 boxes. Use them to cover the measuring cups with the beans inside them.

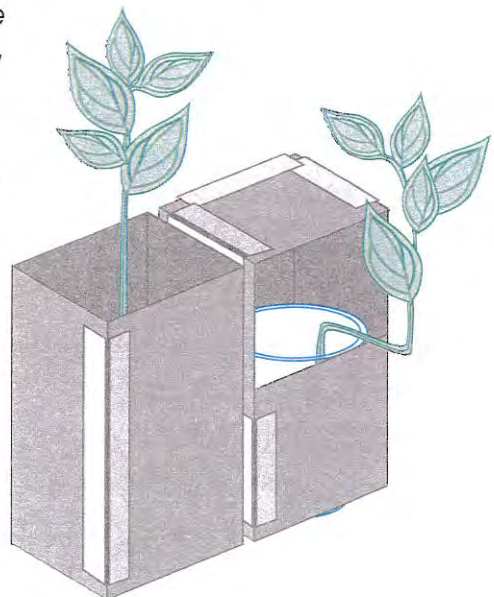
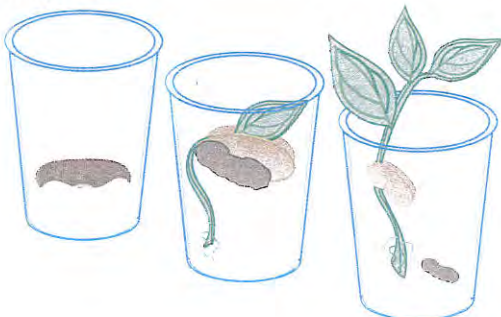


- 10 Stand the boxes side by side. Keep them exposed to sunlight for at least a week.



Explanation:

The bean seeds will start to grow, just as in the previous activity. In order to sprout, they will need water (from the wet cotton), food (the cotyledon from the seeds), and sunlight. The first two conditions remain the same for both of the seeds. The third condition is different, as the boxes covering the seeds are not the same. The newborn plants will search for the sun's rays and will grow towards them. At first, the seeds develop very similarly. You will enjoy observing the growth of the tiny leaves coming out of the open seeds, and watching how the roots are formed into the piece of cotton. Note the development of the stem. If you wait patiently enough, you will also be amazed by how each plant continues to grow.



ACTIVITY 60

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How much can a plant drink?

Equipment:

*young and healthy plant
water*

Explanation:

*To keep most plants healthy,
you have to water them every so
often, keeping the soil a little damp.
This way your plants will grow
"happily" and look strong and
healthy.*

- 1** Water your plant whenever
you notice that the soil is
starting to dry up.
Touch the soil with your fingers,
learn to sense how moist it is.



More explanation:

*If you stop watering your plants,
the soil will completely dry up
within several days. The plants
will not look healthy or happy.
Avoid this, do not let your plants
die of thirst.*



*On the other hand, you should not
give your plants too much to drink.
If you over-water, the soil will remain
quite wet and the roots will be
permanently under water.
They will not be able to breathe properly.
Soon enough, they will rot, and again,
your plants will look even "unhappier,"...
and the damage may be irreversible!*

- 2** After watering, check if any water
accumulated in the saucer underneath
the plant pot.
If so, touch the soil, if it feels very wet,
pour out the excess water from the saucer.

