KITCHEN SCIENCE

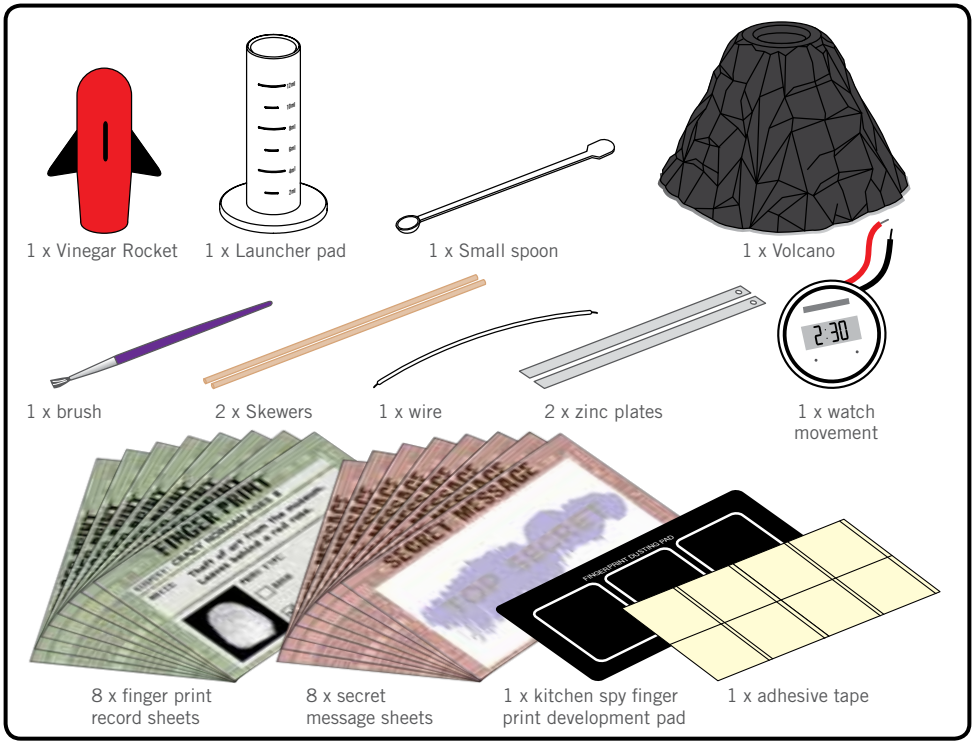
⚠ WARNING:
CHOKING HAZARD - Small parts.
Not for Children under 3 years.

To Parents: Please read through these instructions before giving gudiance to your children.

A. SAFETY MESSAGES

1. Adult supervision and assistance are recommended for all the experiments.
2. Intended for children aged over 8.
3. This kit and its finished products contain small parts which may cause choking if misused. Keep away from children under 3 years old.
4. Kitchen materials are also required from home to perform the experiments. Adults' assistance is required in collecting these materials.
5. When performing the rocket experiment outdoors, launch the rocket in an open area. Do not point the rocket at a person or pet. Never watch the launching rocket from above to avoid any injury.
6. Adult assistance and supervision are required when handling hot water in the Rock Candy Factory experiment.

B. CONTENTS



Materials required from home kitchen: vinegar, baking soda, red food colouring, washing up liquid, measuring cup, sugar, cloth pegs, teaspoon, forks, corn starch, black currant/grape juice concentrate, lemon. Ask for adults' permission and assistance in getting these materials for the experiments.

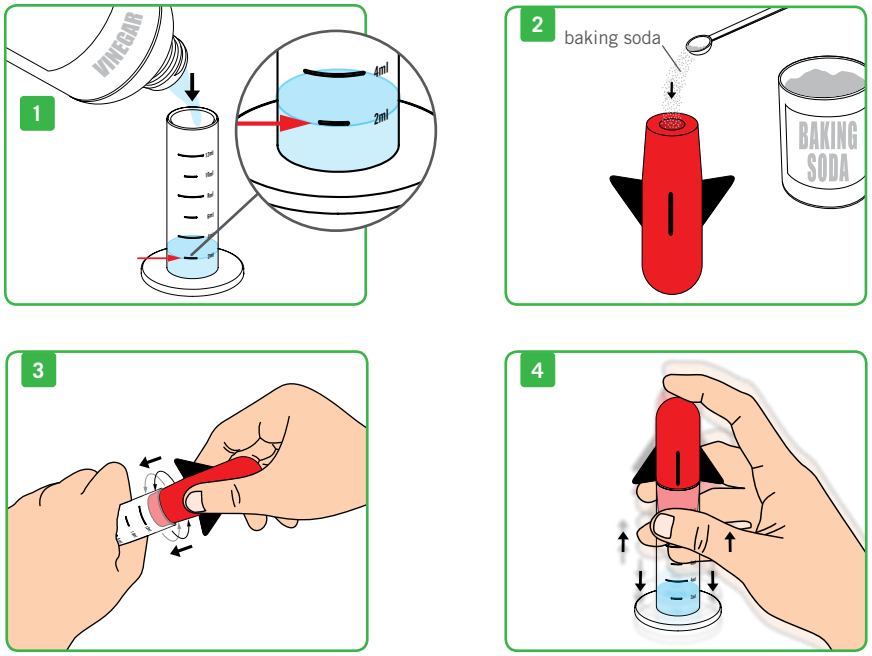
C. VINEGAR ROCKET

From the kit: foam rocket, launcher pad, small spoon
From the kitchen: baking soda, vinegar

Safety messages:

Find an outdoor open space with a level surface, preferably with a concrete floor, e.g. a garden yard.
Cover the area with old newspaper as the launching could be messy.
Do not point the rocket at a person or pet. Never watch the launching rocket from above.
Warning! Do not aim at eyes or face.

1. Put 2ml of vinegar into the launch pad and place it on the floor.
2. Using the small spoon provided, put a spoonful of baking soda into the hole at the bottom of the rocket. Remove excess baking soda from the edge of the rocket so that the baking soda just fills up the bottom cavity.
3. Insert the rocket into the launch pad. Hold the launch pad and rocket as shown in Diagram 3 and shake gently three times.
4. Quickly place the rocket and the launch pad on the floor vertically and move away. Keep your distance. Watch how your rocket shoots up into the sky! 3, 2, 1 … Blast off!



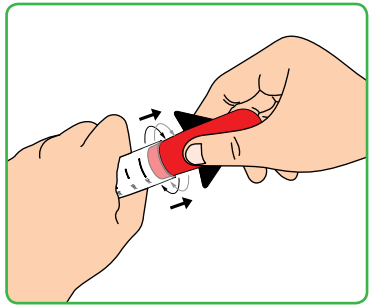
Remarks: Rinse the launcher pad and rocket with water after each use. The vinegar residual will erode the plastic of the foam rocket and the launcher pad.

How does it work?

A chemical reaction takes place when the vinegar is mixed with the baking soda. The acidic vinegar reacts with the alkaline baking soda to produce carbon dioxide. There is no place for the carbon dioxide to escape inside the launch pad. The pressure builds up and eventually it gets so great that the launch pad propels the rocket high up into the sky.

Troubleshooting

If your rocket does not blast off, the connection between the rocket and the launch pad is probably too loose meaning that the air leaks out, or it may be too tight so that friction prevents the rocket from shooting up. Hold the rocket and the launch pad so that the rocket faces away from you and not pointing at anyone. Remove the rocket from the launch pad carefully. If you hear a big pop sound (which is produced by the escaping air) then the rocket and launch pad connection was probably too tight. If the pop sound is small, the connection is too loose and the air is leaking already. Repeat the launching steps and adjust the force used to insert the rocket accordingly.



Fun Facts

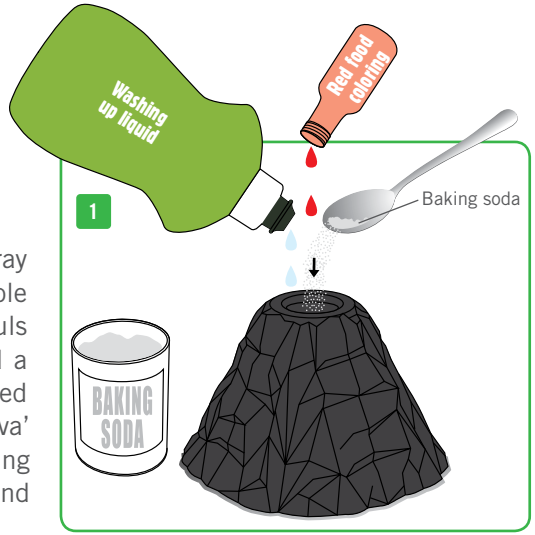
In a real rocket, fuel is burned inside which causes hot gases to shoot out of the back of the rocket. This propels the rocket forward according to Newton's Third Law of Motion, which states that every action creates an equal and opposite reaction. The force that pushes the gases out of the back of the rocket is the action. The rocket moving forward in an upward direction is the counter-reaction. Since rockets are heavy, it takes a large force to make a rocket speed up to the point where it can escape the Earth's gravity (Newton's Second Law states that the force is proportional to the mass and acceleration). Once the rocket is in motion, it keeps moving in a straight line until another force makes it turn or stop. This is the result of Newton's First Law, which states that an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force.

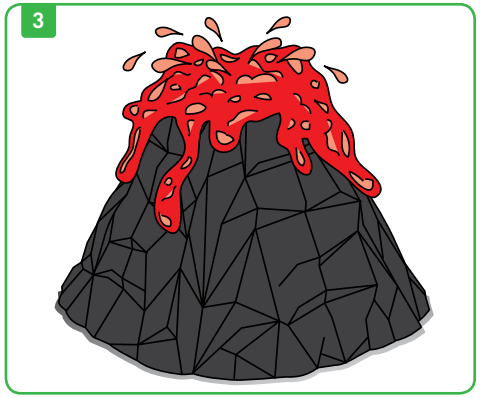
D. TABLE TOP VOLCANO

From the kit: volcano
From the kitchen: tray, baking soda, vinegar, washing up liquid, red food colouring, teaspoon

1. Place the volcano on a large flat tray to avoid making a mess. Cover the table with old newspaper. Put two teaspoonfuls of baking soda into the volcano. Add a few drops of washing up liquid and red food colouring. This will make the 'lava' effect look more dramatic. The washing up liquid slows down the eruption and makes the volcano foam.
2. Slowly pour a teaspoonful of vinegar into the volcano and watch it erupt with 'bubbly lava'.
3. You can continue to add more vinegar to cause more 'lava' to erupt out of the volcano. Eventually the eruptions will cease.

Remarks: You could repeat the eruption process unlimited times. However, remember to rinse the volcano with water after each use to prevent the vinegar residual eroding the plastic.





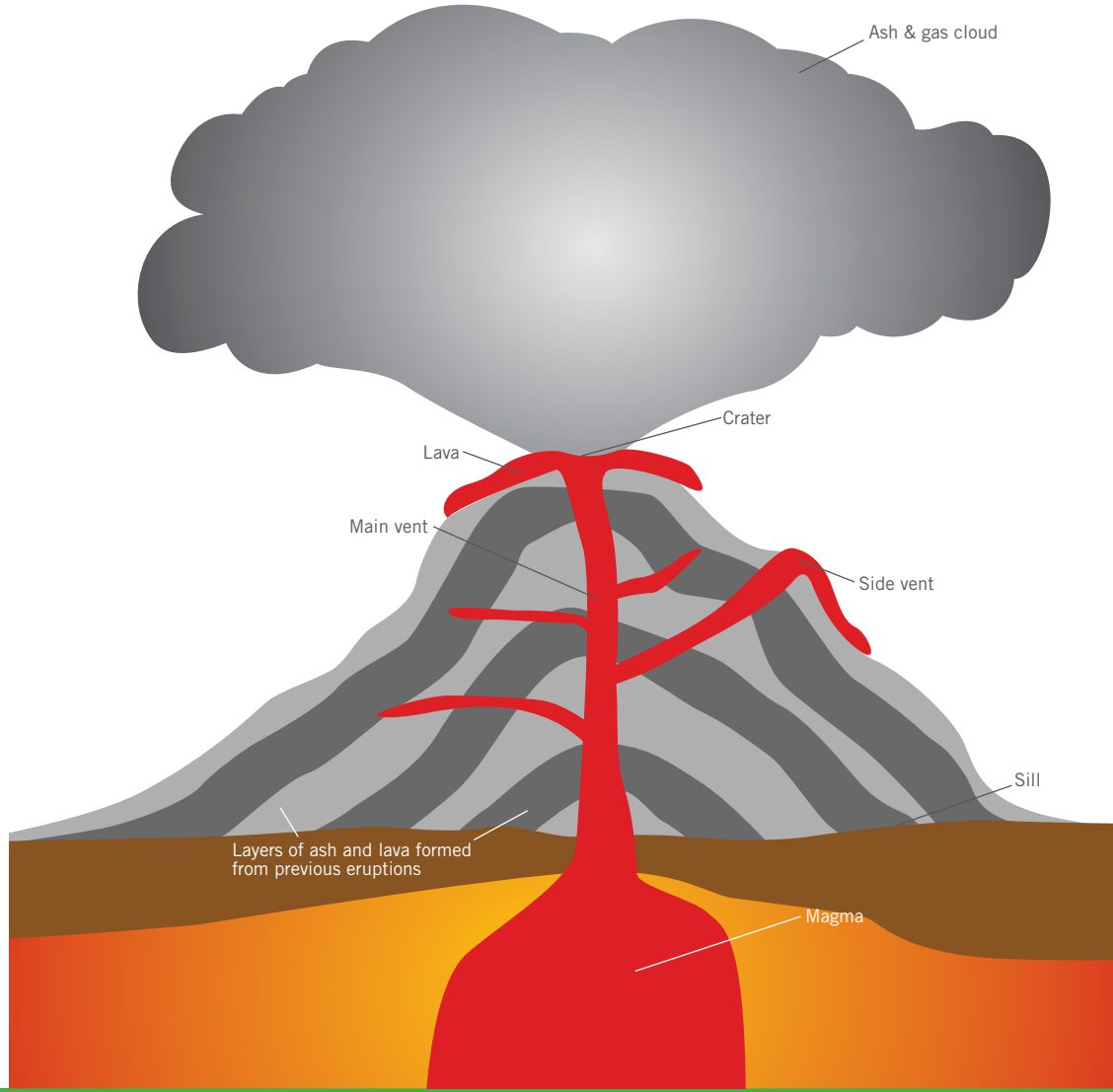
How does it work?

When the vinegar and the baking soda are mixed together, a chemical reaction takes place which produces carbon dioxide. The carbon dioxide escapes from the volcano in the form of bubbles. When all the carbon dioxide has escaped into the air, the solution becomes flat and the volcano stops 'erupting'. You can try using lemon juice instead of vinegar and see what effect this has on the eruption. Or add some starch or sand to the baking soda to see if you can get a better 'lava'.

Fun Facts

Volcanoes are openings in the Earth's surface. When they are active they can shoot out ash, gas and hot liquid rock known as magma. Once the magma comes out of the volcano, it is known as lava. Lava can flow at a rapid speed. The most lava ever recorded from a single volcanic eruption was the 1783 Laki eruption in Iceland. A quarter of the population of Iceland was killed by the poisonous gases and clouds of ash that resulted in severe destruction of crops and starvation.

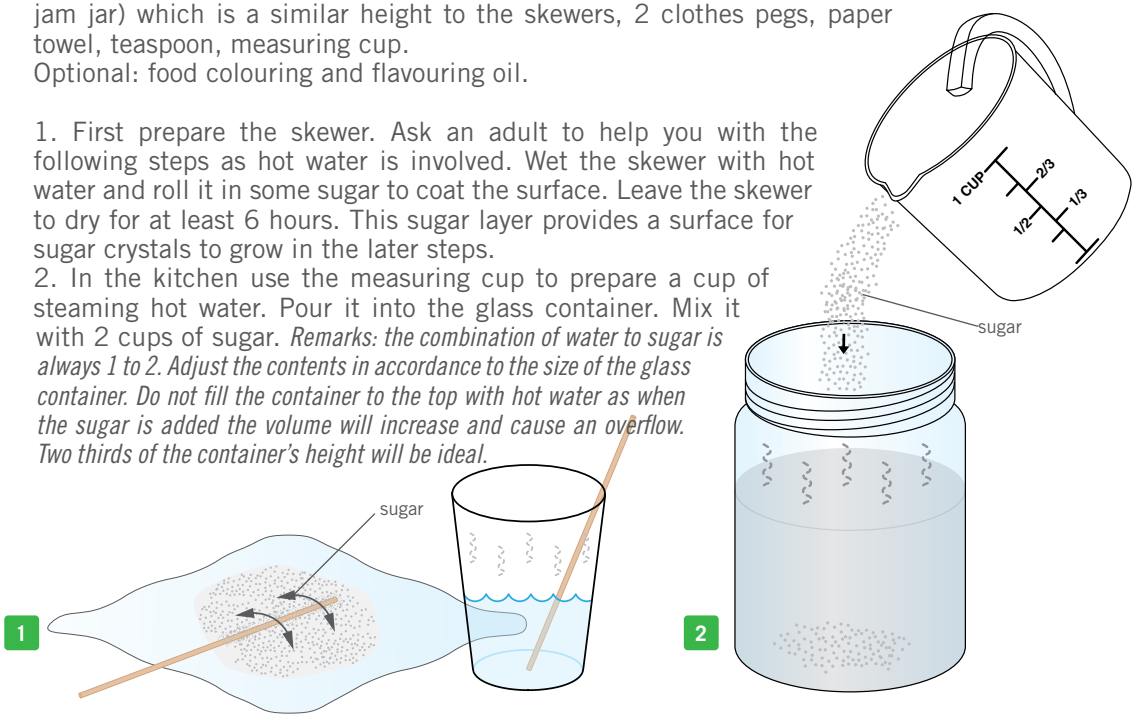
Below is a sectional diagram of a volcano:



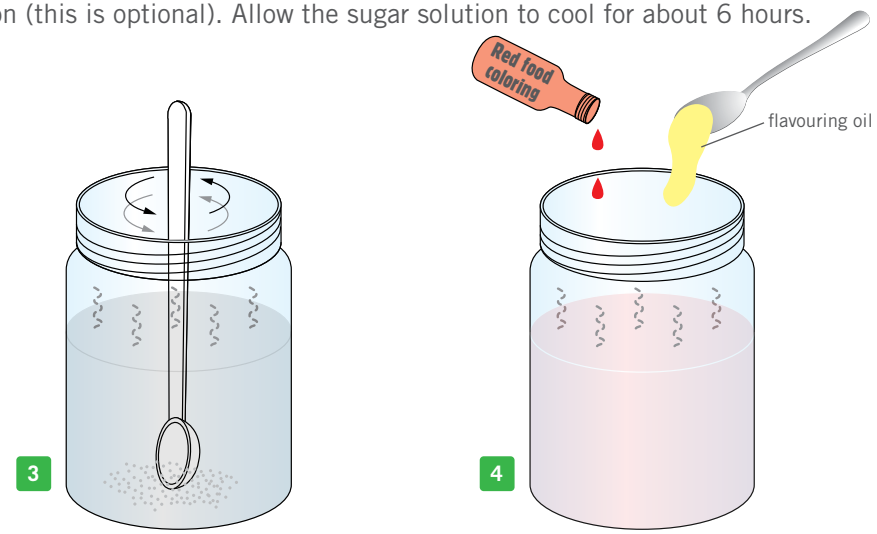
E. ROCK CANDY FACTORY

From the kit: 2 skewers
From the kitchen: sugar, steaming hot water, a glass container (glass or empty jam jar) which is a similar height to the skewers, 2 clothes pegs, paper towel, teaspoon, measuring cup.
Optional: food colouring and flavouring oil.

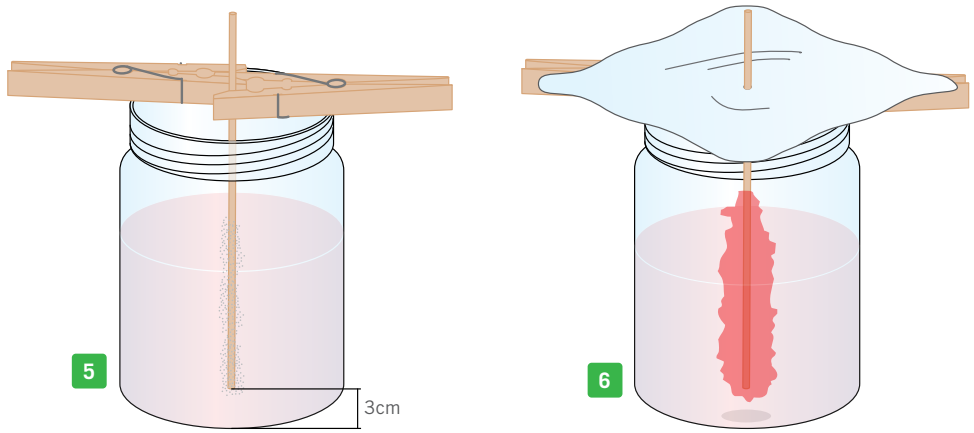
1. First prepare the skewer. Ask an adult to help you with the following steps as hot water is involved. Wet the skewer with hot water and roll it in some sugar to coat the surface. Leave the skewer to dry for at least 6 hours. This sugar layer provides a surface for sugar crystals to grow in the later steps.
2. In the kitchen use the measuring cup to prepare a cup of steaming hot water. Pour it into the glass container. Mix it with 2 cups of sugar. *Remarks: the combination of water to sugar is always 1 to 2. Adjust the contents in accordance to the size of the glass container. Do not fill the container to the top with hot water as when the sugar is added the volume will increase and cause an overflow. Two thirds of the container's height will be ideal.*



3. Stir the mixture until all the sugar has dissolved.
4. Add half a spoon of flavouring oil and 2-3 drops of food colouring to the hot sugar solution (this is optional). Allow the sugar solution to cool for about 6 hours.



5. Place the prepared skewer (already coated with sugar) into the glass container and hold it in place using 2 clothes pegs as in Diagram 5. Rest the clothes pegs across the top of the glass container allowing the skewer to hang down. Adjust its position so that it is about 2cm from the bottom of the container. Avoid touching the bottom of the container as the candy will stick to the bottom.
6. Leave the glass container in a cool place, away from strong light. Place a paper towel over the top to prevent dust from falling into the container. You should see sugar crystals forming on the skewer after about 1 day. The longer you wait, the bigger the crystals will be. Allow the rock candy to grow to the size you want. Remove it from the sugar solution and let it dry for a few minutes. It is ready for you to enjoy! Or you can wrap it in plastic wrap and savour it later.Or you can wrap it in plastic wrap and savour it later.



How does it work?

The sugar solution you made is called a supersaturated solution. This means that it contains more dissolved sugar than possible under normal conditions. This is achieved by mixing the sugar with very hot water. A supersaturated solution is very unstable and will crystallise easily. As time passes, the water will slowly evaporate, allowing more sugar crystals to collect on the skewer. By first coating the skewer with a layer of sugar, you provide a "seeded" surface for sugar crystals to grow more easily.

Fun Facts

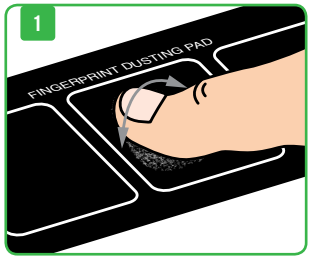
Many crystals can be found on Earth. They are minerals that have had the chance to grow into their natural shapes which are determined by the chemicals they are composed of. Most of the Earth's crystals were formed millions of years ago when the hot liquid rock (lava) inside the Earth has cooled and hardened. Most of these crystals took thousands of years to 'grow'.

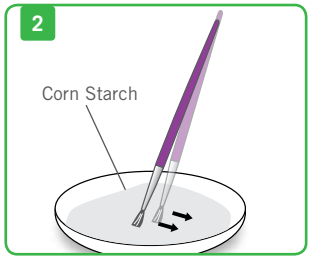
F. KITCHEN DETECTIVE - FINGERPRINTS

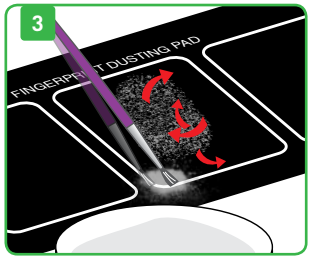
From the kit: kitchen spy finger print development pad, brush, fingerprint record sheets, adhesive tape
From home: fine corn starch

Handy tip: you may photocopy more fingerprint record sheets for future use.

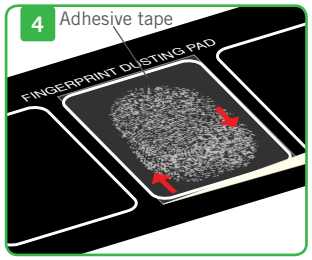
1. Ask a volunteer to make a latent fingerprint by pressing a finger onto the development pad. For best results, ask the volunteer to touch their nose or hair first before touching the development pad.
2. Dip the brush in some corn starch and tap the brush gently to remove the excess.
3. Gently use the brush on the latent fingerprint area in a circular motion. You should be able to see the fingerprint appearing after a few strokes. Tap the brush again to remove all the corn starch. Brush the fingerprint again with the clean brush to get rid of any remaining corn starch on the print.

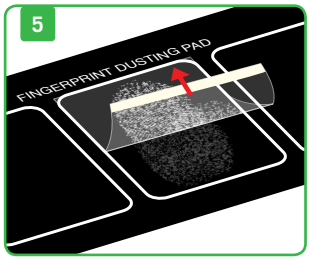


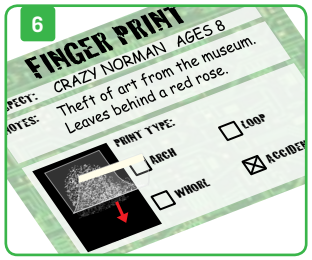




4. Put a piece of adhesive tape onto the dusted fingerprint and press gently. Smooth out any bubbles under the adhesive tape. Do not rub too hard as this may distort the developed fingerprint.
5. Lift the adhesive tape slowly and gently. You should see the developed fingerprint being lifted with the tape.
6. Stick the adhesive tape onto the black square of the fingerprint record sheet. Smooth the surface gently to remove any bubbles. Now you have a fingerprint of the volunteer! Fill in the fingerprint record sheet. Collect the fingerprints of your family and compare.







How does it works?

When a person touches something with his or her fingers, a visible or invisible residue is usually left on the touched surface. The residue shows a copy of the person's fingerprint. The invisible prints are called 'latent fingerprints'. These prints can be 'developed' by dusting powder made of finely grounded chalk coal or corn starch.

Examine and classify the fingerprints:

Each fingerprint has ridges, which belongs to one of four patterns: WHORLS, ARCHES, LOOPS and ACCIDENTAL (also called COMPOSITES).

Use a magnifying lens to study the fingerprints you have collected, then classify them to different types as mentioned above to complete your fingerprint record sheet. Continue to collect fingerprints from different people to build up your very own fingerprint database. Familiarise yourselves with all these print patterns. They are very useful in identifying the print's owner.

The WHORL pattern looks like a bull's eye. Whorl has lines entering at the side of the finger pad and spiralling inward, ending in the centre.

The ARCHES pattern is like a hill with lines entering at one side of the finger pad and leaving from the opposite side.

The LOOP pattern is like an upside down U and slanted left or right. Loops have lines entering at one side of the finger pad and leaving from the same side.

The ACCIDENTAL pattern is made up of a combination of the other 3 patterns.

Fun facts

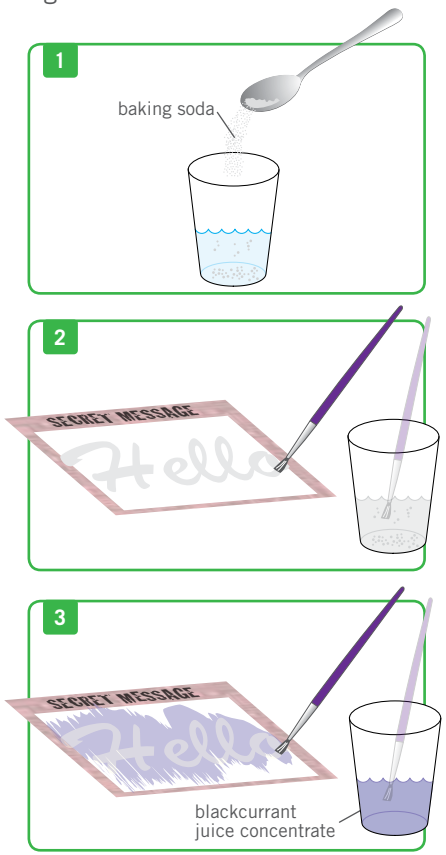
Fingerprints help us grip things properly. The skin on the palms of our hands and the soles of our feet are covered with tiny raised lines called friction ridges that allow us to pick up and handle objects easily. The ridges also contain pores which are attached to sweat glands under the skin and we leave behind fingerprints on surfaces because of sweat from these. The unique patterns on our fingertips are caused by ridges in the bottom layer of our skin. No two people have the same fingerprints, not even identical twins. This is why fingerprints are used to identify people.

G. KITCHEN SPY - INVISIBLE INK

From the kit: paintbrush, secret message sheets
From the kitchen: 1/4 cup of water, 3 tablespoons of baking soda, blackcurrant or grape juice concentrate (or other deep colour juice concentrate), teaspoon, cup

Handy tip: you may photocopy more secret message sheets for future use.

1. Mix the water and the baking soda in a cup with a teaspoon.
2. Dip the paintbrush into the solution and write your secret message on the secret message sheets. You can also use a toothpick or a cotton swab to write your message. Let it dry completely. You should not be able to see anything at this stage. Send this invisible message to your agent or simply put it on the fridge to puzzle your family.
3. To reveal the message, brush some blackcurrant/grape juice concentrate across the secret message sheet carefully. Your message will appear magically!



How does it work?

Baking soda is alkaline. Blackcurrant/grape juice concentrate is acidic. When you put these juice concentrates on top of baking soda, a chemical reaction takes place which produces a colour change in the paper.

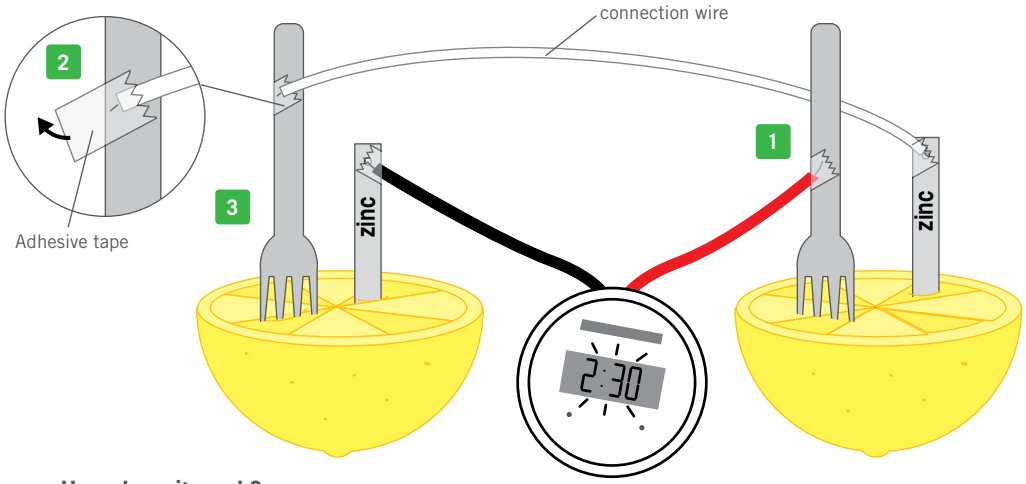
Fun Facts

Spies of all nations have been sending secret messages since ancient times in order to protect their battle plans and important information from their enemies. Writing with invisible ink is one of the ways spies communicate but there are many other ways to create secret messages. For example, you can change the spaces between words, such as “Wh ati sthi sme ssa ge?” (What is this message?); or write the sentence backwards: “EGASSEM A UOY LLET OT TNAW I.” (I want to tell you a message.) Another way is to substitute numbers in place of the letters of the alphabet, e.g. 1 = A, 2 = B, etc. Can you create your own secret message using this spy system?

H. FRUIT BATTERY

From the kit: 2 zinc plates, LCD watch movement, connection wire, adhesive tape
From the kitchen: 2 forks, 1 lemon - halved (or other fruits, e.g. apple, tomato)

1. Connect the red wire on the LCD watch to a fork and the black wire to a zinc plate. Secure the wires in place with adhesive tape.
2. Get another fork and zinc plate and connect them with the connection wire using adhesive tape.
3. Insert the forks and zinc plates into the lemon halves to activate the LCD watch movement as shown in the diagram. You will see your watch start blinking.



How does it work?

The forks act like the positive electrodes of a battery. They are plated with a metal which is less reactive than zinc. When the forks and zinc plates are inserted into the lemon, a chemical reaction takes place. Electrons (extremely small particles with negative charge) move from the zinc plates to the forks to form a current, thus activating the LCD watch. The lemon juice helps to conduct electricity. You can replace the lemon with a potato, a grapefruit or use soft drinks and see what effect this has.

Fun Facts

The development of the battery started in 1775 when a scientist called Alessandro Volta invented a machine that produced and stored static electricity by rubbing cat fur across a metal plate. A few years later, a doctor called Luigi Galvani noticed that dissected frogs’ legs twitched when they were in contact with two different metals. Volta realised that the electricity came from the metals and began doing experiments with different types of metal. In 1800, he made the first ever battery which consisted of copper and zinc strips separated by a piece of paper soaked in salt water and dipped in diluted acid.

Setting the watch

Press A twice and the display will show the set month mode, then Press B to adjust to the right month.

After the month is set, Press A to confirm, and the set day mode will be displayed, Press B to adjust to the the right day.

After the day is set, Press A to confirm and the set hour mode will be displayed, Press B to adjust to the right hour.

After the hour is set, Press A to confirm and the set minute mode will be displayed, Press B to adjust to the right minute.

After the minute is set, Press A to confirm and the normal time will be displayed. You should see the two dots flashing on the display between the hours and minutes.

The LCD watch may temporary lose its function in an electrostatic discharge environment, but normal function can be resumed by resetting the device.

Viewing the time

By default, the clock display shows the current time.

To view the Date: Press B once. The clock display will resume showing the current time after 2 second.

To view the Seconds: Press B twice. To resume to normal time, Press B again.

To view the Time and Date alternately, Press A once. To resume to normal time display, Press A 5 times to skip all set clock modes.

QUESTIONS & COMMENTS

We treasure you as a customer and your satisfaction with this product is important to us. In case you have any comments or questions, or you find any parts of this kit missing or defective, please do not hesitate to contact our distributor in your country, whose address is printed on the package. You are also welcome to contact our marketing support team at Email: infodesk@4M-IND.com, Fax (852) 25911566, Tel (852) 28936241, Web site: WWW.4M-IND.COM

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