EARTH SCIENCE

STEAM POWERED KIDS

⚠ WARNING:
CHOKING HAZARD – Small parts.
Not for children under 3 years.

A CRYSTAL SCIENCE

⚠ WARNING: CHOKING HAZARD - Small parts.
Not for children under 3 years. This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

⚠ **WARNING:** FOR AGES OVER 10. Not suitable for children under 10 years. For use under adult supervision. Contains some chemicals which present a hazard to health. 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. Keep the experimental set out of reach of children under 10 years old.

Please read the following instructions, safety messages, and first aid information provided in case of accidents. Keep them for reference. In case of accidental swallowing of dangerous substances, please call the local poison centre (central office for first aid information), or your local hospital. Please write your local emergency telephone number here for quick reference:

A. SAFETY ADVICE FOR SUPERVISING ADULTS

1. Read and follow these instructions, the safety rules and the first aid information, and keep them since it contains important information. 2. The incorrect use of chemicals can cause injury and damage to health. Only carry out those experiments which are listed in the instructions. 3. This experimental set is for use only by children over 10 years. 4. 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. 5. The supervising adult should discuss the warnings and safety information with the child or children before commencing the experiments. 6. 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. 7. Substances in non-reclosable packaging should be used up completely after opening the package.

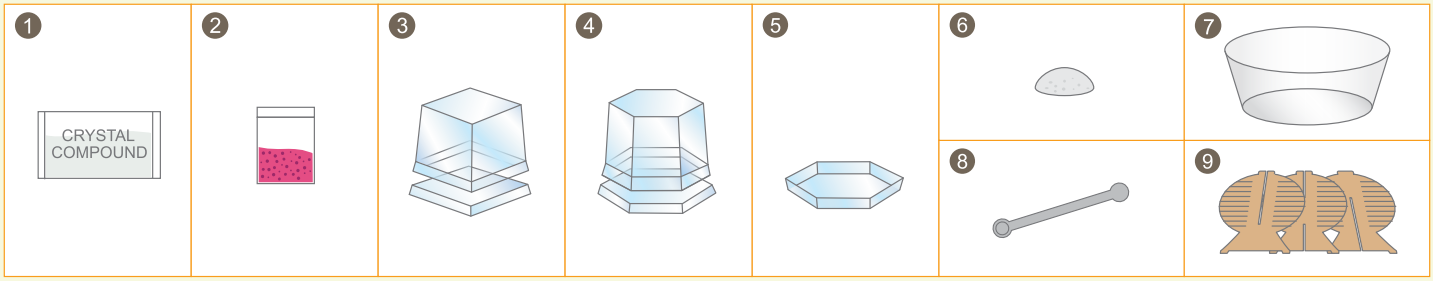
B. SAFETY MESSAGES

1. Read these instructions before use, follow them and keep them for reference. 2. Keep young children and animals away from the experimental area. 3. Store this experimental set and the final crystals out of reach of children under 10 years of age. 4. Clean all equipment after use. 5. Ensure that all empty containers and non-reclosable packaging are disposed of properly. 6. Wash hands after carrying out experiments. 7. Do not eat or drink in the experimental area. 8. Do not allow chemicals to come into contact with the eyes or mouth. 9. Do not apply any substances or solutions to the body. 10. Do not grow crystals where food or drink is handled or in bedrooms. 11. Do not use any equipment which has not been supplied with the set or recommended in the instructions for use. 12. Take care while handling with hot water and hot solutions. 13. Ensure that during growing of the crystal the container with the liquid is out of reach of children under 10 years of age. 14. Make sure that all containers are fully closed and properly stored after use. 15. Do not inhale the chemical dust. 16. Place completed crystals on a plate or non-porous materials, as the colour in crystal will remain soluble and may stain surface. 17. Dispose of materials according to your country's health and safety, and environmental regulations. 18. Wear protective clothing, gloves and eye/face protection when using the chemicals, and when removing the crystals from the container.

C. FIRST AID

In case of eye contact: Wash out eye with plenty of water, holding eye open if necessary. Seek immediate medical advice. If swallowed: Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice. In case of inhalation: Remove person to fresh air. In case of skin contact and burns: Wash affected area with plenty of water for at least 15 minutes. In case of doubt, seek medical advice without delay. Take the chemical and its container with you. In case of injury always seek medical advice.

D. CONTENTS

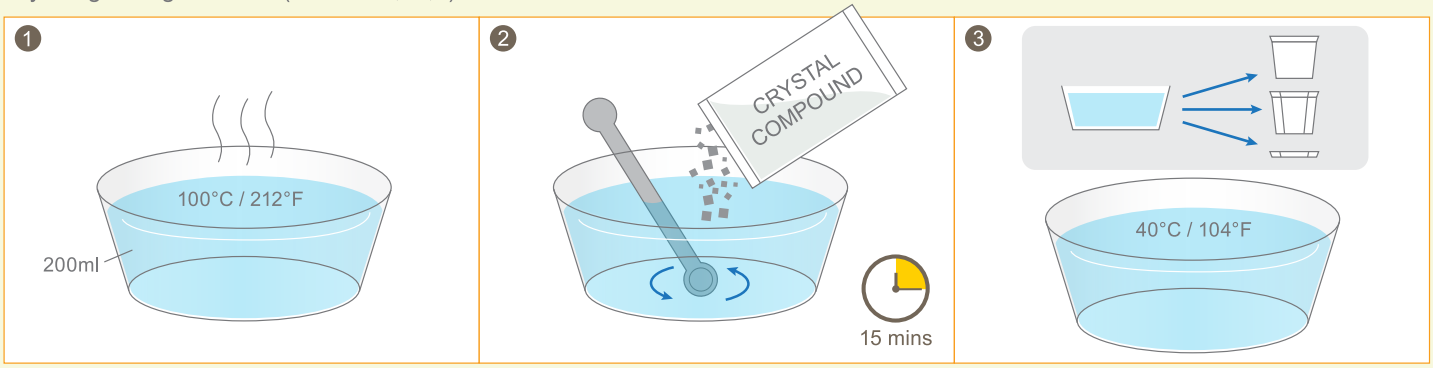


Large bag of white crystal compound* (a base compound called Monoammonium Phosphate), Small bag of red seeding mixture, Square transparent base with cover, Hexagonal transparent base with cover, Shallow hexagonal container, Glow-in-the-dark moon crystal base, Stirring bowl, Stirring spoon, 1 set of crystal snow tree paper. Also needed, but not included in this experiment: a jar of steaming hot water, an apron, protective goggles, and rubber gloves. (*If there is a safety container provided, take out the crystal compound from the container before your start. You need press down the cap then twist it to open.)

Important Remarks: 1. The red coloured seeding mixture contains the Aluminium Potassium Sulphate and Amaranth FCF. Please be aware that the seeding mixtures are intense colours. While it helps produce beautiful crystals, take care not to spill any coloured solution or seeding mixture! While any stains on your skin would be temporary, they may leave permanent stains on some clothing or surfaces. Therefore, please wear an apron and washing up gloves when handling coloured seeding mixtures. Cover the work surface with old newspaper, and clean it after the experiment. Dispose of the coloured solution and unused seeding mixtures properly, to avoid staining the washing sink/ drain. 2. The white crystal compound (Monoammonium Phosphate) is hygroscopic: it tends to "capture" humidity contained in the air, and this phenomenon creates links between crystals. The material may become hard (due to caking), but can very easily be separated afterwards, rather like sugar.

E. PREPARATION – MIXING THE CRYSTAL SOLUTION

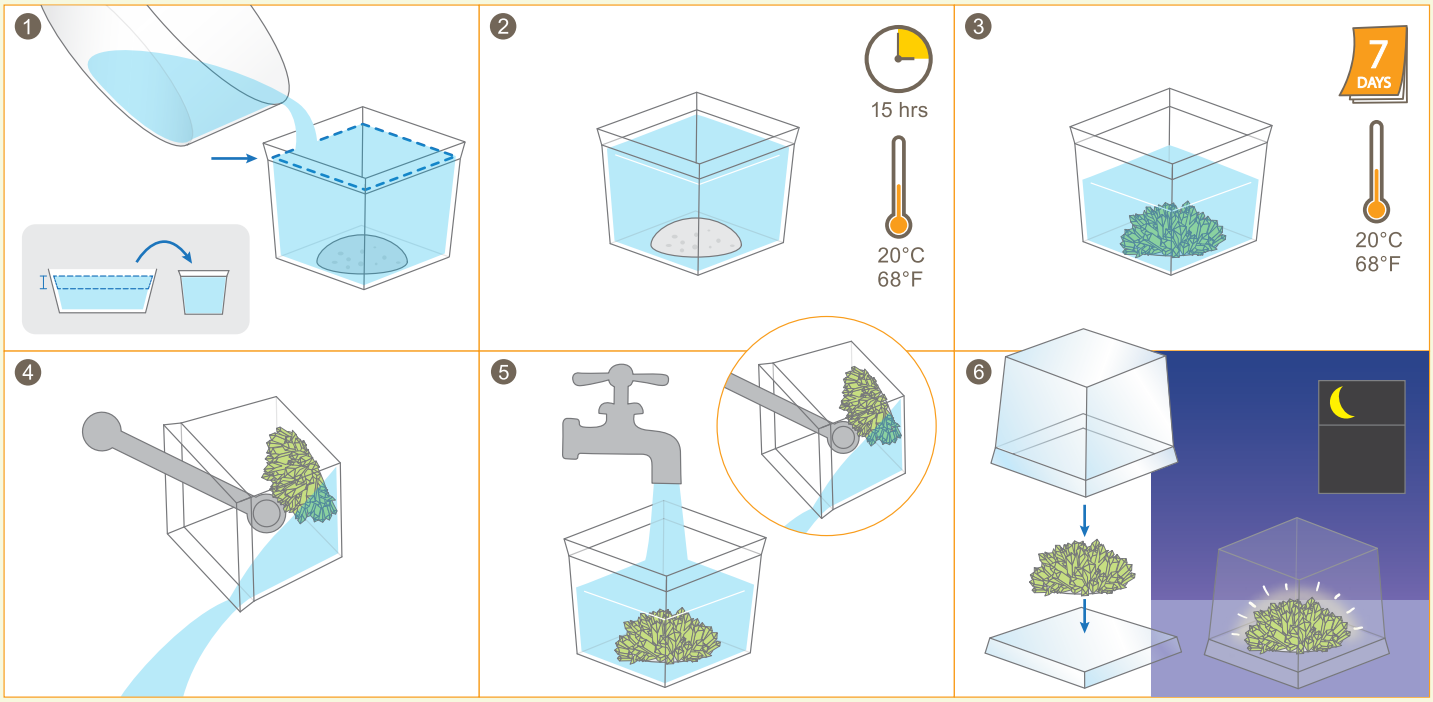
Safety messages: Adult supervision is required at all times. As the solution and the crystals may stain, cover your work area with old newspaper beforehand. Take great care with hot water and solutions. Be careful when handling your crystals, as the spines are very sharp and are easily broken! Before you start, make sure you get all the materials for each section ready, as the following three crystal growing activities (Section F, G, I) are to be carried out one after the other.



1. You need 200 ml (6.7 fl oz) of hot water to make the crystal solution. Use boiling water (at 100ºC (212°F)) if possible, as this makes the crystals grow best. Use a measuring jug to measure and pour the hot water into the stirring bowl. (Do not use the other containers for this purpose, as the hot water will deform thin plastic.)
2. Add the contents of the large bag (the white crystal compound) to the water. Stir until all the powder has dissolved to make a solution.
3. Allow 15 minutes for the solution to cool in the bowl until it is just warm (ideally around 40°C (104°F), slightly warmer than body temperature).

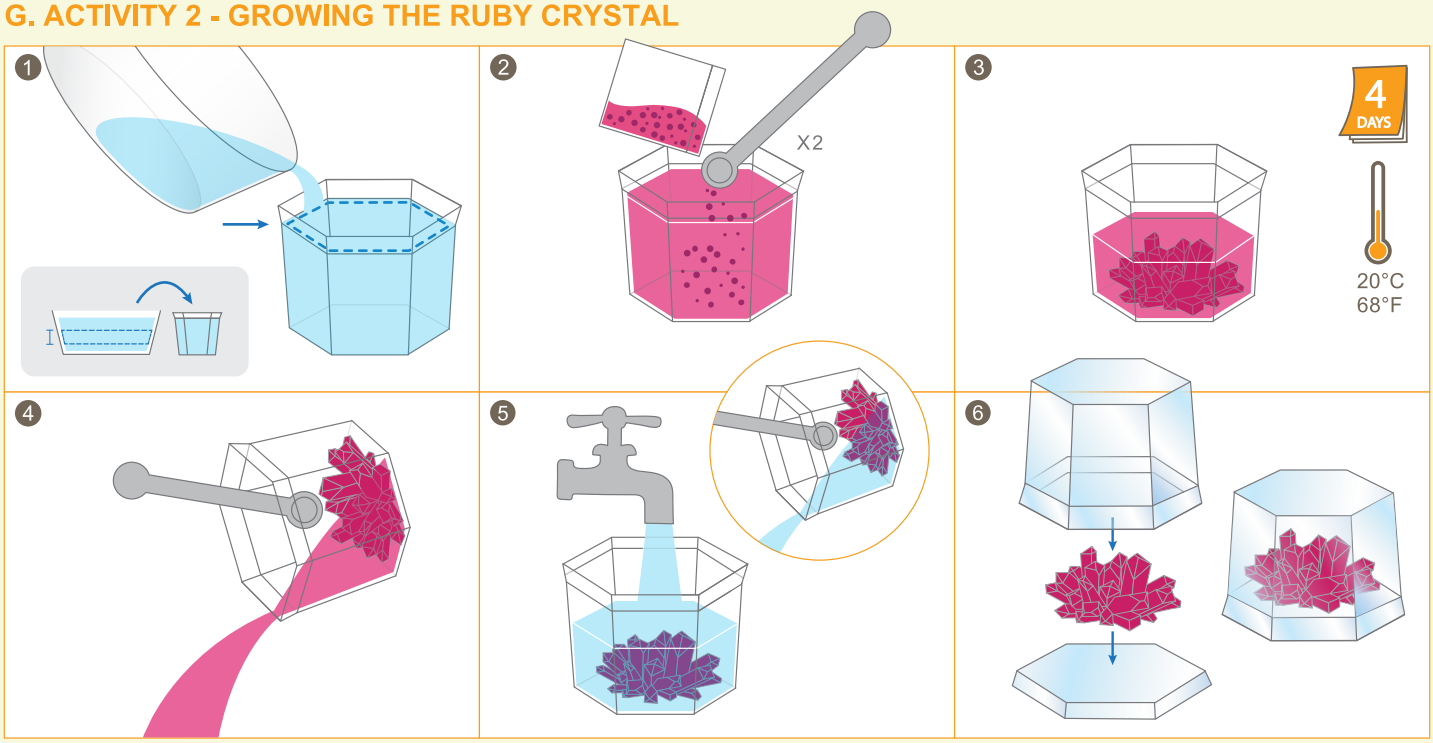
Remarks: This solution will be used for the next three crystal growing activities, so be aware of the usage per instruction. Do not dispose of it until the last activity is done.

F. ACTIVITY 1 – GROWING THE GLOW-IN-THE-DARK MOON CRYSTAL CLUSTER



1. Place the glow-in-the-dark moon crystal base into the square transparent cover. Next, pour the warm crystal solution into the square transparent cover until it reaches the marked level. (Note: the leftover solution will be used in Sections G & I.) The crystal base may float at first. After it soaks up some solution, it will gradually sink. Then, using the spoon, position it at the centre of the transparent cover.
2. The Glow-in-the-dark Moon Crystal Cluster needs a temperature above 20°C (68°F) to grow properly, so carefully put the transparent cover in a warm room, or on top of your refrigerator. Place a piece of kitchen paper under the transparent cover as a mat. Choose a place where it will remain warm and undisturbed for at least 15 hours, to allow the crystals to start growing.
3. The Glow-in-the-dark Moon Crystal Cluster will grow enough to be visible on the first day, and then slowly cover the whole surface of the base and reach a height of 30 mm (about 1.2 inches). The growing process takes 7-10 days. The size will vary depending on the environment in which the crystals are growing. If you prefer small crystals, you may stop the growing process earlier.
4. When the crystals have reached the size described above, drain away the remaining solution, using the spoon to hold the crystals in the transparent cover as you tip it. Once the solution is poured away, you cannot use it again, so BE SURE YOUR CRYSTALS HAVE GROWN BEFORE YOU POUR AWAY THE SOLUTION. Due to the rough texture of the crystal base, the grown crystals would look thin and sharp, unlike the ones you will grow in the next section.
5. Gently rinse the crystals with fresh water for a few seconds, and pour away the water. Do not wash them for too long or they will dissolve. Carefully remove the crystals and let them dry on a paper towel. Rinse the transparent cover with fresh water and set aside.
6. When the crystals and the transparent cover are completely dry, put the crystals on the square display base and cover them with the transparent cover to protect against moisture. Congratulations! Your Glow-in-the-dark Moon Crystal Cluster is complete. Display them as part of your crystal collection. Briefly expose it to the room's light or to the light of a torch for a minute and watch it glow!

G. ACTIVITY 2 - GROWING THE RUBY CRYSTAL



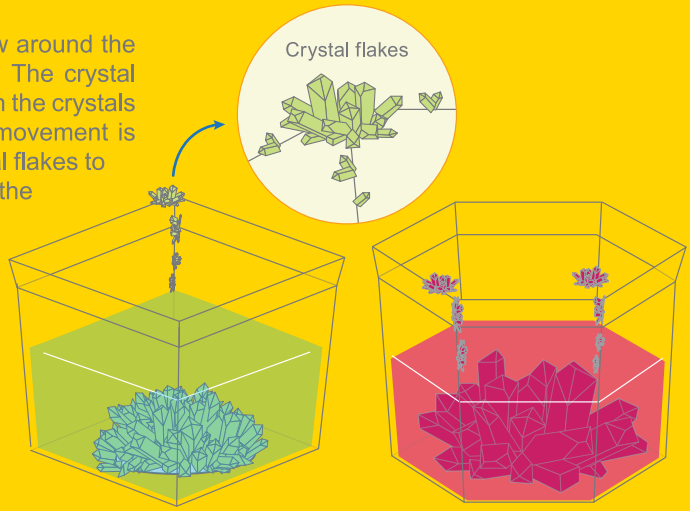
1. Pour the crystal solution into the hexagonal transparent cover until it reaches the marked level. (Note: the leftover solution will be used in Section I.) Allow 30 minutes for the solution to stabilise.
2. Take the small bag containing the red seeding mixture. Using the stirring spoon (which should be clean and dry before use), gently sprinkle 2 spoonfuls of the seeding mixture over the surface of the warm solution. The particles should sink and spread evenly over the base of the container. DO NOT STIR THE SOLUTION. Try not to disturb any of the seeding mixture that may have fallen to the bottom of the container. Note: handle the seeding mixture with care, as the pigment may cause stains.
3. Similar to the Glow-in-the-dark Moon Crystal Cluster, the Ruby Crystal needs a temperature above 20°C (68°F) to grow properly. Carefully put the transparent cover somewhere warm and undisturbed. Place a paper towel under the transparent covers as a mat. In normal conditions, the crystals will start to grow on the first day and reach a width of about 30 mm (about 1.2 inches) and a height of about 25 mm (about 1 inch) in 4 to 7 days. If the environment is cold or humid, it will take longer for them to grow – even weeks, in some cases – so be patient! It will be worth the wait!
4. When the crystals have reached the size described above, drain away the remaining solution. Use the spoon to hold the crystals in the transparent cover as you tip it. Once the solution is poured away, you cannot use it again, so BE SURE YOUR CRYSTALS HAVE GROWN BEFORE YOU POUR AWAY THE SOLUTION. Check by shining a torch into the solution to look.
5. Gently rinse the crystals with fresh water for a few seconds, and pour away the water. Do not wash them for too long, or they will dissolve. Carefully remove the crystals and let them dry on a paper towel. Rinse the transparent cover with fresh water and set aside.
6. When the crystals and the transparent cover are completely dry, put the crystals on the hexagonal display base and cover them with the transparent cover to protect against moisture. Congratulations! Your Crystals set is complete. Display it as part of your crystal collection!

HOW DO THESE CRYSTALS GROW? When you add the crystal compound to hot water, it breaks up into tiny particles, far too small to see, in the water. The liquid is then called a solution of the powder. In fact, it's called a saturated solution, because if you try to stir in more powder, no more will dissolve. Slowly, as the water cools and some evaporates, it can't keep all the particles dissolved, and some begin joining together again. The particles join up in an organised way, making the crystals that you see, with straight edges and flat faces.

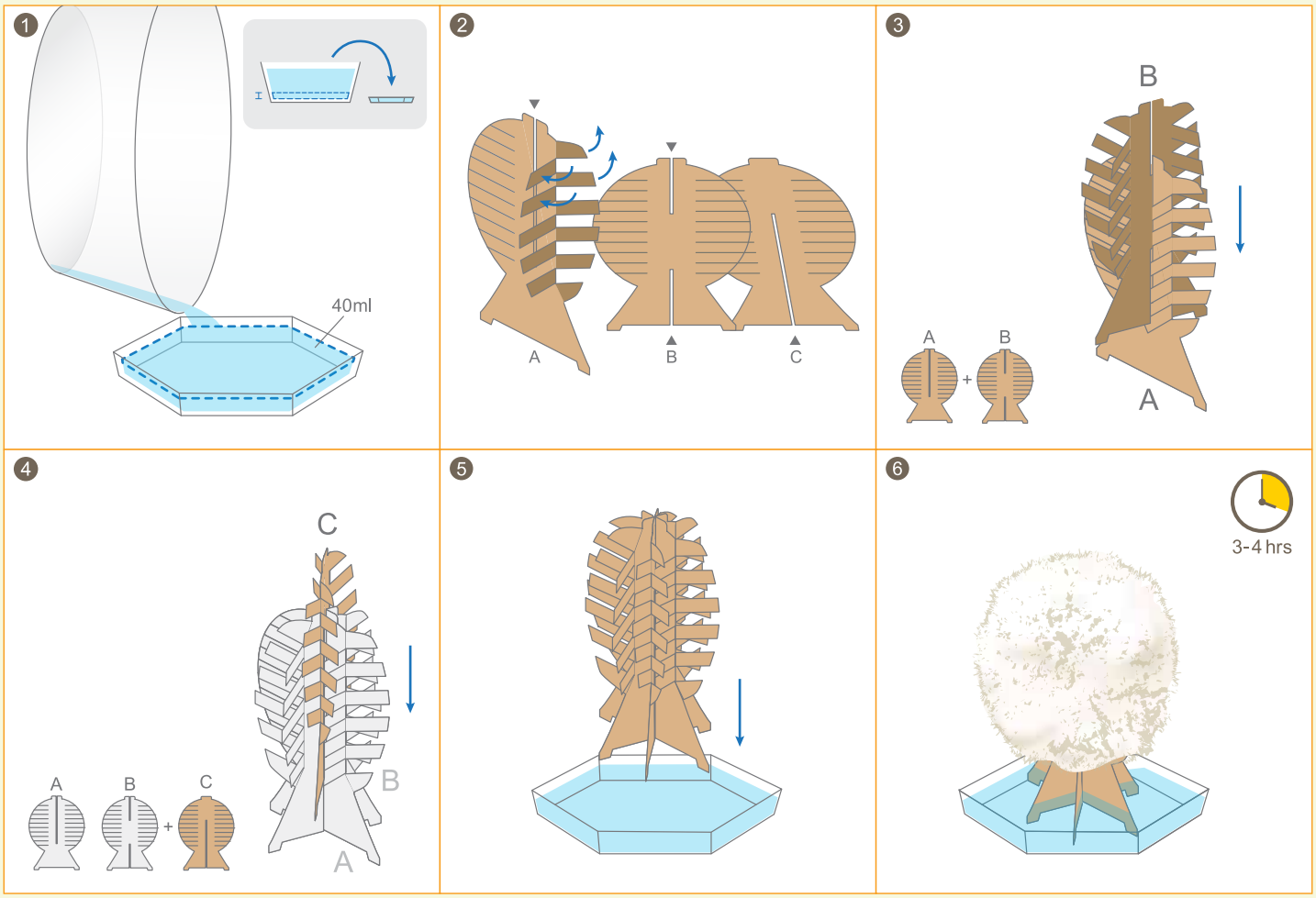
WHY DOES THE MOON CRYSTAL CLUSTER GLOW? The Moon Crystal Cluster glows because of its chemical components, which contain glowing pigment. This pigment absorbs and stores the energy of the light that hits it, and then slowly releases that energy over time, creating a dim glow. Since the crystals are transparent, the glow shines through them, like optic fibres.

H. WHAT IS CRYSTAL CLIMBING?

During the growing process, some small crystal flakes may start to grow around the inner wall of the transparent cover. This is known as Crystal climbing. The crystal flakes are formed because liquid moves up through the tiny gaps between the crystals themselves and between the crystals and the transparent cover (this movement is called capillary action), and then as the water evaporates, it allows crystal flakes to grow. If this happens, gently remove the small crystals without disturbing the solution, or these small crystal flakes eventually growing out of the transparent covers and staining the table top.



I. GROWING THE CRYSTAL SNOW TREE



1. Take the remaining solution in the bowl, left from Section G, and pour it into the shallow hexagonal container. You should have about 40 ml (1.4 fl oz) remaining; if you do not have enough solution, you may top it off using the solution from the finished Moon Crystal Cluster.
2. The three tree paper pieces, A, B and C, have different slot positions. Refer to the diagram and identify these differences. Fold the pre-cut branches to form a V-shape in an alternating manner as shown.
3. Slot A and B together first carefully.
4. Gently slot C onto A and B as well to form a complete standing tree.
5. Place it onto the centre of the container. The bottom of the tree should be soaking in the solution.
6. In 3-4 hours, crystals should start to grow on the tree branches. It will finish growing in 24 hours. The crystal tree is rather fragile when it is first grown, so try not to disturb it. It will become more solid after a few days.

This crystal snow tree can be “re-grown” several times! To re-grow it, gently scrape the crystals into the stirring bowl. Add 30 ml (1 fl oz) of boiling water to dissolve the crystals and use the solution to grow a new crystal snow tree! Note: every time you “re-grow” the tree, the crystals will be smaller in size, since some base compound is left inside the paper tree during the growing process.

HOW DO THE CRYSTALS CLIMB AND GROW ON TREE PAPER? There are tiny fibres within the paper. The saturated crystal solution is slowly wicked up these fibres into the paper, in what is known as capillary action. (Trees and plants draw water and nutrients up from soil the same way.) Slowly, the water evaporates from the paper tree, and the small particles dissolved in the water join together again, forming crystals that you can see on the branches.

J. FUN FACTS

- A crystal is a solid object made up of particles (sometimes atoms, sometimes ions, and sometimes groups of atoms called molecules) that are arranged in a neat pattern. This pattern of particles is repeated again and again throughout the crystal.
- Crystals grow in seven basic shapes, called crystal systems. Each system has a different pattern of particles. The crystal systems are called cubic, tetragonal, hexagonal, monoclinic, triclinic, orthorhombic and rhombohedral.
- Many rocks are made up of crystals of different minerals. Common minerals include quartz, feldspar, hornblende and mica.
- The precious stones that sparkle in rings and necklaces, such as diamonds, emeralds and rubies, are crystals.
- The largest diamond ever found was the Cullinan Diamond, which was dug up in South Africa in 1905. It weighed 621g.
- Amazing and beautiful giant crystals grow in spaces inside rocks. Sometimes, they are discovered by people exploring caves.
- Monoammonium Phosphate (the powder used in this kit) is an ingredient in some fertilisers used on farms. It’s also used in some fire extinguishers.
- The salt that you put on your food is made up of tiny crystals of a mineral called Sodium Chloride.

B CRYSTAL MINING

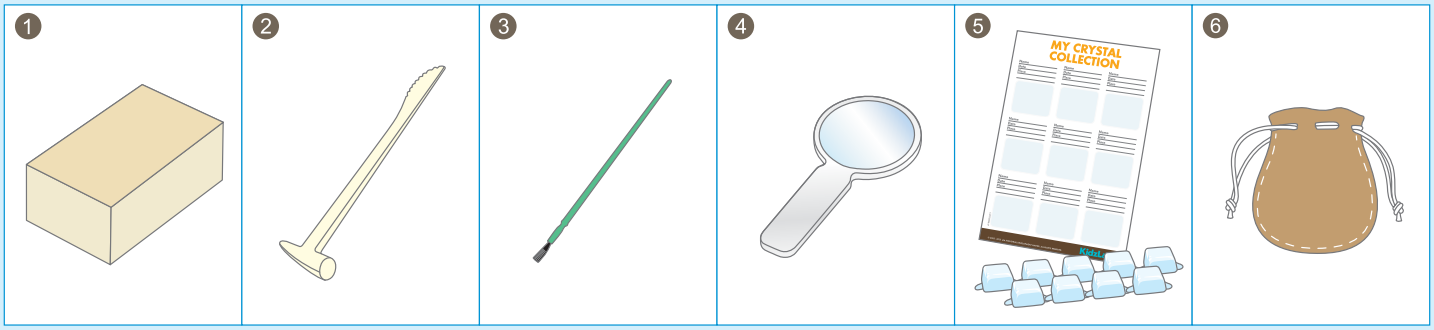
A. SAFETY MESSAGES

1. Please read this instruction booklet carefully before you start.
2. Adults' supervision and assistance are required.
3. This kit and its finished products contain small parts which may suffocate children if misused.
Keep away from children under 3 years old.
4. Do not place the material in mouth. Do not inhale dust or powder.
5. Do not place the materials in the mouth. Do not inhale dust or powder. You may wear protective eye goggle and a face mask for further protection when digging.

B. ATTENTIONS

1. Always work on a solid, level working surface and try to keep the area neat and clean.
2. Do not pour the powder down the sink as it may clog your drain.
3. Plaster may stain some clothing. Wear a working cloth or an apron before you start. Wash the plaster on clothes with soap. Do not mix with other laundries.

C. CONTENTS



1 plaster block with 8 crystals buried inside, 1 specially designed digging tool, 1 brush, 1 magnifier, 1 set display case with cover and base card and 1 pouch bag.

D. ACTIVITY 1 - MINE YOUR OWN CRYSTALS

1. Dig on the plaster with the hammer side of the tool. When the plaster is loosened, scrape the pieces away with the flat side of the tool. When a crystal starts to show through the plaster, apply the digging and the scraping gently or there may be a chance the crystal will be broken. Use the brush to brush away the loosen plaster powder.
2. Remove the crystal from the plaster when it is completely detached. Dust away the plaster powder with the brush. A crystal is mined. Repeat the above steps until all crystals are mined.
Remarks: The kit is intended for kids imitating a geologist digging up crystals. The digging process has to be done with patience like a real geologists. The activity may take a few hours or days to complete, depending on the kid's ability. That is the essence of digging fun.

E. ACTIVITY 2 - MAKE YOUR OWN CRYSTAL COLLECTION

1. CLEANING THE CRYSTALS

- Prepare a pot of warm soapy water and a used toothbrush or other soft brush. Carefully scrub the dusted crystals with the toothbrush and soapy water.
- Afterwards wash them with water and put the cleaned crystals on a piece of newspaper to dry.

2. STUDYING YOUR CRYSTALS

You can use a magnifying glass to study your crystals. Here is the information about the crystals included in this kit.

CRYSTAL	TYPE	CHARACTERISTICS
	Clear Quartz/ Rock Crystal	Some transparent, some milky or striated. Long, pointed.
	Agate	A wide range of colors and it is often variegated and banded. It also is quartz, belonging to the Chalcedony family. Its name comes from "achates" (Greek) and is said to be the first found near the river Achates in Scilly.
	Dolomite	Colours will range from various shades of green, to yellow, red, black, and white. It is an opaque or translucent gemstone. There are three different minerals that are called jade - jadeite, chloromenlanite and nephrite. And the green color is determined by the amount of iron present.
	Amethyst	Transparent, pointed crystal and the colour is purple, violet and pale red-violet. Amethyst is the most highly valued stone in the quartz group. The name means “not drunk”, as amethyst was worn as an amulet against drunkenness.
	Rose Quartz	Strong pink or pale pink. Usually translucent but may be transparent and often crackled. A little turbid. Colouring agent is titanium.

3. MAKING & DISPLAYING "MY CRYSTAL COLLECTION"

- Take out the display base card and cover case.
- Put the information about the crystals in the corresponding information square.
- After all the crystals information is filled in, slide in the cover card with the crystals to the base card.
- Gently turn over the card. Fix the case with the adhesive tape at the back.

F. ACTIVITY 3 - MAKE A SPECIAL CRYSTAL GIFT

Why not send the precious stone as gift to your friends or family. Since ancient times, it has been widely believed that crystals possess mystic power which could bring good luck and health. A bag is provided in this kit. Simply choose one of the crystals from your collection. Put it in the bag and send it as a gift. The recipient will love this special gift. If you have a rock tumbler at home, you may tumble the crystals and have them polished. They will become more shiny and transparent after tumbling, and be a very precious gift.

G. FUN FACTS

- Deep inside our Earth the temperature is very high at which all rocks and minerals are in melted form called magma. When this magma rises towards the Earth’s surface through volcanic actions, it starts to cool and form solid rock and crystal.
- A rock is made up of more than 2 minerals whereas a crystal is composed of 1 mineral throughout.
- Most of the crystals provided in this kit belong to the quartz group. Quartz is silicon dioxide, SiO_2. Quartz is abundant in the Earth's crust and is the chemically simplest silicates. People use The Mohs Scale to measure the hardness of each mineral. The softest is talc (1) and the hardest is diamond (10). Quartz has a hardness of 7.
- When you pick up a rock from the backyard. You may be able to find some tiny crystal embedded in it. If the cooling process is slow, the minerals will form into large crystals which might be as large as a few feet across. Most of the Earth's crystals took thousands of years to grow. However, some crystallisation processes can be so quick that you could watch their formation at home e.g. salt crystal.
- Contrary to common understanding, crystals do not have to be clear and transparent. It all depends on the nature of the forming minerals. But obviously, beautiful, clear and transparent crystals (gems) are more preferred for making jewellery.

VOLCANO MAKING

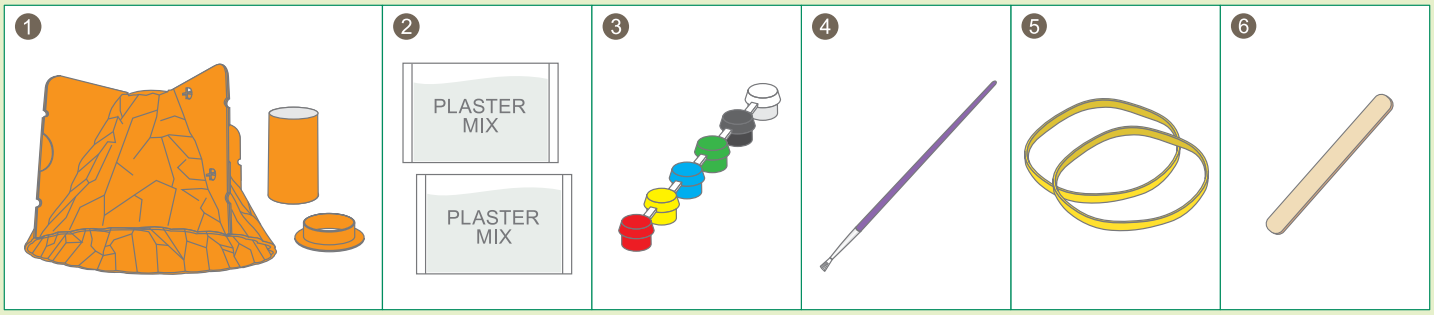
A. SAFETY MESSAGES

1. Please read through these instructions before you start.
2. Adults assistance and supervision is required.
3. This kit and its finished product contain small parts which may cause choking if misused.
Keep away from children under 3 years old.
4. Plaster dust may irritate the eyes, nose and throat. Do not place the material in the mouth or apply it to body. Avoid contact with the eyes and inhalation of dust. In case of eyes contact, flush with water and consult your physician if discomfort persists.

B. IMPORTANT INSTRUCTIONS

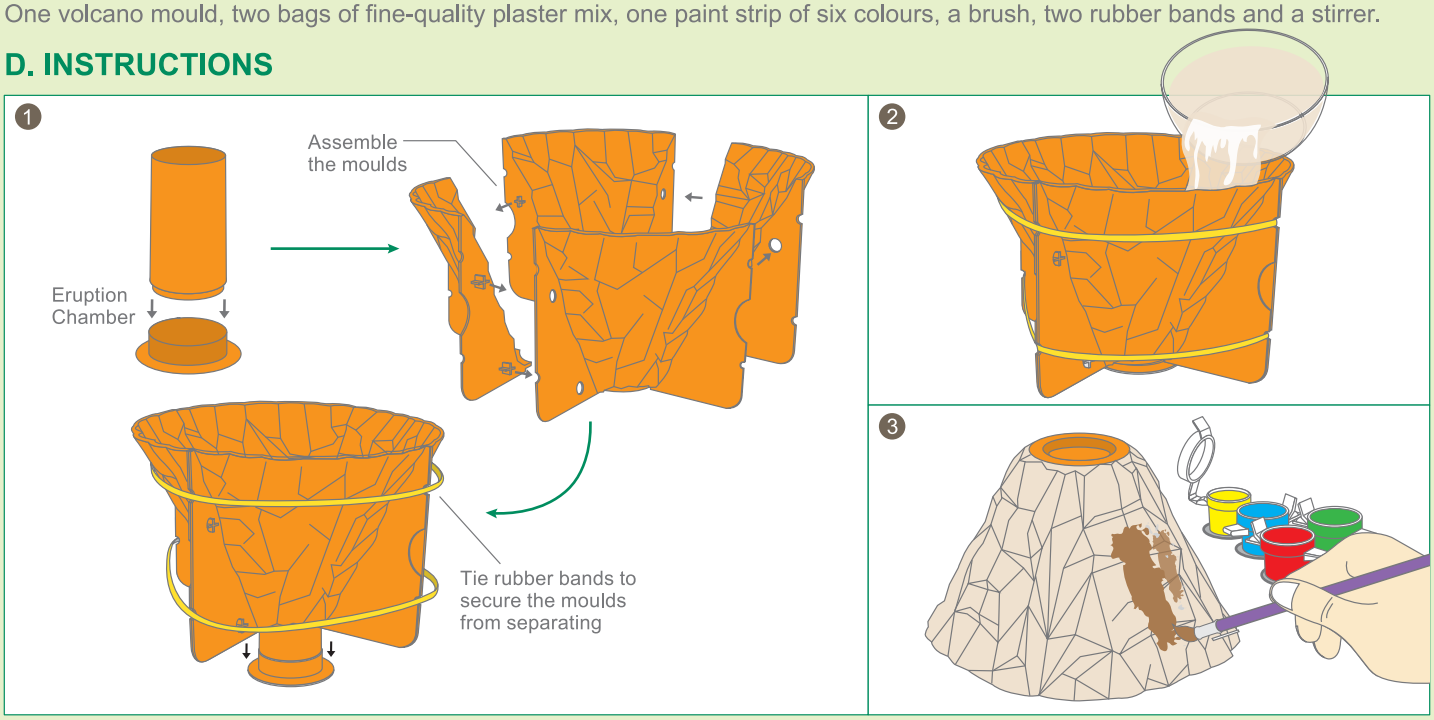
1. Always work on a solid, level surface and try to keep the area neat and clean. Do not pour the powder down the sink or bath plug hole as it may block the drain. Wash any utensils under running water.
2. Put on an apron or wear old clothes. If clothes are stained by paint then wash immediately. Dried paint may leave stains on clothes even when they are washed.

C. CONTENTS



One volcano mould, two bags of fine-quality plaster mix, one paint strip of six colours, a brush, two rubber bands and a stirrer.

D. INSTRUCTIONS



1. CONSTRUCTING YOUR VOLCANO MOULD

Before you start, make sure your working surface is flat. Cover it with aluminium foil or old newspaper. Follow the diagrams to assemble the moulds.

2. MIXING AND MOULDING

You will need: a mixing bowl, scissors to open the bags of plaster and a spoon to stir the plaster mixture.
1. Cut open the two bags of plaster mix using the scissors and pour into the mixing bowl.
2. Add approximately 280ml water to the plaster powder and stir the mixture until it becomes a smooth paste.
3. Pour this paste in to the mould and gently shake the mould to get rid of any air bubbles.
4. Leave the plaster to set. This will take about 20-30 minutes at room temperature. It's normal for the plaster mixture to warm up as it hardens.
5. Once the plaster has fully hardened, gently remove it from the mould. The eruption chamber will remain in the plaster.

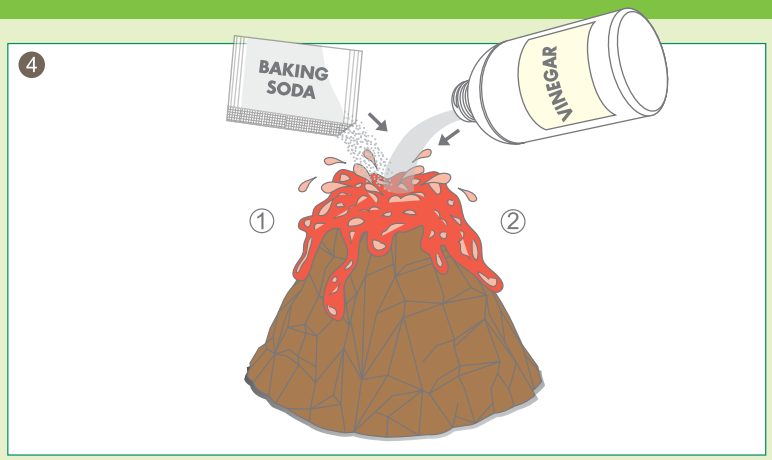
3. PAINTING AND DECORATING YOUR VOLCANO

For the best results, allow the plaster to dry completely before applying any paint. This can take up to 24 hours. Paint the volcano a brown/ red colour or choose your own colour scheme using the paints and brush provided. Read the paint mixing tips to create many more colours to decorate your volcano and look at the cover of the box for ideas.

4. MAKING YOUR VOLCANO ERUPT

You will need some vinegar and baking soda to make your volcano erupt. As it erupts, bubbly, fizzy liquid will flow from the volcano. It's best to place the volcano outdoors or on a protected surface to avoid any mess or staining.

1. Put a teaspoonful of baking soda into the eruption chamber and add a few drops of washing up liquid and red paint so it looks like lava.
2. Slowly pour a teaspoonful of vinegar into the eruption chamber and watch the eruption happen.
3. You can continue adding vinegar until the baking soda has been fully dissolved. When it is finished, you will need to ask an adult to get you some more.



E. PAINTING TIPS

You can use your own colour scheme or copy the illustration on the package. For best results apply more than one layer of paint, but wait until the first layer is dry before applying a second coat. It is always easier to paint a darker colour on a lighter colour background than the other way round. You can also mix a small drop of dishwashing detergent with the paint, which will help the paint stick to the surface better (especially with plastic surfaces). Follow the colour mixing guide below to produce more colours. (Some of the following suggestions may not apply to your kit if the required colours are not included.)

Green	= Yellow + Blue	Pink	= White + Red
Orange	= Yellow + Red	Sky Blue	= White + Blue
Purple	= Blue + Red	Lime Green	= Yellow + a little Blue
Turquoise	= Blue + White + a little Yellow	Brown	= Yellow + Red + a little Black

Mix the colours with white and black to make them lighter or darker. Do not mix too many colours together because that will make the final colour muddy. Always wash your paint brush in a jar of clean water before mixing or applying a new colour. It is also a good idea to use a mixing tray for mixing paints. Close the pot lids tightly to prevent the paints drying up. If the paint is dry, dilute it with a few drops of water.

F. FUN FACTS

- Deep inside the Earth, at temperatures reaching over 1,000 degrees Celsius, rock melts to form magma. This rises to the Earth's surface and erupts to form the lava flows that make up volcanoes.
- Hawaii's Mauna Loa is the largest volcano on Earth. Its height is about 10 kilometres from the sea floor, and its volume is about 80,000 cubic kilometres.
- The largest volcano in our solar system is the Olympus Mons on Mars. It is about 27 kilometres tall and over 520 kilometres across.
- While volcanic eruptions can be destructive, they benefit the Earth by adding minerals and nutrients to the soil. Lava flows from volcanoes help to create and shape our landscape when they harden. Can you imagine how the world would be without volcanoes?

RECYCLING TIPS

To help save our planet, do not throw away any unused materials. Keep them for future projects. You can use spare paint brushes and paint for craft projects at home and school. Buy more plaster powder from your local craft store. The plastic mould can be used to make as many volcanoes as you like. Use a small plastic bottle as the eruption chamber. If it is too tall for your volcano, ask an adult to cut the middle part away. Then connect both ends with adhesive tape to make a short bottle that can be buried completely by the plaster.

QUESTIONS & COMMENTS

We value you as a customer and your satisfaction with this product is important to us. If you have 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. You will find the address printed on the package. You are also welcome to contact our Marketing Support Team: Email: infodesk@4m-ind.com, Fax (852) 25911566, Tel: (852) 28936241, Web site: WWW.4M-IND.COM

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