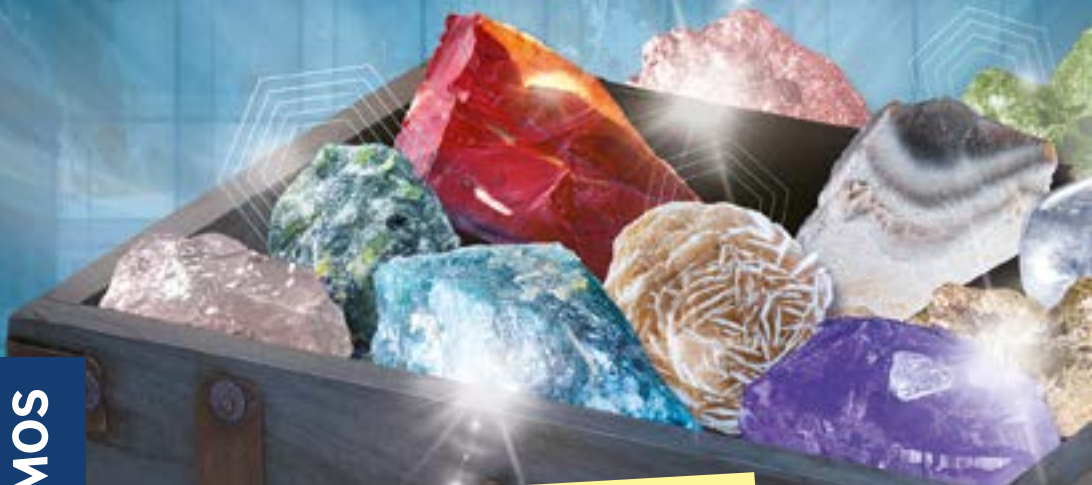


# MINERAL DISCOVERY



## WARNING.

- »» Not suitable for children under 6 years.
- »» For use under adult supervision.
- »» Read the instructions before use, follow them and keep them for reference.



## Safety rules for handling plaster

- » » Keep younger children under the specified age limit and animals away from the activity area.
- » » Store chemical toys out of reach of young children.
- » » Wash hands after carrying out activities.
- » » Clean all equipment after use.
- » » Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.
- » » Do not eat, drink or smoke in the activity area.
- » » Do not place the material in the mouth.
- » » Do not inhale dust or powder.
- » » Do not apply to the body.

**WARNING.** Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled.

Keep the packaging and instructions as they contain important information.

### First aid information

- » » **In case of eye contact:** Wash out eye with plenty of water, holding eye open. 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 doubt, seek medical advice without delay.** Take the chemical and/or product together with its container with you.
- » » **In case of injury always seek medical advice.**

1st Edition 2014

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## &gt;&gt;&gt; IMPORTANT INFORMATION

## Dear Parents,

This kit will not only help your child collect and study minerals, it will also teach him or her how to create cool crystal shapes out of plaster. Although **working with plaster** is not dangerous, you should still help your child and offer your assistance with pouring the plaster.

*Read and follow these instructions, the warnings on the cover, the safety rules, and the first aid information on the inside front cover, and keep them for reference. The supervising adult should discuss the warnings, safety information and the possible hazards with the child or children before commencing the experiments.*

The incorrect use of chemicals (especially inhaling or swallowing plaster) can cause injury and damage to health. Only carry out those activities which are listed in the instructions.

Work slowly and carefully to keep from kicking up too much plaster dust.

This chemical toy is not suitable for children under 6 years. For use under adult supervision.

Because children's abilities vary so much, even within age groups, supervising adults should exercise discretion as to which activities are suitable and safe for them. The instructions should enable supervisors to assess any activity to establish its suitability for a particular child. Carefully review the experiments and select only those that you consider appropriate for your child. The manual will help you gauge the suitability of any given experiment. Keep this chemical toy set out of reach of children under 6 years old.

For the work area, choose a solid table with a surface that can take a little abuse and that can be cleaned easily.

The area surrounding the activity 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.

Do not use containers or equipment in the kitchen after they have come into contact with plaster. The working area should be cleaned immediately after carrying out the activity. Spilled or leftover plaster should be placed in the household trash.

## >>> KIT CONTENTS

>>> Materials that are not included in the kit are marked with a + symbol in the "You will need" sections.

>>> If you are missing any parts, please contact Thames & Kosmos customer service.



### Checklist: Find – Inspect – Check off

✓	No.	Description	Count	Art. no.
<input type="radio"/>	1	Amethyst	1	715508
<input type="radio"/>	2	Rose Quartz	1	715509
<input type="radio"/>	3	Flint	1	715510
<input type="radio"/>	4	Quartz	1	715511
<input type="radio"/>	5	Amazonite	1	715504
<input type="radio"/>	6	Apatite	1	715505
<input type="radio"/>	7	Mookaite (Windalia radiolarite)	1	715506
<input type="radio"/>	8	Labradorite	1	715507
<input type="radio"/>	9	Pyrite	1	715512
<input type="radio"/>	10	Desert Rose	1	715513
<input type="radio"/>	11	Plastic form (for crystals and treasure boxes on poster)	1	715288
<input type="radio"/>	12	Measuring cup (30 mL), blue	1	065100
<input type="radio"/>	13	Measuring cup (30 mL), clear	1	061150
<input type="radio"/>	14	Die-cut sheet	1	715283
<input type="radio"/>	15	Wooden spatula	1	000239
<input type="radio"/>	16	Bag of plaster (200 g)	1	771052

>>> First check the list to make sure all the right materials are included in the kit.


#### **You will also need:**

old cup or plate, slim flashlight, hobby glue, watercolor paints, sandpaper, magnifying glass, pen




## >>> TABLE OF CONTENTS

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**Publisher's Information** .. Inside front  
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**Kit Contents** ..... 2  
**Table of Contents** ..... 3




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Get to know your collection.

**Mysterious Minerals** .... 4  
Just what are minerals and crystals? And how are they created?



**Identifying Minerals** .... 7  
How can you tell minerals apart? Perform some tests on your rocks.

**Mineral Fact Sheets** .. 11  
Learn more about your mineral collection.



**Making Crystal Shapes** ..... 15  
Crystals are geometric structures. You can cast their shapes yourself.

**In Search of Minerals** ..... Back cover  
Where can you find awesome minerals of your own?


## Getting started: Classifying Minerals

Take all the minerals out of the box and study them carefully. Do you recognize differences in shape, sheen, color, and transparency?

Remove the mineral cards from the die-cut sheet and compare them against the specimens. Can you match up each card with a rock?

Use your magnifying glass to examine the rocks more carefully.

### TIP!



If you have a hard time matching the rocks to the cards, just take a look at the Mineral Fact Sheets. It will be easy enough then.





# Mysterious Minerals

For thousands of years, people have treasured colorful rocks and beautiful crystals. Valuable jewels are among the most highly treasured items in museums. With the minerals in this kit, you can become a collector of beautiful stones too. They can become the start of your very own “treasure chamber,” to which you can also add some crystal models that you make yourself.



## MINERALS VS. ROCKS

The building blocks that form any specific **mineral** are the same, giving the mineral an orderly structure. Minerals have a definite chemical composition and can even be made entirely of just one element. **Rocks** are made up of different minerals and do not have definite chemical compositions.

CHECK IT OUT



## What are minerals?

Minerals are a **natural resource** like coal, salt, and building materials such as gravel and sand. Minerals make up the **rocks** that form the solid crust of the Earth. Some minerals exist in huge quantities and are not particularly attractive. Some minerals form beautiful crystals or display wonderful colors and patterns. Those are the ones that tend to be used as gemstones in **jewelry making.**



## What are crystals?

Certain minerals have always made an impression on people due to the fact that they form the regular patterns known as crystals. Were they created by the gods or underground spirits? Today we know that they are actually created by forces of attraction between their smallest building blocks. That's what determines the specific crystalline shape characteristic of any given mineral.



CHECK IT OUT

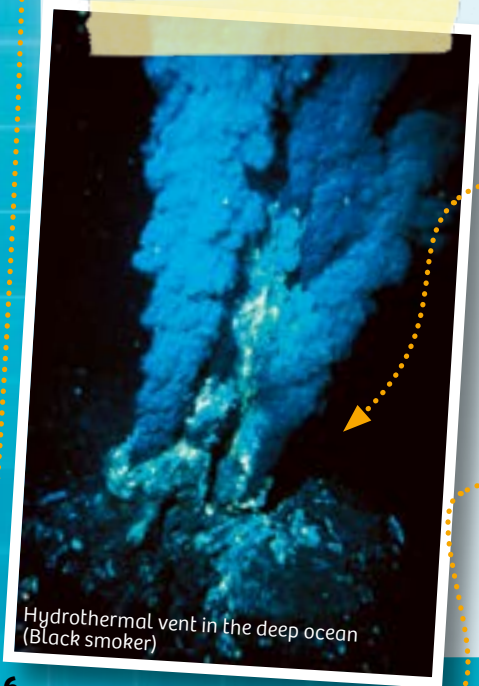


## Where do minerals come from?

The many different ways that minerals are created all have one thing in common: They all relate to the high temperatures in Earth's interior. The deeper you go, the hotter it gets and the higher the pressure rises, so ultimately even rock will melt. If this kind of molten rock (magma) rises to Earth's surface, it will cool down. That's

how minerals are formed.

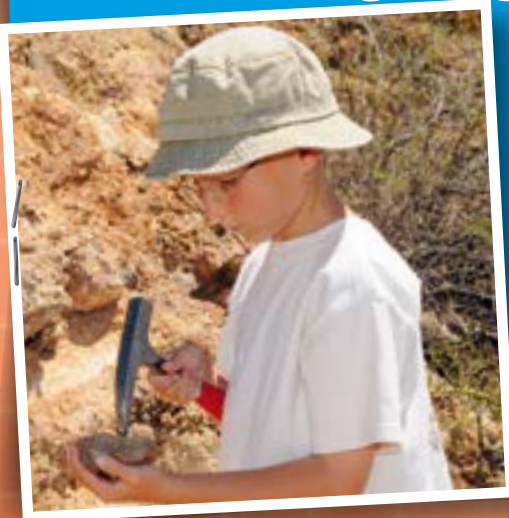
Often, water gets into the act in the formation of minerals. It dissolves certain chemical materials out of the surrounding rock and carries them upwards into cooler regions where the dissolved materials re-solidify as minerals. In this way, water can coat subterranean caverns or hollow spaces in the rocks with gorgeous crystals over thousands of years.



Hydrothermal vent in the deep ocean (Black smoker)



# Identifying Minerals



Mineral collectors have developed many methods for identifying the specimens they collect — in other words, to find out what mineral is present in each specimen they find. Sometimes a complicated chemical analysis may be required, but there are also a few simple tests that you can perform yourself.

## MINERAL TEST 1

### Density

#### YOU WILL NEED



#### INTERESTING!

Density is a property identified in relation to water. A unit of water about the size of a sugar cube weighs 1 gram. The same-sized quantity of pyrite weighs 5 grams, so it has a density of 5. The other minerals are somewhere between the two, around 2.5 to 3.

Take the pyrite rock in one hand and select another rock of about equal size from the kit box. Hold it in your other hand and compare their weights. Which is heavier?



**Aha!**  
The greater the density of a mineral, the heavier it is.

## MINERAL TEST 2

### Streak test

#### YOU WILL NEED



+ Old plate or saucer

#### INTERESTING!

Many minerals are actually colorless and owe their apparent color to **impurities from other substances**, such as iron or titanium. It's more or less like taking some white sugar and adding a little food coloring to turn it blue, red, or yellow.

That's why a single mineral (such as quartz) can show up in so many different colors (as clear or white crystals, as rose quartz, as amethyst, as flint, etc.). These "foreign colors," however, will only show up in larger specimens, not in powder. You can take advantage of that fact when performing a **streak test identification**. Only minerals that have their own color will leave behind a colored streak.

Perform your own streak test. You will need a piece of unglazed white porcelain, such as the narrow rough underside of a cup or plate. Ask a grownup to give you a piece of old unglazed earthenware, pottery, or porcelain. Rub the various minerals across it. Note the color in each case. What do you find out?



#### Aha!

Most of minerals leave behind a whitish streak, but pyrite reveals its own true color with a greenish-black mark. And mookaite often leaves behind a reddish streak.

## MINERAL TEST 3

### Hardness

#### YOU WILL NEED



+ Magnifying glass

#### INTERESTING!

Over 150 years ago, the Viennese mineralogist **Friedrich Mohs** introduced scratch resistance as an identifying feature for minerals. He assembled a comparative scale of 10 known minerals for this purpose, each of which he assigned a **Mohs hardness** of 1 to 10. According to this scale, talcum has a hardness of 1, gypsum 2, apatite 5, quartz 7, and diamond 10. Collections of sharp-edged pieces of the various Mohs minerals (typically lacking just diamond) are inexpensive and easy to buy, and are among the basic equipment of any mineral hunter.

Try the hardness test yourself. Use a sharp corner of the apatite specimen to try to scratch the amethyst or rose quartz. Blow off the dust and take a look (you may need a magnifying glass) to see if it really made a scratch mark. Then try it in reverse. What do you find out?

#### TIP!

You can also try collecting minerals outside and testing them as well.

Test all the other minerals in the kit in the same way.



Raw diamond in rock. Diamonds are the hardest of all minerals.

#### Aha!

Apatite has a hardness of 5, while quartz has a greater hardness of 7. The desert rose, with a Mohs hardness of 2, is the softest mineral in your collection — so soft that you can scratch it with your fingernail.



Ask a grown-up to help you with the scratch test.



## MINERAL TEST 4

# Translucency

## YOU WILL NEED



+ Slim flashlight, pen

## INTERESTING!

Another thing you can do with minerals is see if you can shine **light** through them. This method is not used very often, since **foreign particles** in the stone can block the light and thus reduce the validity of the test. Still, it is often helpful for ruling out certain minerals. Some of your minerals will not let any light through, while quartz minerals are always translucent.



Try it with a small flashlight. Hold the flashlight up to one of your minerals and carefully view the stone from the opposite side. Note: Do not look directly into the light. Which stones let light through? Record your findings in the table.

## Aha!

Flint lets very little light through, even though it belongs to the quartz group. This has to do with the high quantity of foreign particles in it.

Minerals = Light Visibility ↓	Amethyst	Auriferous	Apatite	Quartz	Flint	Labradorite	Malachite	Pyrite	Rose Quartz	Desert Rose
Clear/ Transparent										
Milky/ Translucent										
Not visible/ Opaque										

## FACT SHEETS

## Flint

This mineral has been valued since the **Stone Age**. When you strike it, the broken-off flakes have sharp, hard edges, which can be used for knives, scrapers, borers, axes, hammers, and **arrowheads or spearheads**.

Flint can be found **in nodules** up to 30 centimeters across inside certain rock layers. They probably form from quartz-containing water. Even back in the Stone Age, people operated flint mines by digging shafts into flint-rich layers of earth.



## Pyrite

The brassy, shiny metallic chunks contain no gold — even though gold prospectors used to be fooled by them every once in a while. That's why pyrite is also known as **fool's gold**.

It is an example of an ore, which is a mineral from which a certain **metal can be obtained**. In this case, the metal is **iron** — chemically bonded with sulfur.

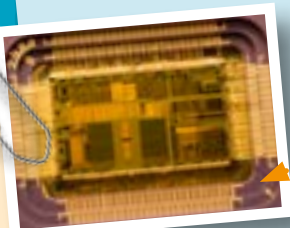
Pyrite can be found in many parts of the world. The chemical industry uses small amounts of it in the manufacture of **sulfur compounds**.



## Quartz crystal

The ancient Greeks imagined quartz crystals to be a kind of ice that once got so cold that it could not melt again. They called it "*krystallos*," from which our word crystal derives.

In fact, these crystals consist of pure, clear quartz — one of the most common substances in Earth's crust and a component of many different kinds of rock. It is used in the **production of computer chips, glass, and porcelain**. Artificially cultivated quartz crystals are used to **keep precise time in quartz clocks**.

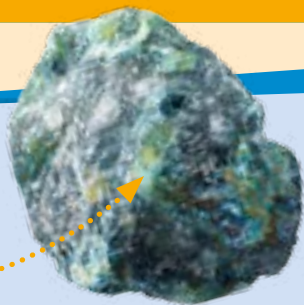


## Labradorite

This shimmering stone was first discovered in Labrador (Canada), hence the name. It is formed from molten rock, or magma.

The **bluish-green shimmer** for which the mineral is famous comes not from pigments, but from a certain fine texture on its surface which influences light in a manner similar to a film of oil on a puddle of water.

Labradorite is most popular as a gemstone, although it is sensitive to heat and cleansers.



## Apatite

This stone's name comes for the Greek **word for "deceit"** — because it occurs in so many different colors that it is easy to confuse with other gems.

It can form from hot water or molten rock, or even inside living creatures. Bones and teeth, primarily their **hard enamel** covering, consist largely of apatite.



## Amazonite

The deep green stone is also formed from molten rock. It is found in Brazil, India, the US, and Madagascar, and it is used to make jewelry.

Many centuries ago, the **ancient Egyptians** were fond of processing it into pieces of jewelry.

Its name, by the way, doesn't originate from the Amazon river or Amazon jungle. It actually derives from the mythical land of **Amazonia**.





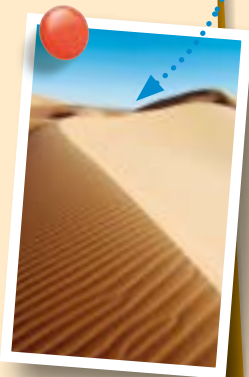
## Mookaite

This stone is usually an intense red in color, and often displays variations in color reminiscent of **clouds**. While it is little-known in much of the world, it has been treasured for millennia by Australian Aborigines. In fact, its name comes from a Western Australian river called the **Mooka**. In the language of the original inhabitants, "mooka" means "**flowing water**" — a real **treasure** in the dry Australian desert.



## Desert rose

This formation, reminiscent of a blooming rose, also comes from the **desert**. It forms in places where mineral-rich water or dew gradually seeped through the ground and evaporated at the hot surface. The minerals (usually gypsum) remained behind and became stuck together with grains of sand, forming **petal-like shapes** with a rough surface. Some can be several meters in size. Unlike your other minerals, the desert rose is **soluble in water**.



## Rose quartz

For centuries, the delicate pink color of this stone has reminded poets and rock collectors of the dawn and of love.

As the name indicates, this is a kind of quartz. Unlike many other quartz minerals, though, this kind is not a product of hot waters deep in the Earth. Rather, it comes from **glowing-hot molten rock**. Some regions have this kind of stone in vast abundance. In Sri Lanka, there is an entire hill made of rose quartz, and Namibia has a **rose quartz mountain**.



## Amethyst

This beautiful purple stone is also a member of the large quartz group. It contains traces of iron, and these **iron atoms** became altered by exposure to natural radiation in such a way that they produce a purple color **(otherwise, iron will create a green or brown color).**



In Brazil, it is not uncommon to find meter-long **rock cavities lined with amethyst crystals**. There is also a famous 400 meter-long amethyst gorge in the Austrian town of Maissau — which inspired the locals to choose purple as their “town color.”

## Making your minerals poster

### YOU WILL NEED



Put the minerals in their plastic treasure boxes, place the boxes in their proper locations on the poster, and hang the poster on the wall.



### TIP!

The treasure boxes come in different sizes!

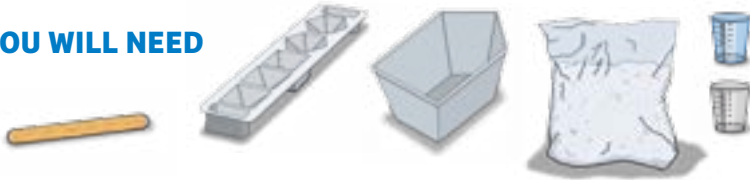


**MAKING MODELS**

# Creating crystal shapes

You can use the plaster-pouring set to create your own beautiful crystal models. These crystal shapes show up in lots of pretty and well-known minerals. If you like, you can also paint them and make them just as colorful as real crystals.

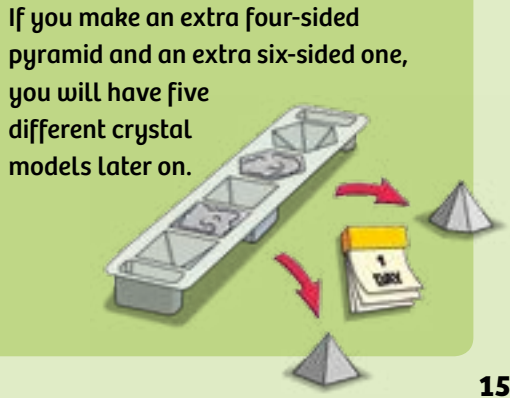
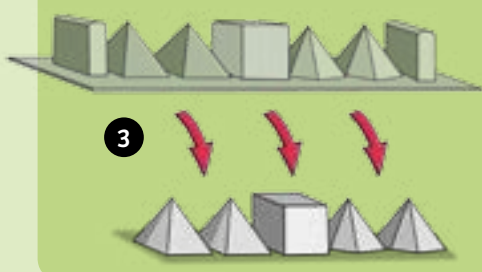
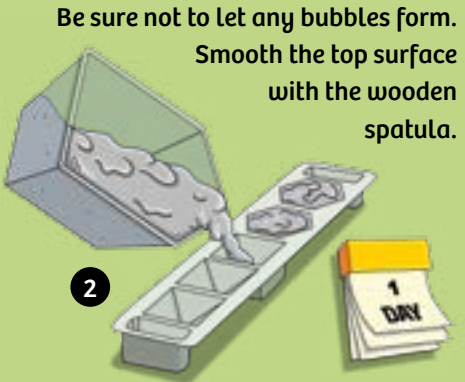
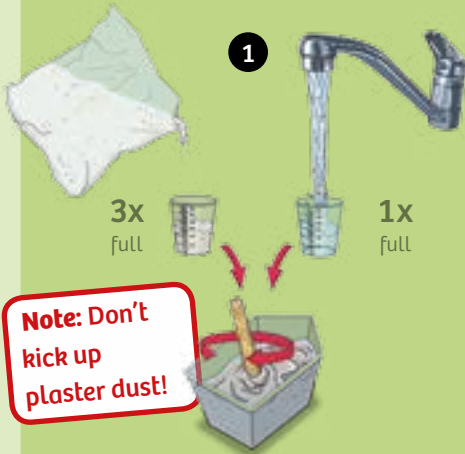
**YOU WILL NEED**



+ Hobby glue, water colors, sandpaper

Be sure to observe the warnings on the inside front cover!

**HOW TO MAKE THE MODELS:**

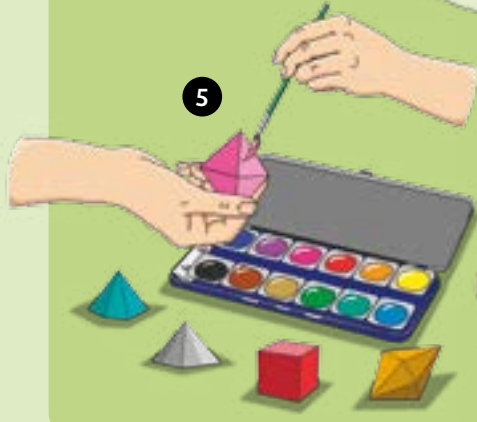
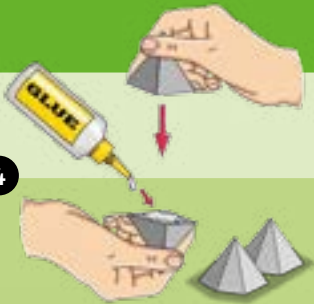




Smooth the bottoms of the pyramids with sandpaper, if necessary.

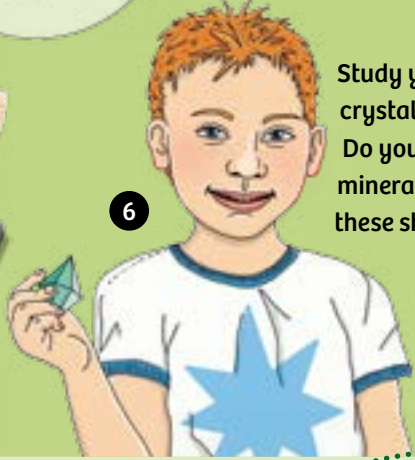


4



5

6



Study your crystal creations. Do you know minerals with these shapes?

Two four-sided pyramids glued together will create a shape known as an octahedron. **Diamonds**, for example, come in this shape. Two six-sided pyramids glued together create a shape that

**quartz** sometimes comes

in. Crystal columns with a pyramid-shaped tip are much more common in the mineral realm. You can find cube-like shapes in beautiful **pyrite** and **fluorite** crystals.



You can also use the shapes to tell different minerals apart. In the pictures above, you can see a clear difference in shape between amethyst (quartz) and fluorite. In this way, you can easily distinguish these minerals even though their colors are almost identical.

# In Search of Minerals

You can search for your own minerals and add your finds to your collection. They can be found almost anywhere — with a little luck — and as long as you know where and when to look.

## Where is the best place to look?

**Along the banks of streams and rivers.** You can often find treasures among the ordinary river rocks. You will have the most success if it has just rained, which may have loosened minerals from the ground, carried them along, and left them washed up on the river bank as the water level dropped.

**Along paths.** If you look carefully, you can also find beautiful minerals along paths and ditches in fields and meadows.

**In the mountains.** You can find the best crystals in places where it freezes and then thaws out again. That can create cracks in rocks or maybe break them open. If you're lucky, you might be able to find some awesome crystals in the cracks.

**In the ocean.** Some beautiful polished minerals can often be found washed up following stormy weather. It's easiest to find these rocks by wading a few meters out into the shallow water and using a scoop to search between the sand and algae.

**Rock collecting excursions.** Tours are often offered in quarries and on lands where you are allowed to collect minerals.

**Be careful when searching outdoors!**  
Wear clothing and shoes suitable for bad weather and the outdoors and take an adult with you.

## Big or small

Crystals come in all possible sizes. The pretty green ones on the left are about the size of a ladybug's dot, while the white ones on the right can grow taller than a giraffe!





## Kosmos Quality and Safety

More than one hundred years of expertise in publishing science experiment kits stand behind every product that bears the Kosmos name. Kosmos experiment kits are designed by an experienced team of specialists and tested with the utmost care during development and production. With regard to product safety, these experiment kits follow European and US safety standards, as well as our own refined proprietary safety guidelines. By working closely with our manufacturing partners and safety testing labs, we are able to control all stages of production. While the majority of our products are made in Germany, all of our products, regardless of origin, follow the same rigid quality standards.