



MATERIALS: **WHATS ARE CRYSTALS AND HOW DO THEY GROW?**

YEAR LEVELS

Year 3

THEME OF UNIT

Crystals are not alive, but they can grow.

In a crystal, atoms or molecules join together in a pattern that repeats itself over and over to create a certain shape. Crystals can be found in many places with salt and sugar the most common crystals available in every home.

Precious gemstones such as diamonds, rubies and emeralds are also crystals. Growing crystals requires a little time and patience. If you have both (plus a few other ingredients), you can grow your own crystals and have lots of fun.

These lessons and activities were designed to teach children about:

- What crystals are
- The fact that all crystals have a distinct shape which differs according to the chemical structure and properties of the building blocks (atoms and molecules) they are made from
- How and why crystals grow

ACTIVITY LINKS TO NATIONAL STATEMENTS OF LEARNING FOR SCIENCE

Science as a human endeavour

Science as a way to know

Science as a body of knowledge - *Matter*

SEQUENCE OF LESSONS IN UNIT

Lesson 1:

Start the topic with a discussion of what crystals are and show them some examples that they hold and feel.

Invite the children to think about and discuss where they might find crystals.

Alternatively show them pictures of crystals.

Ask the following questions:

What is a crystal?

A crystal is a solid object which is made up of an ordered repeating pattern of the same atom or molecule.

Where can we find crystals?

We can find crystals everywhere we look including in our homes.

Examples of crystals the children may have seen are:

- Sugar
- Salt
- Diamonds
- Snow
- Bath salts
- Quartz

Why do different crystals have different shapes?

Crystals grow into certain shapes because the atoms or molecules join together in a pattern that repeats itself over and over to create a certain shape.

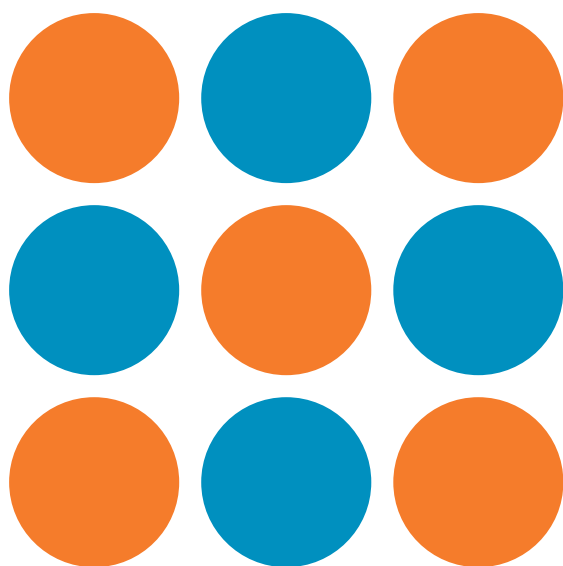
A crystal grows by adding atoms or molecules to all its sides in the exact same pattern as the atoms and molecules that were added before.

Because each different crystal is made up of a different building block (atom or molecule) they each have a different structure or shape.

This is why salt crystals are square in shape while Epsom salt crystals are long and rectangular.

A great way to show the children how this works is to get them to play with some Lego or blocks or something equivalent to investigate how they can make a repeating pattern and hence a crystal shape.

CRYSTAL STRUCTURE OF SALT



Note that the salt crystal structure is actually a 3 dimensional shape whereas this diagram is only showing one face or side of the crystal. Also note the repeating pattern of atoms that make up the crystal structure where each circle is a different atom and a blue and a red circle make up a molecule.

It is sufficient for children to know that atoms and molecules are building blocks that are used to make everything we see and touch including crystals. They do not need to understand the complexity and definitions of what atoms and molecules are!

Explain that the class will do an experiment to show the children that every crystal has a different structure because they are each made of different building blocks (atoms and molecules).

Crystals will be grown using two different starting materials (Epsom salts and borax). These are both white powders or very finely crushed crystals. The particles are too small for you to see their individual crystal shapes. The crystal growing activity teaches how to grow crystals large enough to see their different shapes.

Question:

- If we keep the recipe the same, except for the borax and Epsom salts, will the crystals we make look the same?
- The experiment is carried out under controlled conditions to show students that if the growing conditions are kept the same for both materials, any differences they note are due to the difference in the chemical building blocks. The shape, size and quantity of the crystals formed will differ and are able to be compared fairly.

USEFUL DEFINITIONS

Pure substance

Does not contain anything other than one chemical or substance i.e. no impurities

Atom

Is the smallest unit or building block that is required to make a molecule or substance

Molecule

Contains a number of atoms held together by bonds and are the smallest complete unit of a substance i.e. individual molecule of salt contains two separate atoms held together by a bond

Saturated solution

Is a solution in which the maximum amount of a solid has been dissolved

Super-Saturated solution

Is a saturated solution which has been heated in order to allow more solid to be dissolved. Crystals will only grow from a supersaturated solution

Solute

Is a solid substance that is dissolved into a liquid e.g. sugar

Solvent

Is the liquid in which a solute (solid) is dissolved e.g. water

Lesson 2:

How do Crystals grow?

This activity focuses on showing the children that some crystals like to grow on surfaces. Children will see that the crystals grow all around the inside of a jar as well as on a pipe cleaner inserted into the solution for the purpose of assisting the process of crystal formation.

The crystals are growing by a process called assisted nucleation. The children do not need to understand the term assisted nucleation but do need to understand how the crystals grow by this process.

When we dissolve our starting material (solute) into the water (solvent) we create a solution. The solute molecules float around in the water but aren't able to meet each other properly as they need a meeting place where they can join together. By placing a piece of string into the solution you provide a place for the solute building blocks (atoms and molecules) to meet and join together.

A good way of explaining this to the kids is if they tried to hold onto the side of a smooth slippery surface such as glass they wouldn't be able to. Now if there was a piece of rope or a groove in the glass they would have something they could grab onto. Once one person or building block has a hold others can join to this building block by forming a bond or holding hands thus creating a crystal that grows as more building blocks join.

Lesson 3:

Growing a crystal geode

This activity consolidates what students have learnt about crystals. At the completion of the activity they have sufficient knowledge to write a report.

Geodes are rocks that contain crystals. Normally, millions of years are required for flowing water and minerals to deposit crystals, but you can make your own 'geode' in only a few days. This is done by growing blue copper sulphate crystals inside an egg shell.

Visit www.raci.org.au for further chemistry education resources