When the Earth erupts

In 1943, a crack appeared mysteriously in the ground in a flat cornfield in Mexico. A week later the crack had become a 150-metre-high volcano. Red-hot molten lava spewed from deep inside the growing volcano. Ten years later, a 400-metre-high, rocky mass stood where a peaceful cornfield once lay.

This volcano is now described as dormant because it has not erupted for over 20 years. Dormant volcanoes are ‘sleeping’ volcanoes, but they can wake up at any time without much warning. Volcanoes that have not erupted for thousands of years are said to be extinct. Active volcanoes are those that have erupted recently and show signs of erupting again in the near future. There are about 500 active volcanoes around the world. None of these active volcanoes is in Australia.

What is a volcano anyway?

Magma can break through weak spots in the Earth’s crust. When it does, a volcano is formed. As the magma reaches the Earth’s surface, it releases some of its gases. The molten rock at the Earth’s surface is called lava. The lava can ooze gently out of the top of a volcano or it can burst out explosively. Lava can be runny or really thick. The gases inside the volcano can explode so violently that the top of a volcano can blow right off!
The changing Earth

Mudflows
As magma surges to the surface, it can set off a series of earthquakes, avalanches, landslides and mudflows. Mudflows are caused when rain falls through volcanic ash or when the volcano causes lakes and rivers to burst through their banks. They can also be caused by snow and ice melted by the heat from the volcano.

Lava
The red-hot flow of lava can destroy everything in its path. The heat from lava can even start fires.

Ash and gases
A cloud of ash and gases, including steam, can reach 15 km or more into the sky. Some of the gases released during an eruption, such as carbon monoxide, are poisonous. The ash thrown from the crater can cover a large area. It can affect water supplies and can make breathing difficult. If the eruption is big enough, the ash can block the Sun’s rays and cause a drop in the Earth’s temperature. This happened when Mount Pinatubo erupted in 1991. The temperature drop caused by this eruption lasted for over a year.

Crater
Explosive eruptions fire out red-hot rocks, ash and clouds of gas. Lava pours out of the craters of less explosive volcanoes.

Magma chamber
Pressure from inside the Earth pushes the magma up through a weak spot in the Earth’s crust.

REMEMBER
1. Describe the difference between a dormant and an active volcano.
2. When is a volcano extinct?
3. Where did the lava erupting from this volcano come from?

THINK
4. Explain how the eruption of a single volcano can affect the whole world.
5. How is lava different from magma?
6. How might people living in river valleys near a volcano be affected if the volcano erupted?

IMAGINE
7. Imagine that you live in a small town near a volcano. A warning has been issued that the volcano is about to erupt. What measures could be taken by the residents to protect the town and its people?

CREATE
8. Write a newspaper report that describes the eruption from one of the following famous volcanoes: Mount Vesuvius, Mount Pinatubo, Mount St Helens, Mount Krakatoa.

I CAN:
- describe how volcanoes form
- describe some of the hazards associated with volcanoes
- understand what can happen during a volcanic eruption.
When lava cools

Lava surges out onto the Earth’s surface at temperatures of 1000°C or more! At that temperature, **lava** could take weeks to cool down. But, sometimes, when volcanoes erupt under water for instance, the lava cools much faster. When lava cools down it becomes solid rock. Looking closely at rocks that formed from red-hot lava tells a story about the way they cooled.

**Frothy rocks**

Some violent volcanic eruptions shoot out lava filled with gases. The lava cools quickly, while it is still in the **air**, and traps the gases inside. Rocks that form this way are full of holes. Two examples of these rocks are **pumice** and **scoria**. The substances in the **magma** affect the colour and hardness of the rock that is formed when lava cools. Scoria has more iron in it than pumice, so it is darker than pumice.

**Growing crystals**

Rocks that form from lava cooling above the Earth’s surface are called **extrusive rocks**.

**Basalt** is an extrusive rock that can take on many appearances. One big difference between samples of basalt is the size of the crystals that make up the rock. The size of the crystals gives us clues about how or where the rock formed. The longer it takes for the lava to cool, the bigger the rock crystals grow.

**Basalt with bubbles**

When viewed under a microscope, it is apparent that the crystals in this basalt are large. This is because they formed from lava on the ground. The crystals had time to grow before the rock became solid. Notice the holes. The lava was filled with gases when it began to cool. The gases have since escaped.

**Pillow basalt**

This rock formation came from a volcano that was once under water. The rocks formed from underwater volcanoes are smooth and round. The crystals in this basalt are so small that they are difficult to see.

**Pumice**

Pumice is a pale-coloured rock. It is very light because it is full of holes. It floats on water and sometimes washes up on beaches. Powdered pumice is used in some **abrasive** cleaning products.

**Obsidian**

Obsidian is a smooth, black rock that looks like glass. It is formed when lava cools almost instantly. This rock is different from basalt because it cooled so quickly that no crystals formed. Sometimes very fine air bubbles are trapped in the rock, which give it a coloured sheen.

**Scoria**

Scoria is heavier than pumice. It is usually found closer to the volcano’s crater than pumice. Scoria is a red-brown or grey rock that can be used in garden paths or around drainage pipes.
What affects crystal size?

You will need:
- Bunsen burner, matches and heatproof mat
- Tripod and gauze mat
- Alum solution
- 2 Petri dishes
- Evaporating dish
- Safety glasses and lab coat.

- Pour roughly equal amounts of alum solution into the evaporating dish and the Petri dishes.
- Put one of the Petri dishes in the refrigerator.
- Put the other Petri dish on a windowsill.
- Place the evaporating dish on the gauze mat.

- Gently heat the evaporating dish without allowing the solution to boil rapidly.

**CAUTION:** Rapid boiling may result in spitting. Wear safety glasses at all times.

- Continue heating the solution until nearly all of the water has evaporated.
- Observe the size of the crystals formed in the evaporating dish.
- After two days, observe the size of the crystals formed in the two Petri dishes.
- Observe the crystals formed in the refrigerator again after four or five days.

1. Draw a labelled diagram of the crystals formed in the evaporating dish and in the two Petri dishes. Your diagram needs to show the difference in size between the crystals.

2. Each of these crystals grew over a different time span. How does the time allowed for the crystal to form affect the size of the crystals?

REMEMBER
1. Where do extrusive rocks form?
2. Why are the crystals in pillow basalt smaller than the crystals in basalt which form on the ground?
3. Scoria and pumice are formed in a similar way. Why are their colours different?
4. What type of extrusive rock could easily be mistaken for glass?

THINK
5. In which of these two rocks did the lava cool faster? Explain your answer.

ICT
8. Go to www.jaconline.com.au/sciencealivevic/salevel5 and click on the Guinness Book of Records link. Mount Everest is said to be the highest mountain in the world, but there is a volcano that is higher.

(a) What is the name of the volcano?

(b) Where is the volcano?

(c) Why do we call Mount Everest the highest peak, when this volcano is taller than Everest?