Geology: Rocks, Crystals, Gemstones, Fossils Outcomes and activities

God is Truth Yr 4

Spiritual Overview:
God uses the symbol of a rock to describe something strong and immoveable, He is that rock. Jesus told the story of the wise and foolish builders, where we are instructed to build our lives upon the rock.

God's word is a rock of truth, dependable and totally reliable. Because many geologists believe that the Earth has existed for billions of years, they have a bias when dating the age of rocks. Their dating methods start from a basis that the Earth is billions of years old. But rocks and fossils do not have dates stamped upon them. The date must be interpreted, and this depends on the scientists' belief about the past. Every dating method relies on many assumptions about the past that cannot be proved. Many dates given by geologists have been proved wrong, e.g. when creation scientists submitted rocks formed by lava flows of 50 years ago, conventional dating methods came up with a date of thousands of years.

Our response to 'God is Truth'
Because God is truth I will…

- Trust Him in times of trouble
- Depend on Him
- Build my life on Him
- Believe and obey His word
- Believe that God created the Earth as recorded in Genesis

Biblical references
About rocks
Matthew 7:24 the man who built his house on the rock
Psalm 18:2; 19:14; 40:2; 61:2; 92:15 God is our rock

About salt/crystals
Job 6:6 Salt for preserving food.
Ezekiel 16:4 Salt as an antiseptic.
Leviticus 2:13; Ezekiel 43:24 Salt as an offering.
Numbers 18:19; 2 Chronicles 13:5 Covenants made with salt.
Matthew 5:13 You are the salt of the earth. But if the salt loses its saltiness, how can it be made salty again? It is no longer good for anything except to be thrown out and trampled by men.
Luke 14:34-35; Mark 9:49-50 Salt of the earth
Colossians 4:6 Salted conversation
Ezekiel 47, especially 47:11 Salt is retained

About gemstones and precious metals
Exodus 25 Materials for building the Ark: Metals including pure gold; gemstones; only the best for the most holy God.
Malachi 3:3 God is a judge who refines like a fire that refines metal.
Revelation 21 & 22 The purity of Heaven; a holy city made of pure gold, with gates of pearls and foundations of precious jewels.

Key Questions
What is geology?
What is a geologist?
Why did God create rocks and soil?
How long ago did God create rocks?
What would we say if we heard that a rock was billions of years old?
How do rocks remind us of God's strength?
How can salt change the taste of food?
We could say that the world has 'good flavour' and 'bad flavour'. What does this mean?
How can Christians help the world to have 'good flavour'?
What would happen if a Christian stopped following Jesus?

Outcomes
Students will
Knowledge
- Classify various kinds of rocks
- Understand ways in which rocks were/are formed
- Understand the problems with dating methods carried out by scientists who believe in evolution
- Identify rocks in the local environment
- Understand the Biblical symbol of salt as sign of purity.
- Understand that through surrendering our lives to Christ we can be changed to become more like Him.
- Observe and describe the formation of crystals.
- Understand the uses for salt
- Understand the way in which crystals develop into gemstones.
- Understand that metals are minerals and found in rocks
- Identify different metals
- Make a study of fossils and identify different kinds of dinosaurs

Skills
- Collect and classify rocks according to qualities and formation processes.
- Measure, weigh and test rocks for hardness.
- Investigate salt through dissolving, preserving and evaporating experiments.

Values
- Develop a desire to live pure lives as Jesus would want them to live.
- Trust in God as our rock.
- Develop a desire to share God's love, and be salt and light to those around them.
- Believe God's word.

Activities
ROCKS
- Make a class collection of rocks. Classify according to colour and shapes, e.g. rounded or sharp edges.
- Identify igneous, sedimentary and conglomerate rocks.
- Explain how these were formed.
- Discuss the problems with dating methods and dates given for the age of rocks by geologists who believe in evolution. Decide how old the oldest rock in the world could be according to the Bible.
- Identify and classify rocks according to the following three groups:

1. granite, basalt, scoria, quartz, (formed by cooling of molten material)
2. sandstone, mudstone, conglomerate, coal, limestone (formed by sedimentary deposition).
3. marble, quartzite, slate (formed by effects of heat and pressure on previously existing rock).

- Classify rocks according to size, shape, weight, density, colour, texture, layer formation.
- Record weights and sizes of rocks.
- Test rocks for hardness / softness / brittleness using a hammer.
- Try writing with rocks on hard surfaces.
- Compare freshly broken surfaces with weather-worn surfaces.
- Visit a road cutting if possible, or an area where rock layers can be seen.
- Demonstrate some of the principles of rock formation by making toffee, firing clay, allowing layers of mud to dry out, throwing pebbles into a cement-sand-water mixture.
- Test for limestone in rocks by pouring on lemon juice, vinegar or other diluted acid. Limestone rocks will effervesce or bubble in the presence of acid.
- Identify rocks used in local buildings or monuments.
- Identify man-made rocks including bricks, tiles and concrete.
- Make some cement using 4 cups of sand, 4 cups of water and some Epsom salts. Mix sand and water together with Epsom salts and dump it in a hole made in a bucket of dirt. Pat it down and wait 2 days.

CRYSTALS

- Use a microscope and hand lens to examine table salt.
- Describe and draw the shape of the crystals. Are they all regular?
- Grow crystals: Take a glass jar, salt, sugar or washing soda, a long piece of thread and a paper clip. Fill jar with very hot water from the hot tap. Stir in lots of washing soda. Keep stirring until no more will dissolve in the water. Tie a paper clip on to the end of a piece of thread. Tie the other end around a pencil. Drop paper clip into the jar. Wind up the thread until the paper clip is suspended in the mixture. Leave in a place where it will not be moved. After a few days crystals will form. They will grow along the thread. To make coloured crystals, add food colouring.
- Using a magnifying glass, study rocks such as quartz, and observe crystal formations.
- Evaporate a volume of seawater and measure the mass of salt remaining.
- Explain the difference between rock salt and sea salt.
- Compare the difference between white table salt and natural grey sea salt (known as Celtic or macro-biotic salt, available from health shops).
- Research the formation of stalagmites and stalactites in limestone caves.

GEMSTONES

- Draw and label gemstones.
- Describe how gemstones are cut to reflect light.
- Study the precious minerals that will form the Holy City, (Revelation 21).

Assessment

What have I learned from studying geology…

- about rocks, crystals and gemstones? about fossils?
- about God?
- about the Bible?
- about the age of the Earth?
- about doing what God wants me to do?

Values education Year 4
God is Truth
Commitment to truth

Commitment is…

- following through on what you say you will do
- finishing something you start
- being firm about what you believe
- being loyal to a person or a belief
- no turning back

Activities and discussion
Discuss the following commitments that people make:
Playing in a sports team
Singing in a choir
Doing jobs at home
Looking after a pet

What would happen if you decided one day that you didn't feel like doing your part?

What commitments do you have? Make a list.

What does the Bible say about commitment?

Luke 9:62 Jesus replied, "No one who puts a hand to the plow and looks back is fit for service in the kingdom of God."

Practical Science Year 4

God is Truth

Rocks and crystals: Make a Crystal Snowflake!

http://www.sciencekids.co.nz/experiments/snowflake.html

Learn how to make a snowflake using borax and a few other easy to find household items. Find out how crystals are formed in this fun crystal activity, experiment with food coloring to enhance the look and keep your finished crystal snowflake as a great looking decoration!

What you'll need:

- String
- Wide mouth jar
- White pipe cleaners
- Blue food coloring (optional)
- Boiling water (be careful! or better still get an adult to help)
- Borax
- Small wooden rod or pencil

Instructions:

1. Take a white pipe cleaner and cut it into three sections of the same size. Twist these sections together in the center so that you now have a shape that looks something like a six-sided star. Make sure the points of your shape are even by trimming them to the same length.

2. Take the top of one of the pipe cleaners and attach another piece of string to it. Tie the opposite end to your small wooden rod or pencil. You will use this to hang your completed snowflake.

3. Carefully fill the jar with boiling water (you might want to get an adult to help with this part).

4. For each cup of water add three tablespoons of borax, adding one tablespoon at a time. Stir until the mixture is dissolved but don't worry if some of the borax settles at the base of the jar.

5. Add some of the optional blue food coloring if you'd like to give your snowflake a nice bluish tinge.

6. Put the pipe cleaner snowflake into the jar so that the small wooden rod or pencil is resting on the edge of the jar and the snowflake is sitting freely in the borax solution.

7. Leave the snowflake overnight and when you return in the morning you will find the snowflake covered in crystals! It makes a great decoration that you can show your friends or hang somewhere in your house.

What's happening?

Crystals are made up of molecules arranged in a repeating pattern that extends in all three dimensions. Borax is also known as sodium borate, it is usually found in the form of a white powder made up of colorless crystals that are easily dissolved in water.

When you add the borax to the boiling water you can dissolve more than you could if you were adding it to cold water, this is because warmer water molecules move around faster and are more spread apart, allowing more room for the borax crystals to dissolve.

When the solution cools, the water molecules move closer together and it can't hold as much of the borax solution. Crystals begin to form on top of each other and before you know it you have your completed crystal snow flake!

Art Year 4

God is Truth

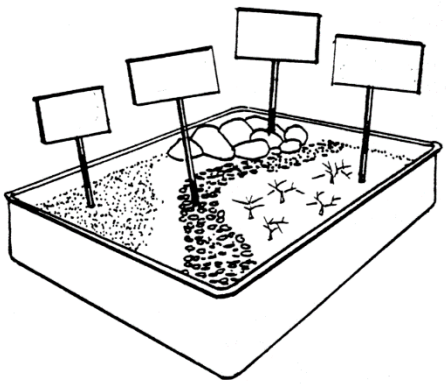
Topic: Geology – rocks, fossils, dinosaurs

Biblical connection: The truth about the landforms, rocks and fossils of the earth is found in the account of the Great Flood, when there was upheaval of the earth's surface and volcanic eruptions from the deep. This happened about 4,000 years ago.

Bible art as a wall display
The House on the rock

Caption: Build your life on the Truth
Proverbs 30:5 Every word of God is flawless

Modelling
Make models of the house on the rock and the Sower and the seed.



Make models of rocks from paper mache or dough.

Make a sand collage with different coloured sands.

Make dinosaur footprints in a lump of dough.

Painting

Paint rocks in landscape scenes using visual texture and graduation of colour.

Printing

Make stencil prints of fossils.

Example: students draw and cut out dinosaur shapes. They use these as stencils by applying paint over the cut-out. This works well with a roller.

Thinking Skills Truth Yr 4

Geology 1 Create a new product by combining: **a quartz rock** and **a microphone**	**Geology 2** Place the letters A to Z down the side of a page. Now name rocks in the world that start with each of these letters.
Geology 3 The answer is **"crystals".** Make up 5 questions.	**Geology 4** Name 8 things that **salt** and **a fly swatter** have in common.
Geology 5 Design a special machine for extracting salt from the sea.	**Geology 6** Name 10 items that would **not** be worth taking when you go fossicking for precious metals or gemstones.

Thinking Skills Truth Yr 4

Geology 7 Use your imagination. In regard to gem fossicking name 10 things that this picture represents. 	**Geology 8** Name 10 different uses for **salt.**
Geology 9 Predict all the ways that people might use clay in the future.	**Geology 10** Draw a cement mixer. Now redesign it by using the following steps: **B** – igger **I** – instead of **N** – onsense **G** – et rid of **O** – ther uses
Geology 11 What if all gemstones were illegal to use. Write down at least 10 consequences.	**Geology 12** Construct a model of a piece of jewellery using: construction paper noodles string

Mary Jones and her Bible

Mary Jones was a girl who lived in Wales more than 200 years ago. If you look at a map of Great Britain you will find Wales next to England. In those days the people of Wales didn't speak English. They only spoke their own language, Welsh.

Mary started school when she was nine years old and soon became a very good reader. At school there was a big Bible written in Welsh. One day she was asked by the teacher to read aloud from the Bible. Mary was excited. She loved the Bible stories and was now able to read them for herself.

She told her parents about her opportunity to read the Bible at school, but at the same time felt sad that there was no Bible at home. Her family was poor and could not afford to buy a Bible.

Mary decided that she would save up to buy one, no matter how long it took. Mary worked hard. She collected fire-wood and helped her neighbours with cleaning and baby-sitting. Every job earned her a few pennies. Finally, after six years she had enough money.

Mary was fifteen now. She knew of a man who sold Bibles in a village 40 kilometres away. Mary decided to go to see this man.
"How will you get there?" asked her parents.
"I'll walk," said Mary. "I know I can walk that far."
"We will pray that God will keep you safe," said her parents.

Mary had only one pair of shoes. She knew that she couldn't afford them to wear out, so she decided to walk barefoot. It was rough and stony. Mary's feet became sore but she pressed on. Finally she arrived at the village.
"Can you direct me to the house of Mr. Charles?" she asked a friendly minister. The minister took her to the home of Mr. Charles.

"I'm so sorry, Mary," said Mr. Charles, "but I only have one Bible left and I have already promised that to a friend."
Mary started to cry. Mr. Charles felt sad too.

"Mary," he said, "I will let you have the Bible. My friend can have an English Bible while I am waiting to get some more."
Mary's tearful face quickly changed to a happy one.

The next day she started the long journey home with her Bible under her arm. After some days she arrived home. How happy her parents were to see her. God had protected Mary and helped her to get the Bible. Now they too could read the Bible.

Meanwhile Mr. Charles thought of Mary's eagerness to own a Bible.

"I'm sure there are others who would like to have their own Bibles as well," he thought. Mr. Charles went to London, and with a friend started working to produce Bibles for the

many people who needed them. This involved translating and printing. It was his aim that one day there would be enough Bibles for the whole world. The work started by Mr. Charles in 1804 later became known as the British and Foreign Bible Society.

Activities – Mary Jones and her Bible

PART A

1. What language did Mary speak?
2. Where is Wales?
3. How did Mary save enough money for a Bible?
4. How far did she have to walk to get the Bible?
5. Why did she walk barefoot?
6. Why was she disappointed when she got to the village?
7. What did Mr. Charles do for Mary?
8. What work did Mr. Charles start in 1804?

PART B - God is truth

Read

When we know the truth, then we must not turn away from it, even when things get difficult. God shows us His truth in His word, the Bible. Having the word of God in our hearts helps us to stay with the truth.

Look up the Bible verses and write sentences to explain how God's word can help us when we are:

angry.....James 1:19-20
sad.....…2 Corinthians 1:3-5
afraid.....Psalm 27:1

Rocks 1
What are rocks made of?

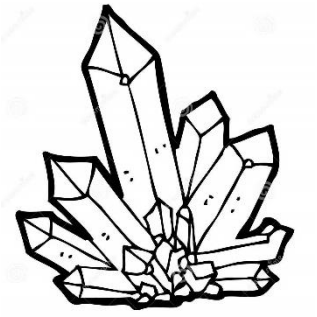
Student Activities

Rocks are made up of different minerals. Minerals are part of God's creation. They are found in the ground. You will know some of them: silver, gold, iron, aluminium and silicon. Silicon is the mineral that sand is made from.

Some rocks are made from crystals. Crystals form when the mineral particles are arranged in repeated patterns. The particles can be coloured. Gemstones are made of coloured crystals. These are very valuable.

To see them sparkle and shine they have to be cut and polished. Here are some examples of gemstones. You may have even seen one in someone's jewellery… diamonds (clear), rubies (red), sapphires (blue), emeralds (green).

1. What are rocks made from?
2. Draw a crystal.
3. Draw some gemstones, label and colour them the right colour.



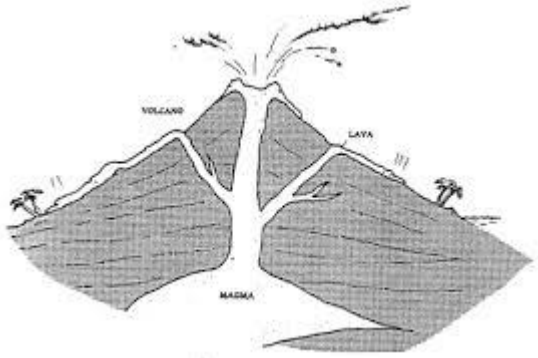
crystals

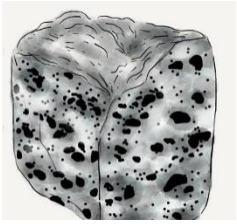
Rocks 2
Types of rocks: Igneous

There are three types of rocks: Igneous, Metamorphic and Sedimentary.

Igneous Rocks
This type of rock is formed from the lava of a volcano. Deep inside the earth, rocks are melted and become magma. When magma comes out of a volcano it is called lava. When the lava cools down, it forms igneous rock. If the lava cools quickly, the rocks will look smooth and shiny. But if the lava cools slowly, the rocks will have plenty of texture, gas bubbles, tiny holes and spaces. These rocks are hard.

Examples: granite, basalt





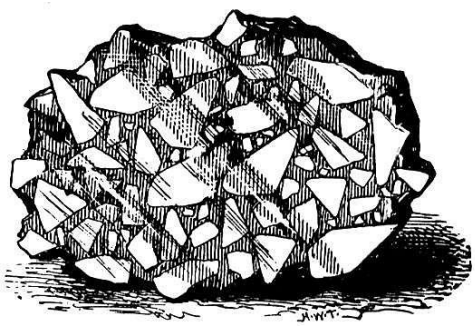
1. How are igneous rocks formed?
2. Why are there often holes in igneous rocks?

Rocks 3
Types of rocks: Metamorphic

There are three types of rocks: Igneous, Metamorphic and Sedimentary

Metamorphic Rocks
These rocks form beneath the surface of the earth. They form from intense heat and pressure. They have ribbon-like layers. Some of them have shiny crystals on their surface. The have been changed by the heat and pressure, sometimes splitting into many layers that look like a stack of pancakes with different mineral grains running through the rock. These rocks are hard.

Examples: quartz, marble



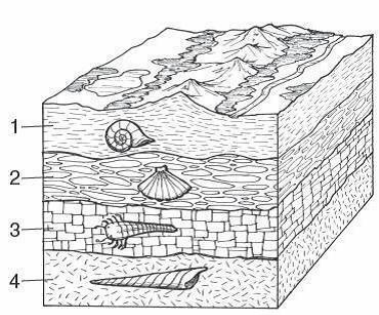
1. What are quartz and marble made from?
2. How are metamorphic rocks formed?
3. Find out how marble is used.

Rocks 4
Types of rocks: Sedimentary

There are three types of rocks: Igneous, Metamorphic and Sedimentary

Sedimentary Rocks
These rocks form beneath the surface of the earth. They form from the intense heat and pressure. They have ribbon-like layers. Some of them have shiny crystals on their surface. The have been changed by the heat and pressure, sometimes splitting into many layers that look like a stack of pancakes with different mineral grains running through the rock. These rocks are hard. Fossils are often found in sedimentary rocks.

Examples:
Sandstone (a rock made of sand cemented together)
Shale (compressed hard mud)
Limestone (made from layers of sediment which is soft when in water but becomes hard when out of water)

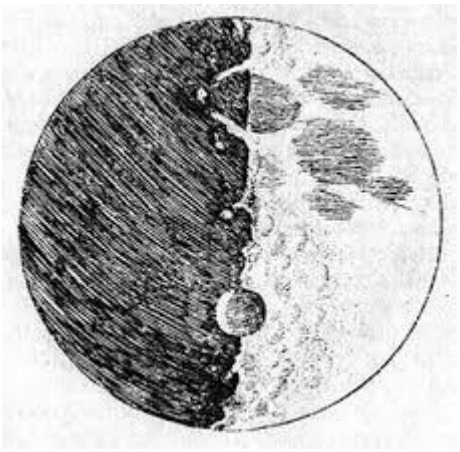


1. How are sedimentary rocks formed?
2. What do sedimentary rocks look like?

Rocks 5
Meteorites

Meteorites are chunks of rock that fly onto the earth from space. Most meteorites are burned up by our atmosphere, but some still make it through as small rocks.

Craters on the moon
If you look at the moon you will see darker areas. Those are actually huge craters from the impact of meteors. The moon does not have an atmosphere to protect it like the earth does. Large meteors can do a lot of damaged because of the fast speed at which they travel through space.



1. How were the craters on the moon made?
2. Why doesn't the earth get hit by large meteors?

Rocks 6
The age of rocks

It is not always possible to tell how old rocks are because no one was there to see certain rocks formed.

When there is a volcanic eruption, rocks called “igneous rocks” will form from the lava when it cools. If we see a volcanic eruption, we can go and look at the rocks formed around the volcano when they cool. We know how old these rocks are because we have just seen the volcano erupt. But that doesn’t mean we know the age of every rock in the world.

Many scientists think that rock layers took millions of years to be laid down. But because the scientists were not there to see the formation of the layers they can only guess.

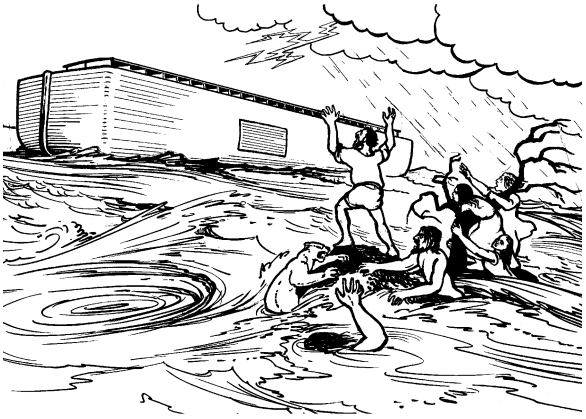
We know from the Bible that many layers of mud were laid down very quickly during the Great Flood. Many sedimentary rocks were formed at this time, about 4,000 years ago. Sedimentary rocks are rocks that have formed through layers of mud or dirt. Many of these rock layers contain fossils because during the Great Flood many animals died and were buried quickly in the mud layers. These rocks did not take millions of years to form. So when you hear someone say that a rock is millions of years old, remember that this cannot be proven. According to the Bible the earth is thousands of years old, not millions.

1. When did most fossils form?
2. What do we find them in?

Rocks 7
Sediment becomes hard rock

The earth's crust moved a lot during the Great Flood. Volcanoes were exploding. Fountains of water were gushing out of the earth. Rocks bumped into each other and broke into smaller pieces. All this made a lot of muddy water. The mud was carried along quickly by strong Flood currents and settled as sediment when the Flood waters slowed down. The sediments settled in layers.

Sediments become hard rock when they are squeezed together by pressure. During the Flood, the weight of each new layer of sediment increased the pressure and squeezed the sediments together. They were cemented together by silica and limestone which dissolved in the water during the Great Flood.



1. What is the "earth's crust"?
2. What happened to the mud and rocks during the Great Flood?
3. Which two minerals can act as cement?

Rocks 8
Limestone Caves

Limestone caves are found in limestone rock. Many of these caves have large rooms are exciting places to explore. Rivers and streams sometimes run through passage ways. Stalactites hang from the ceiling. (They hold ‘tight’ to the ceiling.) Stalagmites rise up from the cave floor. They often look like cones. They are formed by dripping water that is loaded with dissolved limestone. The limestone hardens and forms beautiful and colourful shapes. Chalk is made from limestone.

1. Draw a picture of a limestone cave and label the stalactites and stalagmites. Use colours: yellow, orange, brown, white and grey.
2. Look at the picture below. What do we call it when a stalactite and stalagmite join?
3. Write three facts about limestone.