ACTIVITY 6.1 Minerals

1. Determine if each of the following statements is true or false.
   - a. Minerals may be solid or liquid.
   - b. Minerals are inorganic.
   - c. Minerals are not made of crystals.
   - d. Minerals are all rocks.
   - e. Quartz is made of silicon dioxide.

2. List five common minerals found on Earth.

3. What mineral is found in the following items?
   - a. glass __________________________
   - b. iron ore __________________________
   - c. aluminium ore __________________________

4. Use Mohs hardness scale to identify each of the following:
   - a. the softest mineral __________________________
   - b. the hardest mineral __________________________
   - c. the mineral with a hardness of 4 __________________________
   - d. the minerals that are harder than topaz __________________________

5. Write out the mineral property that:
   - a. measures the shape of the crystal __________________________
   - b. is measured by scratching __________________________
   - c. is described as grey, blue, silver, etc. __________________________
   - d. is the same as density __________________________

Mohs hardness scale

<table>
<thead>
<tr>
<th>Hardness</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Talc</td>
</tr>
<tr>
<td>2</td>
<td>Gypsum</td>
</tr>
<tr>
<td>3</td>
<td>Calcite</td>
</tr>
<tr>
<td>4</td>
<td>Fluorite</td>
</tr>
<tr>
<td>5</td>
<td>Apatite</td>
</tr>
<tr>
<td>6</td>
<td>Feldspar</td>
</tr>
<tr>
<td>7</td>
<td>Quartz</td>
</tr>
<tr>
<td>8</td>
<td>Topaz</td>
</tr>
<tr>
<td>9</td>
<td>Corundum</td>
</tr>
<tr>
<td>10</td>
<td>Diamond</td>
</tr>
</tbody>
</table>
6 Identify the chemical that makes up quartz, and explain whether it is an element or a compound.

7 An unknown mineral scratches apatite but not ruby. Identify the property being measured here and give the approximate value of this on Moh’s hardness scale.

8 Granite is a mixture of crystals of quartz and feldspar, but other minerals, such as micas, pyroxene and amphiboles, may also be found in it in lesser amounts. Is granite a rock or a mineral? Explain.

9 Complete the table below using the following words/phrases.

<table>
<thead>
<tr>
<th>Property</th>
<th>Meaning</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inorganic</td>
<td>Sand is a non-living compound</td>
</tr>
<tr>
<td></td>
<td>Naturally occurring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crystalline</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Is found in nature</td>
<td>Shells are made of calcium carbonate</td>
</tr>
<tr>
<td></td>
<td>A non-living substance, not formed by living processes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Has a crystal structure</td>
<td>The atoms composing the solid have an orderly and repeated pattern, such as cubic</td>
</tr>
<tr>
<td></td>
<td>The chemical composition is fixed, it is a pure substance</td>
<td></td>
</tr>
</tbody>
</table>

ACTIVITY 6.2 Internet activity: Birthstones

1 Name the gemstones shown in Figure 6.1

   a ______________________ c ______________________

   b ______________________ d ______________________

2 Use a dictionary or online dictionary to write out an appropriate definition in your own words of the following.

   a Gemstone

   b Mineral

3 Use the Internet to find information on birthstones, such as by month, by astrological sign and spiritual/mystical properties. The following search terms may be useful: ‘crystal realm birthstones’, ‘galleries birthstones’, ‘thinkquest birthstones’.

4 Write out your birth date and birth month.
5 Examine the lists of birthstones on the Internet pages, and write out your birthstone by:
   a month (modern) ________________________________
   b the zodiac (astrological) _______________________

6 Complete the table below for your month of birth, and the surrounding months. For example, if your birthday is in April, then complete the table for March, April and May.

<table>
<thead>
<tr>
<th>Month 1</th>
<th>Your month</th>
<th>Month 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birthstone by month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birthstone by zodiac:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spiritual/mystical properties by month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical properties (colour, hardness, density, element/compound)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7 Compare the physical properties with the spiritual/magical properties. Identify the more scientific property, and explain the difference between these two.

8 Find your mineral birthstone (they often have more than one form), so choose one mineral form. Using an A4 sheet of paper, make a poster on your mineral birthstone with the pictures you found from the Internet. The following must be present on the poster:
   a Heading
   b Pictures of birthstone mineral and associated jewellery
   c The chemical formula of the compound that the mineral is made from
   d Physical properties (includes colour, hardness and density or specific gravity)
   e Spiritual/magical properties
   f Historical origins

ACTIVITY 6.3 Mining resources

Many issues have to be looked at from all different sides before you can decide whether they benefit society or not. The diagram below shows some of the points that should be addressed.

In this activity you will look at issues surrounding mining our precious resources.

1 Divide into teams of five.
2 Photocopy and cut out the cards on the next page.
3 Assign each team member one of the cards. Team members complete this activity by putting forward their own opinions as well as carrying out research on the Internet.
4 List the benefits of the mining industry.

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SAMPLE
The rock cycle

Examine Figure 6.25 of the rock cycle in Unit 6.2 of the textbook and answer the following questions.

1. Determine whether each of the following statements is true or false. TRUE FALSE
   a. Molten rock that solidifies is called igneous rock.
   b. Rocks on the Earth’s surface cannot be recycled.
   c. After rock is uplifted and exposed, it forms metamorphic rock.
   d. The wind and rain can both cause erosion.

2. List the three main types of rock.

3. Complete the following passage:
   The rock cycle shows that the _____________________________ of rock formation is cyclical. The Earth uses older rock to make ____________________________, just like aluminium cans being recycled. Weathering and erosion at the Earth’s surface can ____________________________ down rocks into small particles. The ____________________________ are moved about and deposited as sediments, eventually cementing together into ____________________________ rock. Burial, with rising pressure and temperature, can alter any rock to form what is called ____________________________ rock. The hot molten ____________________________ inside the Earth will cool to form ____________________________ rock.

4. Outline what occurs during lithification.

5. Explain how magma forms different types of igneous rock.

Initial Attempts
What work has been attempted or carried out so far? This may have been done in the past or currently.

Alternatives
What are the alternatives to this?

Obstacles
Discuss the current problems stopping the go-ahead. These may be technical, economic or societal problems.

Yes
The case for going ahead with mining resources. Discuss the gains and benefits that may occur with a go-ahead.

No
The case for not going ahead with mining resources. Discuss the benefits of not going ahead.

Skills
Processing and analysing data and information

Activity 6.4
The rock cycle

List the drawbacks of the mining industry.

Explain why mining is a big issue in Australia.

List the benefits of group work.
ACTIVITY 6.5 Sedimentary rock

1. Determine whether each of the following statements is true or false.

   a. Sedimentary rock forms from a molten state.
   b. Sandstone is an example of sedimentary rock.
   c. Fossils will occur abundantly in all types of rock.
   d. Sedimentary rock layers are only ever found in horizontal layers.

   True | False
   --- | ---
   | |
   | |
   | |
   | |

2. List things that cause the break-up of the Earth’s crust into small sediments.

   ____________________________
   ____________________________
   ____________________________

3. Why are there many different types of sedimentary rocks but fewer types of igneous rock?

   ____________________________
   ____________________________
   ____________________________

Extension

11. Which parts of the rock cycle could occur on the Moon and which could not? Research what Moon rocks are made of. Describe how they formed and whether or not they have changed over time.
4. Complete the partial rock cycle diagram below.

ACTIVITY 6.6 Modelling rocks with food

Modelling conglomerate rock using chocolate crackles

What you need
- 1 tablespoon icing sugar
- 1 tablespoon shredded coconut
- 1 teaspoon cocoa
- ½ cup of rice bubbles
- ¼ cup of corn flakes
- ¼ cup of melted copha butter

What to do
1. Pour the dry ingredients (icing sugar, coconut, cocoa, rice bubbles, corn flakes) into a mixing bowl.
2. Pour in melted copha butter.
3. Stir well until the mixture is evenly combined.
4. Pour into the patty cakes.
5. Refrigerate until set.

How is your chocolate crakle like a conglomerate rock?

5. Explain how sedimentary rock turns into metamorphic rock.

6. Identify the type of rock that fossils usually form in and explain how fossils form.
CHAPTER 6
THE CHANGING EARTH

Modelling igneous rock using toffee

What you need
- 3 cups of sugar
- 1 cup of water
- 2 spoons of molasses
- ¼ cup of white vinegar

What to do
1. Pour the water and vinegar into a saucepan and heat on a hotplate.
2. Add the sugar and molasses to the solution as it warms up.
3. Stir on low heat until the sugar crystals dissolve.
4. Increase high heat and boil without stirring for about 12 minutes.
5. Remove the saucepan from the heat slowly, allowing the bubbles to disappear, and pour the hot toffee into patty pans.
6. Allow to set at room temperature.

How is your toffee like igneous rock?

ACTIVITY 6.7
Review: The changing Earth

1. Which scientific area is the study of rocks and minerals a part of?
   A. physics
   B. chemistry
   C. biology
   D. geology

2. Which of the following is a mineral?
   A. water
   B. rust on metal
   C. paper
   D. amethyst

3. In general, what is a mineral composed of?
   A. a compound
   B. one kind of atom
   C. two kinds of atom
   D. a mixture

4. What is the name of the Earth’s outermost solid layer?
   A. crust
   B. mantle
   C. outer core
   D. inner core

5. What is the name of the molten rock material inside the Earth?
   A. crust
   B. mantle
   C. lava
   D. magma

6. What is the name of the process by which rock is broken down into small pieces?
   A. lithification
   B. melting
   C. weathering
   D. erosion

7. The lustre of a mineral could be described using what words?
   A. metallic
   B. green
   C. cubic
   D. soft

8. What is the most common mineral in the Earth’s crust?
   A. iron
   B. quartz
   C. gold
   D. sandstone

9. Which of the following is an example of a sedimentary rock?
   A. sandstone
   B. granite
   C. marble
   D. oil

10. Which of the following is an example of an igneous rock?
    A. sandstone
    B. granite
    C. marble
    D. coal

11. Write each word in the list next to its matching statement in the table on the next page.
    sedimentary metamorphic crystal shape weathering igneous

Modelling igneous rock using toffee

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5. Remove the saucepan from the heat slowly, allowing the bubbles to disappear, and pour the hot toffee into patty pans.
6. Allow to set at room temperature.

How is your toffee like igneous rock?
Word | Statement
--- | ---
Rock formed from molten material
A mineral property expressed as cubic, rhombic, tetrahedral
The breaking down of rocks into smaller particles by wind and rain
Rock that has been changed by heat and/or pressure
Rock that is made from layers of particles compacted together

12 Write in the word(s) needed to complete each sentence:

a All igneous rock starts out in the ________________ state.

b The ________________ is a diagram showing how rocks can change.

c The Earth’s ________________ is responsible for the formation of sedimentary rock.

d Sedimentary rock can change into metamorphic rock when it is subjected to ________________.

13 Use Moh’s hardness scale to answer the questions below.

<table>
<thead>
<tr>
<th>Moh’s hardness scale</th>
<th>1 Talc</th>
<th>2 Gypsum</th>
<th>3 Calcite</th>
<th>4 Fluorite</th>
<th>5 Apatite</th>
<th>6 Orthoclase</th>
<th>7 Quartz</th>
<th>8 Topaz</th>
<th>9 Corundum (ruby)</th>
<th>10 Diamond</th>
</tr>
</thead>
</table>

da Which is the hardest mineral?

______________________________

b Which mineral has a hardness of 4?

______________________________

c What mineral property is measured by this scale?

______________________________

d Which mineral will scratch calcite but not apatite?

______________________________

e What is the hardness of wood if it can be scratched by fluorite and apatite but not by calcite?

______________________________

14 Explain why some igneous rock is made up of large crystals but other types have small crystals.

______________________________

______________________________