

Rationale:

The students will understand how metamorphic, sedimentary and igneous rocks are formed by different processes over thousands or millions of years, including the influences of different energies and forces (e.g. exposure to heat and pressure in the formation of metamorphic rock). They will observe, draw and describe the different physical characteristics of rocks including variations in grain size, minerals and colour. They will also ascertain whether the chemical composition of rocks includes calcium carbonate through testing for reactions to vinegar. Investigations will be conducted in pairs while ensuring that proper safety guidelines are followed.

The students will be engaged by activities suited for various learning preferences, with new information processed with the use of visual sources (observing videos of magma and lava) and kinaesthetic-based investigations (handling different rock samples). Students will also enjoy working in pairs and recording the different properties of rocks by making drawings and testing for chemical reactions.

Learning Outcomes:

Cognitive:

Students will:-

1. Understand how igneous, metamorphic and sedimentary rocks are formed, including the timescales involved in their formation.
2. Recognise different types of rock based on observable physical and chemical characteristics.
3. Comprehend that rocks consist of different types of minerals and crystals.
4. Realise the role of energy and forces in the formation of rocks.

Affective:

Students will:-

5. Be excited to test the chemical properties of rocks.
6. Enjoy working in pairs.
7. Appreciate watching videos.
8. Enjoy drawing the characteristics of different types of rock.

Procedural/Skill:

Students will:-

9. Improve their use of scientific equipment in a safe manner.
10. Develop their observational skills through studying the characteristics of rocks.
11. Refine their communication skills through discussions with the teacher and fellow students.
12. Advance their drawing skills in sketching different types of rock.

Resources:

Activity Sheets, computer, projector, magnifier lamps, pipettes, vinegar, jaws, gloves, safety glasses, lab coats and rock samples including limestone, sandstone, mudstone, shale, basalt and marble.

Suggested YouTube clips:

1. 'Exploring Magma | Curiosity: Volcano Time Bomb'
<https://www.youtube.com/watch?v=KtexwZeUk7w> - (animation of magma underground).
2. 'Volcano lava'
<https://www.youtube.com/watch?v=xExdEXOaA9A> - (video of lava flow from a volcano).

For related teachers' notes and activity sheets, please go to www.kronosauruskorner.com.

Procedure:

Engagement:

The teacher will place a seashell into a jar filled with vinegar and ask the students for their observations (students must take notes during this lesson). The teacher states that acetic acid in the vinegar reacts with the mineral calcium carbonate in the shell to form carbon dioxide bubbles. The teacher will place limestone in a jar filled with vinegar. The students will be asked why bubbles are produced (answer: calcium carbonate in the limestone reacts with acetic acid). The teacher will state that limestone is a sedimentary rock formed by grains made of seashells. The students will be asked where limestone is formed (answer: it is deposited on ancient seafloors). The teacher will explain that other sedimentary rocks like sandstone and mudstone formed on the bottom of lakes, streams and beaches over thousands or millions of years.

Lesson steps:

1. The teacher will state that rocks have distinct observable features, including sedimentary rocks. A piece of sandstone will be shown to the class, with the students noting sand-sized grains of rock and quartz minerals. A piece of mudstone will be shown, with the students noting smaller grains of clay minerals and mud (these will be too small to see). The teacher will show a layer of shale and ask how it was formed (answer: mudstone was compacted by other layers of sediment). The teacher will display different fossils and explain that they are preserved in sedimentary rocks.
2. The students will watch YouTube clips 1 and 2 featuring magma and lava. The teacher will state that igneous rocks form when hot liquid magma cools to become solid rock. They will explain that large crystals form in igneous rocks when magma cools slowly and small crystals form in igneous rocks when lava cools quickly. The teacher will show a piece of basalt and asks why it contains small holes (answer: gas bubbles were trapped inside lava as it cooled).
3. The students will be asked for the meaning of the word morph (answer: to change). The teacher will state that metamorphic rocks are sedimentary and igneous rocks that have changed underground when exposed to heat and pressure. A piece of marble is shown to the class with the teacher explaining that it was once limestone but has changed chemically and physically. The teacher will state that metamorphic rock is usually harder than other types of rock and can sometimes have different bands of colour, swirls or veins.
4. Following the directions for Task 1 on their Activity Sheets, pairs of students will identify different types of rocks at several work stations. They must observe, draw and describe their physical features by looking through magnifier lamps or microscopes. In completing Task 2, students will pipette droplets of vinegar on samples to test for potential chemical reactions to calcium carbonate (they must use safety glasses and gloves).

Conclusion:

5. The students will be asked to hand in their work and clean up any mess. They will be asked if they found reactions between the vinegar and any of the samples. The teacher will recap the major points from today's lesson, including key messages on the formation and features of different types of rock.

Homework:

Students who haven't completed the Activity Sheet must finish it for homework.

Name: _____

Task 1. Pairs will identify several types of rocks. They must observe, draw and describe their physical features, such as grain size, colour, holes and crystals by looking through magnifier lamps or microscopes.

--	--	--

Type of rock: _____

Type of rock: _____

Type of rock: _____

Features: _____

Features: _____

Features: _____

--	--	--

Type of rock: _____

Type of rock: _____

Type of rock: _____

Features: _____

Features: _____

Features: _____

Task 2. Pipette droplets of vinegar on the rocks to test for chemical reactions. Which rocks reacted and why?
