Chapter Menu

How are minerals and rocks formed, identified, classified, and used?

Get Ready

What do you think?

Before you begin, decide if you agree or disagree with each of these statements. As you view this presentation, see if you change your mind about any of the statements.

Get Ready

Do you agree or disagree?

1. Minerals generally are identified by observing their color.
2. Minerals are made of crystals.
3. Once a rock forms, it lasts forever.
4. All rocks form when melted rock cools and changes into a solid.

Get Ready

Do you agree or disagree?

5. All rock types are related through the rock cycle.

6. Rocks move at a slow and constant rate through the rock cycle.

Lesson 1

Minerals

Key Concepts

- How do minerals form?
- What properties can be used to identify minerals?
- What are some uses of minerals in everyday life?

Lesson 1

Minerals

Vocabulary

- mineral
- crystal structure
- crystallization
- streak
- luster
- cleavage
- fracture
- ore

What is a mineral?

- A **mineral** is a naturally occurring, inorganic solid that has a crystal structure and a definite chemical composition.
- The atoms in a mineral are arranged in an orderly, repeating pattern called a **crystal structure**.

What is a mineral? (cont.)

- **Crystallization** is the process by which atoms form a solid with an orderly, repeating pattern.
- When melted rock material—called magma—cools, some of the atoms join together and form solid crystals.
- When water cools or evaporates, the particles of the dissolved substances come together again in the solution and crystallize.

What is a mineral? (cont.)

Key Concept Check

How do minerals form?

Mineral Identification

Every mineral has a unique set of physical properties, or characteristics.

Science Use v. Common Use

property

Science Use a quality or characteristic of an individual or thing

Common Use something owned or possessed

Mineral Identification (cont.)

- If two mineral samples have the same volume, the one with greater mass has greater density.
- The hardness of a mineral is measured by observing how easily it is scratched or how easily it scratches something else.
- The Mohs' hardness scale ranks hardness from 1 to 10, 10 being the hardest.

Mohs' Hardness Scale	
Hardness	**Mineral or Ordinary Object**
10	diamond
9	corundum
8	topaz
7	quartz
6.5	streak plate
6	feldspar
5.5	glass, steel knife blade
5	apatite
4.5	wire nail
4	fluorite
3.5	copper wire or copper coin (penny)
3	calcite
2.5	fingernail
2	gypsum
1	talc

Mineral Identification (cont.)

- The color of a mineral's powder is called its **streak**.
- **Luster** describes the way that a mineral's surface reflects light.
- If a mineral breaks along smooth, flat surfaces, it displays **cleavage**.
- A mineral that breaks along rough or irregular surfaces displays **fracture**.

Mineral Identification (cont.)

A mineral's atomic structure determines its crystal shape.

KEY CONCEPT CHECK

What are the common properties used to identify minerals?

Mineral Identification (cont.)

- Some minerals have unusual properties, such as a salty taste or fluorescence, that make them easy to identify.
- Toothpaste, cosmetics, and table salt are just a few everyday items that contain minerals.
- Deposits of metallic or non-metallic minerals that can be produced at a profit are called **ores**.

Mineral Identification (cont.)

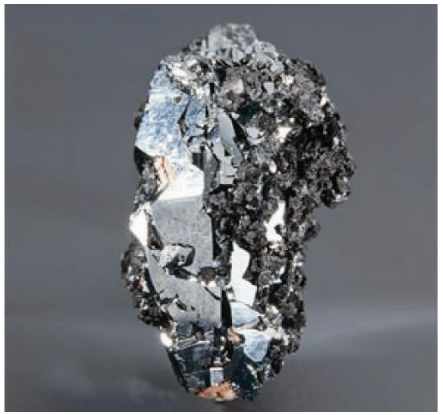
Some minerals, such as gemstones, are valuable because of their appearance.

Key Concept Check

How are minerals used in everyday life?

Summary

- Hardness varies from mineral to mineral. Hardness can be used to help identify a mineral.
- All minerals have specific crystal shapes that can be used to help identify them.



DEA/A.RIZZI/Getty Images

- Minerals are present in everyday items such as toothpaste, makeup, and household items.

Lesson Review

What term is used to describe the color of mineral's powder?

A. fracture

B. cleavage

C. luster

D. streak

Lesson Review

What are deposits of minerals that can be produced at a profit called?

A. minerals

B. ores

C. crystals

D. cleavage

Lesson Review

What term describes the process by which a solid with an orderly, repeating pattern of atoms forms?

A. crystal structure

B. crystallization

C. evaporation

D. none of these

Lesson Review

What do you think NOW?

Do you agree or disagree?

1. Minerals generally are identified by observing their color.
2. Minerals are made of crystals.

Lesson 2

Rocks

Key Concepts

- What characteristics can be used to classify rocks?
- How do different types of rocks form?
- What are some uses of rocks in everyday life?

Lesson 2

Rocks

Vocabulary

- rock
- grain
- magma
- lava
- texture
- sediment
- lithification
- foliation

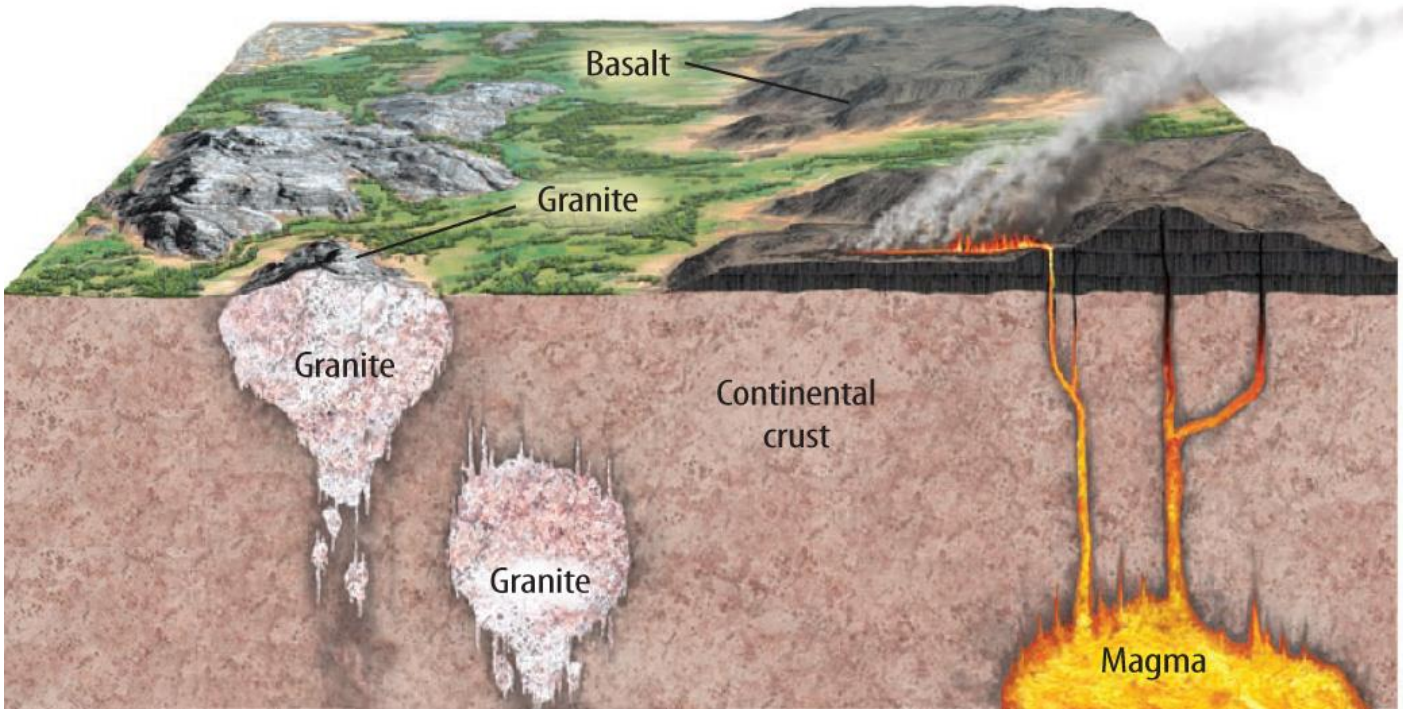
What is a rock?

- A **rock** is a naturally occurring solid mixture composed of minerals, smaller rock fragments, organic matter, or glass.
- The individual particles in rocks are called **grains**.

Classifying Rocks

- The three major types of rocks are igneous, metamorphic, and sedimentary.
- Molten rock is called **magma** when it is inside Earth.
- Molten rock that erupts onto Earth's surface is called **lava**.
- As magma or lava cools, mineral crystals form and become the grains of a new igneous rock.

Classifying Rocks (cont.)



Classifying Rocks (cont.)

- For rocks, **texture** refers to grain size and how the grains are arranged.
- Geologists describe the texture of igneous rocks with small crystals as fine-grained.
- Geologists describe the texture of igneous rocks with large crystals as coarse-grained.

Classifying Rocks (cont.)

Key Concept Check

What characteristics are used to classify igneous rocks?

Classifying Rocks (cont.)

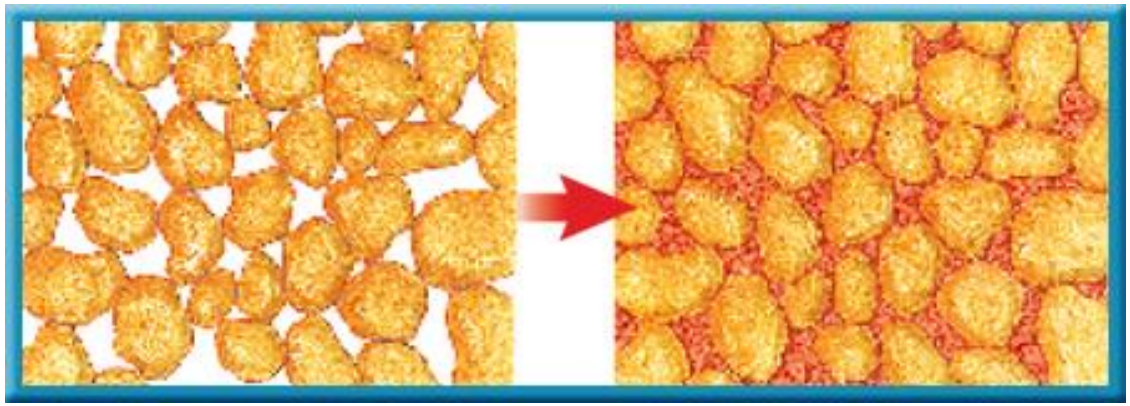
- Sedimentary rock forms from sediment that has been compacted and cemented together.
- Rock and mineral fragments that are loose or suspended in water are called **sediment**.
- Sediment is the source material for sedimentary rocks.

Classifying Rocks (cont.)

Sediments become compacted as additional layers are deposited.

Classifying Rocks (cont.)

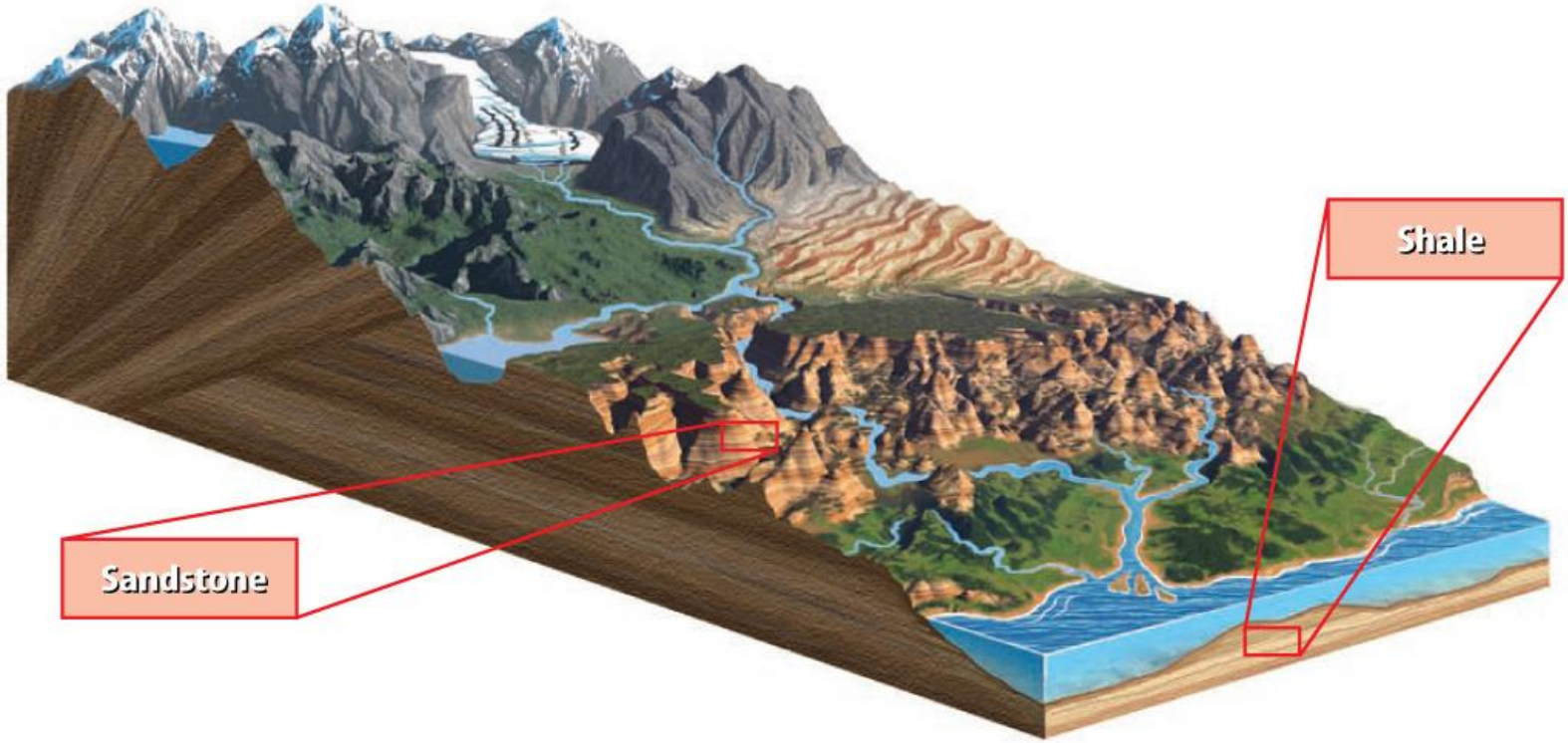
Dissolved minerals cement the grains together and form sedimentary rocks.



Classifying Rocks (cont.)

- **Lithification** is the process through which sediment turns into rock.
- Usually sediment is formed through weathering by water, ice, or wind.
- It is eventually deposited in low areas called basins.

Environments of Sedimentary Rock Formation



Classifying Rocks (cont.)

- Metamorphic rocks form when parent rocks are squeezed, heated, or exposed to hot fluids.
- The textures of most metamorphic rocks result from increases in temperature and pressure.

Classifying Rocks (cont.)

Key Concept Check

How do metamorphic rocks form?

Classifying Rocks (cont.)

- Minerals with flat shapes, such as mica, have a texture called foliation.
- **Foliation** results when uneven pressures cause flat minerals to line up, giving the rock a layered appearance.

Rocks in Everyday Life

- Rocks are abundant natural resources that are used in many ways based on their physical characteristics.
- The igneous rock pumice is soft but contains small pieces of hard glass, which makes it useful for polishing and cleaning.
- Natural layering makes sedimentary rock a high-quality building stone.

Rocks in Everyday Life (cont.)

Some metamorphic rock, such as marble, is soft enough to carve and often is used for making detailed sculptures.

Key Concept Check

What are some everyday uses for rocks?

Summary

- Interlocking crystals of different sizes are common in igneous rocks.
- The individual grains that form sedimentary rocks can be mineral grains or fragments of other rocks.
- Increases in temperature and pressure cause minerals to change in size and shape.

Lesson Review

What term refers to molten rock inside the earth?

A. lava

B. grains

C. magma

D. sediment

Lesson Review

Which term describes the process through which sediment turns into rock?

A. lithification

B. foliation

C. both of these

D. none of these

Lesson Review

What types of rocks form when parent rocks are squeezed, heated, or exposed to hot fluids?

A. sedimentary

B. metamorphic

C. igneous

D. magma

Lesson Review

What do you think NOW?

Do you agree or disagree?

3. Once a rock forms, it lasts forever.
4. All rocks form when melted rock cools and changes into a solid.

Lesson 3

The Rock Cycle

Key Concepts

- How do surface processes contribute to the rock cycle?
- How is the rock cycle related to plate tectonics?

Lesson 3

The Rock Cycle

Vocabulary

- rock cycle
- extrusive rock
- intrusive rock
- uplift
- deposition

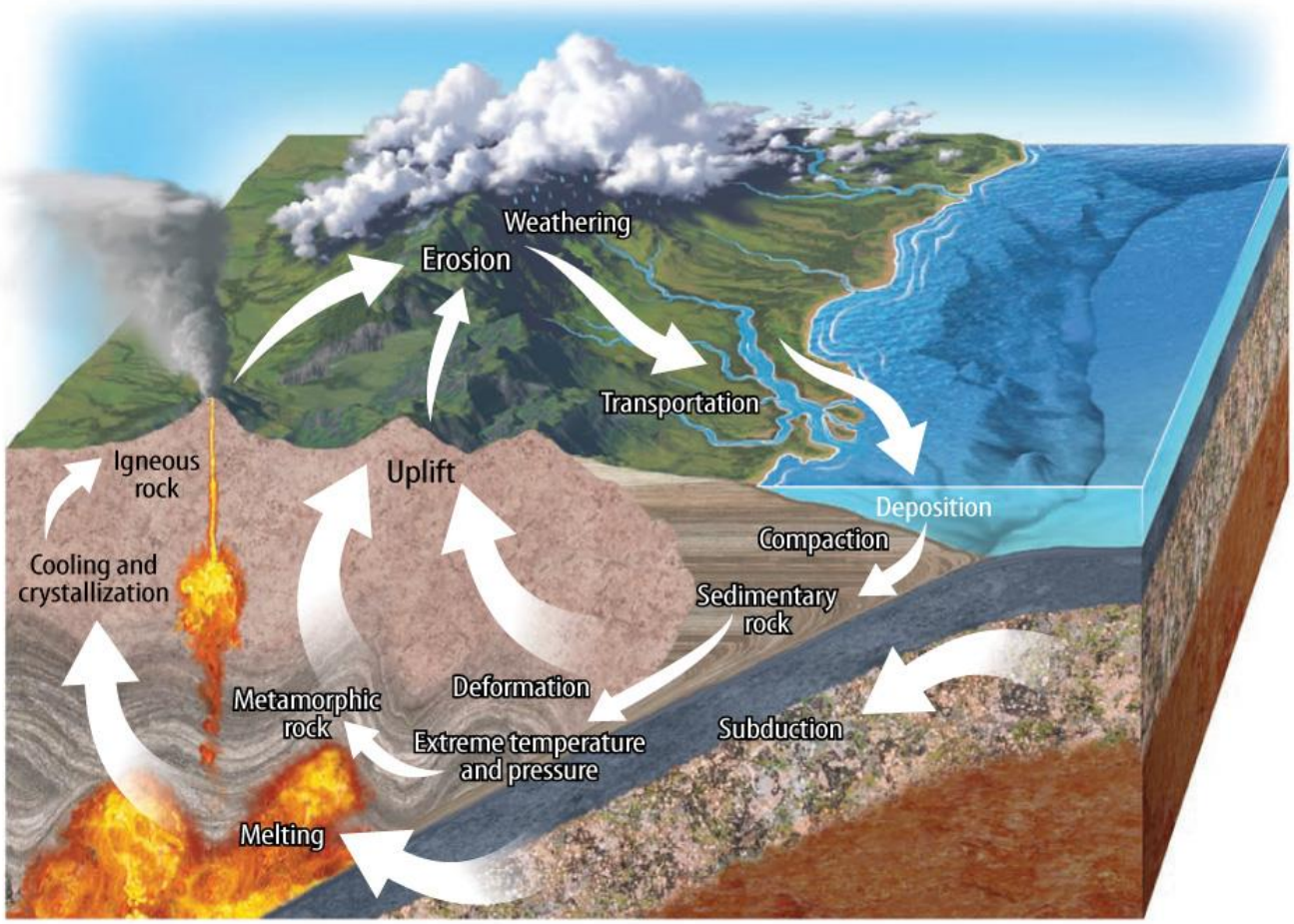
What is the rock cycle?

- The series of processes that continually change one rock type into another is called the **rock cycle**.
- As materials move through the rock cycle, they can take the form of igneous rocks, sedimentary rocks, or metamorphic rocks.

What is the rock cycle? (cont.)

- At times, the material might not be rock at all but instead, sediment, magma, or lava.
- Some processes in the rock cycle take place on Earth's surface, and others take place deep beneath Earth's surface.

What is the rock cycle? (cont.)



Get Animated

Processes of the Rock Cycle

- When lava erupts and cools and crystallizes on Earth's surface, the igneous rock that forms is called **extrusive rock**.
- When magma cools and crystallizes inside Earth, the igneous rock that forms is called **intrusive rock**.

Processes of the Rock Cycle (cont.)

SCIENCE USE V. COMMON USE

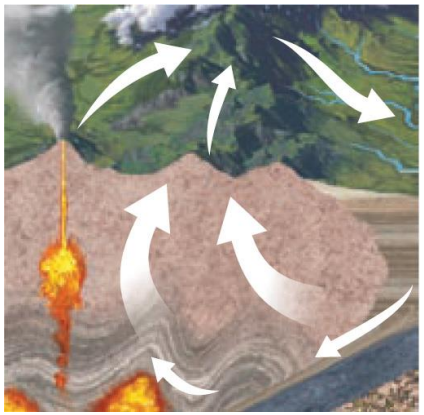
intrusive

Science Use igneous rock that forms as a result of injecting magma into an existing rock body

Common Use the condition of being not welcome or invited

Processes of the Rock Cycle (cont.)

- **Uplift** is the process that moves large amounts of rock up to Earth's surface and to higher elevations.



- The process of laying down sediment in a new location is called **deposition**.

Processes of the Rock Cycle (cont.)

Key Concept Check

How are surface processes involved in the rock cycle?

Processes of the Rock Cycle (cont.)

- In a process called compaction, the weight of overlying layers of sediment pushes the grains of the bottom layers closer together.

- Rocks subjected to high temperatures and pressure undergo a change known as metamorphism.

Processes of the Rock Cycle (cont.)

WORD ORIGIN

metamorphism

from Greek *metamorphoun*, means “to transform”

Processes of the Rock Cycle (cont.)

- The theory of plate tectonics states that Earth's surface is broken into rigid plates.
- These plates move as a result of Earth's internal thermal energy and convection of the mantle.
- The theory explains the movement of continents, as well as earthquakes and volcanoes.

Processes of the Rock Cycle (cont.)

- Processes within Earth that move tectonic plates also drive the rock cycle.
- As long as these processes exist, the rock cycle will continue.

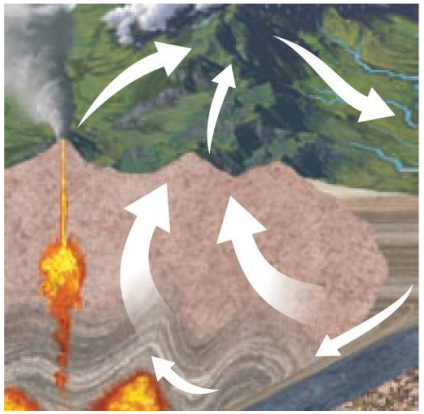
Processes of the Rock Cycle (cont.)

Key Concept Check

How is the rock cycle related to plate tectonics?

Summary

- Weathering and erosion are important processes in the rock cycle.
- Uplift contributes to rock cycle processes on Earth's surface.
- Plate tectonic activity contributes to rock cycle processes beneath Earth's surface.



Lesson Review

What type of rock forms when lava erupts and cools and crystallizes on Earth's surface?

A. intrusive rock

B. extrusive rock

C. metamorphic rock

D. none of these

Lesson Review

What process moves large amounts of rock up to Earth's surface and to higher elevations?

A. uplift

B. deposition

C. crystallization

D. compaction

Lesson Review

During what process does the weight of overlying layers of sediment push the grains of the bottom layers closer together?

A. uplift

B. deposition

C. compaction

D. none of the above

Lesson Review

What do you think NOW?

Do you agree or disagree?

5. All rock types are related through the rock cycle.
6. Rocks move at a slow and constant rate through the rock cycle.

Menu

Minerals and rocks form through natural constructive and destructive processes, have practical uses in everyday life, and are valued for their beauty. Minerals can be identified based on their physical properties. Rocks are classified based on their physical characteristics and how they formed.

Lesson 1: Minerals

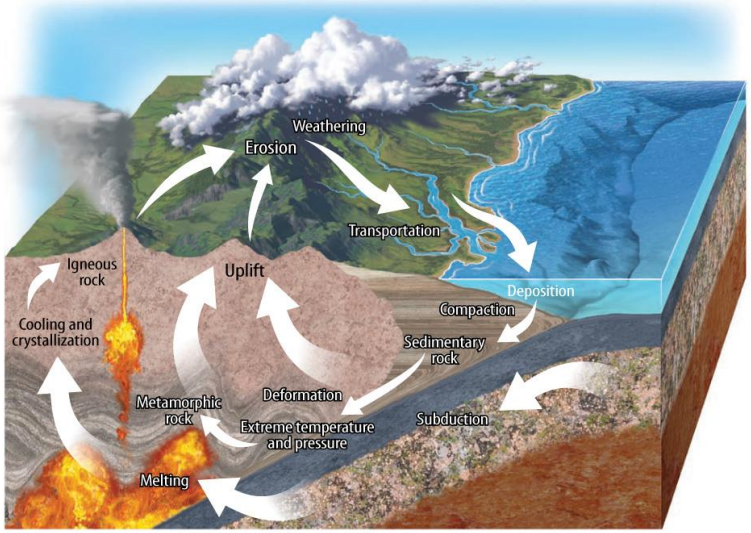
- Minerals form when solids crystallize from molten material or from solutions.
- Properties such as color, streak, hardness, and cleavage are used to identify minerals. Unique properties such as magnetism, reaction to acid, and fluorescence can also be used to identify certain minerals.
- Minerals are used to make everyday products such as toothpaste and makeup. Metals are used in cars and buildings. Gemstones are valued for their beauty.

Lesson 2: Rocks

- Rocks are classified based on their texture and composition.
- Igneous rocks form when magma or lava solidifies. Sedimentary rocks from when sediments are lithified. Metamorphic rocks form when parent rocks are changed by thermal energy, pressure, or hot fluids.
- Rocks are used in construction, abrasives, and art.

Lesson 3: The Rock Cycle

- Surface processes break down existing rocks into sediment. They transport this sediment to locations where it undergoes deposition and can be recycled to make more rocks.
- Thermal energy is released at plate boundaries. This thermal energy provides the energy needed for making igneous and metamorphic rocks. It also drives the forces that expose rocks to processes occurring on Earth's surface.



Chapter Review

What word is used to describe the way that a mineral's surface reflects light?

A. streak

B. fracture

C. luster

D. cleavage

Chapter Review

What term describes the orderly, repeating pattern in which the atoms in a crystal are arranged?

A. mineral

B. crystal structure

C. cleavage

D. luster

Chapter Review

What term refers to grain size and how grains are arranged in rocks?

A. sediment

B. texture

C. foliation

D. none of these

Chapter Review

What term refers to rock and mineral fragments that are loose or suspended in water?

A. magma

B. lava

C. grains

D. sediment

Chapter Review

What is the series of processes that continually change one rock type into another?

A. crystallization

B. compaction

C. deposition

D. rock cycle

Standardized Test Practice

What is the term for a naturally occurring, inorganic solid that has a crystal structure and a definite chemical composition?

A. rock

B. ore

C. mineral

D. sediment

Standardized Test Practice

If a mineral breaks along smooth, flat surfaces, what kind of break is it displaying?

A. cleavage

B. fracture

C. luster

D. streak

Standardized Test Practice

Which of these refers to what happens when uneven pressures cause flat minerals to line up, giving a rock a layered appearance?

A. lithification

B. texture

C. foliation

D. deposition

Standardized Test Practice

What term refers to a naturally occurring solid mixture composed of minerals, smaller rock fragments, organic matter, or glass?

A. grains

B. magma

C. sediment

D. rock

Standardized Test Practice

What is the name of the igneous rock that forms when magma cools and crystallizes inside Earth?

A. intrusive rock
B. extrusive rock
C. uplift
D. sediment