

# Chapter 4 Notes

## Rocks

### Section 1

- **Describe** two ways rocks have been used by humans.
- **Describe** four processes that shape Earth's features.
- **Describe** how each type of rock changes into another type as it moves through the rock cycle.
- **List** two characteristics of rock that are used to help classify it

### The Rock Cycle

- A \_\_\_\_\_ is a naturally occurring solid mixture of one or more minerals or organic matter.
- Rocks \_\_\_\_\_ themselves.
- This is a constant process
- The series of processes in which a rock forms, changes from one type to another, is destroyed, and forms again by geological processes is called the **rock** \_\_\_\_\_.

### The Value of Rock

- Very important natural resource
- How did ancient civilizations use rock?
  
- How do we use rock today?

### Processes That Shape the Earth

- **Q:** What makes and destroys rocks?
- **A:** \_\_\_\_\_ processes make and destroy rock.
- These processes shape our planet.
- They also influence the type of rock that is found in certain areas.

### Weathering, Erosion, and Deposition

- The process in which **water, wind, ice, and heat** break down rock is called \_\_\_\_\_.
- Breaks rocks into tiny pieces called \_\_\_\_\_. Sediments form together to make sedimentary rock.
- Takes place at the surface.
- So, where do you think most sedimentary rocks are found?
- The process by which wind, water, ice, or gravity \_\_\_\_\_ soil and sediment from one location to another is called **erosion**.
- The process in which sediment moved by erosion and is \_\_\_\_\_ or deposited (comes to rest) is called **deposition**.

### Heat and Pressure

- High heat
  - Crystals break down
  - New "\_\_\_\_\_ loving" crystals form

- New Rock!
- Crazy high heat!!!
  - Rock melts into \_\_\_\_\_
  - Magma rises
  - Magma cools
  - Eventually it \_\_\_\_\_
  - New Rock!
- High pressure
  - Sediments closer to the surface, layer on top of one another.
  - Pressure causes them to “\_\_\_\_\_” together.
- Higher pressure
  - Crystals stretch and become \_\_\_\_\_
  - New crystals can form
  - New Rock!
- Sudden decrease in pressure
  - Rock \_\_\_\_\_ into magma

### How the Rock Cycle Continues

- Buried rock is exposed at the Earth’s surface by a combination of \_\_\_\_\_ and erosion.
- **Uplift** is movement within the Earth that brings rocks inside toward the surface.
- When uplifted rock reaches the Earth’s surface, weathering, erosion, and deposition begin.

### Round and Round It Goes

- Continual process
- New rock forming from \_\_\_\_\_ rock
- \_\_\_\_\_ to tens of millions of years
- No specific order:
  - Igneous – Sedimentary – Metamorphic
  - Sedimentary – Metamorphic – Sedimentary
  - Metamorphic – Igneous – Sedimentary
  - Etc...

### Rock Classification

Rock can be three main classes based on how the rock is formed:

- \_\_\_\_\_ rock
- **Sedimentary rock**
- **Metamorphic rock**
- Each class of rock can be divided further, based on differences in the ways rocks form.
- Scientists study rocks in detail using two important criteria: composition and texture.
- \_\_\_\_\_ is the chemical makeup of a rock.
  - The minerals that make up the rock.
- **Texture** is the size, shape, and position of the rock’s grains.
  - \_\_\_\_\_ grained texture has small mineral crystals or none at all.
  - Coarse grained texture has \_\_\_\_\_ mineral crystals.

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### Section 2

- **Describe** three ways that igneous rock forms.
- **Explain** how the cooling rate of magma affects the texture of igneous rock.
- **Distinguish** between igneous rock that cools within the Earth's crust and igneous rock that cools at the Earth's surface.

### Origins of Igneous Rock

- Forms when rock \_\_\_\_\_ then cools and solidifies.
- There are three ways magma can form:
  - When rock is \_\_\_\_\_
  - When pressure is \_\_\_\_\_
  - When rock changes composition

### Composition and Texture of Igneous Rock

- **Felsic** - \_\_\_\_\_ colored igneous rocks.
  - Rich in the elements aluminum, potassium, silicon, and \_\_\_\_\_.
- **Mafic** - \_\_\_\_\_ colored igneous rocks.
  - Rich in calcium, iron, and magnesium.

### Igneous Rock Formations

- \_\_\_\_\_ **igneous rock** – Forms inside the Earth
  - Rising magma \_\_\_\_\_ its way (**intrudes**) into existing rock layers, cools, and hardens.
- Cools very slowly
  - Crystals have a long time to grow
  - Large crystals (\_\_\_\_\_ **grain**).
- **Extrusive igneous rock** - Forms on Earth's \_\_\_\_\_.
- Rising magma pushes its way to the surface and spills out onto the ground (\_\_\_\_\_).
- Cools very rapidly
  - Crystals don't have much time to \_\_\_\_\_
  - Small crystals (\_\_\_\_\_ **grain**)
- Where could you find lots of extrusive igneous rock?

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## Rocks

### Section 3

- **Describe** the origin of sedimentary rock.
- **Describe** the three main categories of sedimentary rock.
- **Describe** three types of sedimentary structure.

### Origins of Sedimentary Rock

- Weathering makes \_\_\_\_\_.
  - What causes weathering?
- Erosion moves sediments from one place to another.
  - What causes erosion?
- The sediment is brought together to the \_\_\_\_\_ point and deposited (deposition) in layers.
- Over time layers \_\_\_\_\_.
- The most noticeable feature of sedimentary rock is its layers, or \_\_\_\_\_.
- A single, horizontal layer of rock is sometimes visible for many miles.

### Composition of Sedimentary Rock

- Sedimentary rock is classified by the way it \_\_\_\_\_.
- **Clastic sedimentary rock** - sediments are \_\_\_\_\_ *together* by pressure and a mineral such as calcite or quartz.
  - coarse-grained, \_\_\_\_\_-grained, or fine-grained textures.
- **Chemical sedimentary rock** - forms from solutions of \_\_\_\_\_ minerals and water.
  - As \_\_\_\_\_ slowly makes its way to the ocean, it dissolves some of the minerals it passes through.
  - Some of the dissolved minerals eventually \_\_\_\_\_ and form chemical sedimentary rock.
  - \_\_\_\_\_ (salt) is a type of chemical sedimentary rock.
- **Organic sedimentary rock** - skeletons and \_\_\_\_\_ of sea animals, or swamp plants.
  - These remains collect on the ocean floor and eventually become \_\_\_\_\_ together.
  - \_\_\_\_\_ is a type of organic sedimentary rock

## Sedimentary Rock Structures

- \_\_\_\_\_ is the process in which sedimentary rocks are arranged in layers.
- Strata differ from one another depending on the kind, size, and \_\_\_\_\_ of their sediment.
- Sedimentary rocks sometimes record the \_\_\_\_\_ of wind and water waves on lakes, oceans, rivers, and sand dunes in features called \_\_\_\_\_ **marks**.
- Structures called **mud cracks** form when \_\_\_\_\_-grained sediments at the bottom of a shallow body of water are exposed to the \_\_\_\_\_ and dry out.
- Even \_\_\_\_\_ impressions can be preserved in fine-grained sediments, as small pits with raised rims.

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- **Describe** the origin of sedimentary rock.
- **Describe** the three main categories of sedimentary rock.
- **Describe** three types of sedimentary structure.

### Origins of Metamorphic Rock

- Metamorphic rocks are rocks in which the *structure, texture, or composition* of the rock have \_\_\_\_\_.
- Metamorphism – “change”
- What animals undergo metamorphism?
- Occurs due to changes in heat and pressure.
- **Q:** How would the heat and pressure on a rock change?
- 2 types of metamorphism:
- \_\_\_\_\_ **Metamorphism**
  - Magma rises through the crust.
  - The surrounding rock comes into \_\_\_\_\_ with the magma and heats up.
  - The minerals in the rock \_\_\_\_\_.
  - New rock!
- \_\_\_\_\_ **metamorphism**
  - Occurs in rocks buried under many other \_\_\_\_\_.
  - Can also occur when pieces of Earth’s crust \_\_\_\_\_.
    - In either case pressure and temperature in these rocks increase.
    - That increase causes the rocks to become \_\_\_\_\_ and change minerals.
    - New rock!

### Composition of Metamorphic Rock

- As rocks undergo metamorphism, original minerals in a rock change into new minerals that are more \_\_\_\_\_ within the new pressure and temperature conditions.
- Many of these new minerals form \_\_\_\_\_ in metamorphic rock. These are known as \_\_\_\_\_ **minerals**, and are used to estimate the temperature, depth, and pressure at which metamorphic rocks form.

## Texture of Metamorphic Rock

- All metamorphic rock has one of two textures.
- \_\_\_\_\_ **Metamorphic Rock**
- \_\_\_\_\_ **Metamorphic Rock**
- **Foliated Metamorphic Rock** - Mineral grains are arranged in planes or \_\_\_\_\_.
- Foliated metamorphic rock usually contains aligned grains of \_\_\_\_\_ minerals, such as biotite mica or chlorite
- Metamorphic rocks can become other metamorphic rocks if the \_\_\_\_\_ changes again
- **Nonfoliated Metamorphic Rock** - Mineral grains are \_\_\_\_\_ arranged in planes or bands
- Commonly made of \_\_\_\_\_ or only a few minerals.
- During metamorphism, crystals of these minerals may change in \_\_\_\_\_ or the mineral may change in \_\_\_\_\_ in a process called recrystallization.

## Metamorphic Rock Structures

- **Deformation** is a change in the \_\_\_\_\_ of a rock caused by a \_\_\_\_\_ placed on it.
- These forces may cause a rock to be squeezed or \_\_\_\_\_. Folds, or bends, in metamorphic rock are structures that indicate a rock has been deformed.