

Earth Materials (Strahler) - tests

This chapter deals with the systems and cycles of the solid Earth. It discusses the basic materials of the solid Earth – **rocks and minerals** – and some principals of their formation. These are linked to the cycle of rock change which describes how different rock types develop as Earth materials are cycled and recycled through geologic time.

Task 1 Fill in the missing words. The first letter has been given.

- The elements oxygen and silicon account **f**_____ approximately seventy-five percent of the Earth's crust, **w**_____ the metallic elements iron, aluminum, and the base elements account **f**_____ most of the rest. The elements of the crust are combined in inorganic chemical **c**_____ called minerals. These minerals are combined in various proportions to form many kinds of rock.
- The rocks of the Earth's crust are grouped **i**_____ three major classes: igneous, sedimentary, and metamorphic rocks. Igneous rocks form when molten material from the Earth's interior cools and **s**_____ in the crust. Magma that cooled slowly **b**_____ the surface **f**_____ coarse-textured intrusive (plutonic) igneous rocks. Lava that cooled rapidly at the surface **f**_____ fine-textured extrusive (volcanic) igneous rocks. Igneous rocks consist mainly **o**_____ silicate minerals containing silicon, oxygen, and metallic elements. The type of metallic elements present **d**_____ the mineral density. Less dense felsic minerals dominate the igneous rocks of the upper crust, **w**_____ more dense mafic and ultramafic minerals dominate **t**_____ of the lower crust.

Task 2 Finish the sentences:

Silicate minerals undergo chemical changes called mineral alteration when ¹ _____
Most clay minerals are produced ² _____

Weathering, ³ _____, occurs through both mineral alteration and physical disintegration.

Layers of mineral sediment and organic matter accumulate in oceans and low-lying land areas to be compacted ⁴ _____

Different types of sediment produce ⁵ _____

Igneous and sedimentary rocks can be altered by heat and pressure ⁶ _____

The cycle of rock change describes the circulation of rock material ⁷ _____

This is a very slow process powered by the heat of radioactive decay ⁸ _____

- A exposed to air and water at the Earth's surface.
- B to form metamorphic rocks.
- C and hardened into sedimentary rocks.
- D deep within the Earth.
- E between the Earth's interior and the crust.
- F different kinds of sedimentary rock.
- G by mineral alteration.
- H or the breakdown of rocks into smaller particles known collectively as sediment,

(Adapted from Strahler - Chapter 11)

The rock cycle (AW)

Task 3 (Homework) - Fill in the missing words with one of the words from the box.

another apart as buried cycle dissolved either hardens nor undergo

The rocky face of the earth is constantly changing. Rocks and minerals are part of a huge recycling process.

Any class of rock can be changed into any other class of rock. An igneous rock, for example, can be _____ and broken _____ by weathering processes at the earth's surface. The products of weathering are _____ particles of rock or dissolved salts. The particles of rock and the dissolved salts are deposited and built up _____ layers of sediments that harden to become a sedimentary rock. The sedimentary rock can become deeply _____ in the earth and changed into a metamorphic rock. The metamorphic rock can then be melted by heat within the earth and be changed into magma, which later cools and _____ into an igneous rock. This process of change from one class of rock to another is called the rock _____.

In the example you just read, the igneous rock at the beginning of the cycle would probably not be the same as the igneous rock at the end. The rock cycle is a cycling in the sense of a recycling. It is a redistribution of elements and minerals from one rock type to _____. The rock cycle is not the kind of cycle that returns to the same point or condition after a period of time. _____ does the rock cycle always follow the same series of changes.

Two other processes are often very important parts of the rock cycle. Rocks buried deep in the earth must be raised to the surface and exposed before they can be broken down or dissolved by the weather. And rocks near the surface must be buried to great depths in order to be exposed to the pressure and heat needed to _____ metamorphism or melting.

Task 4 - Find the antonyms of buried.

Task 5 - Find the synonym of solidify.

Check yourself

1. What are the processes that turn an igneous rock into a sedimentary rock?
2. What are the processes that turn a sedimentary rock into a metamorphic rock?
3. What are the processes that can turn a sedimentary rock into a different sedimentary rock?

What to look for in a rock

The first step in identifying a rock is to determine whether / _____ the rock is igneous, sedimentary, or metamorphic. This first step is very important / _____, but it is not always easy because some very different rocks may look like each other / _____.

And thus / _____ you have to examine a rock for certain physical properties. In particular, you need to consider a rock's texture and its mineral composition.

Task 6 *Substitute the underlined words by one of these: significant, similar, mainly, if, so*

The **texture** of a rock is the pattern made by the size, shape, and arrangement of the particles that are in the rock. Six common rock textures are defined in the table below this text. Though sometimes called by different names, those six textures will help you describe most any rock you find.

Task 7 *Fill in the missing words with one of the words from the box and translate the types.*

at all at least enough evenly throughout too

Six Common Rock Textures

Type of Texture	Description of That Texture	Example Rocks of That Texture
coarse-grained texture	made up of mineral grains or crystals that are large _____ to be seen without using a microscope	granite marble sandstone (page 87)
fine-grained texture	made up of mineral grains or crystals _____ small to be seen without a microscope	limestone basalt (page87)
mixed-grain texture	made up of _____ two very different-size grains	conglomerate (page 86)
glassy texture	containing no mineral crystals _____; a natural glass	obsidian (page 86)
layered texture	made of mineral crystals all lined up in the same direction; parallel grains distributed more or less _____ within the rock	slate schist sandstone (page87)
banded texture	made up of different minerals that are concentrated in different bands rather than distributed evenly _____ the rock	gneiss (page87)

Task 8 *Answer the following questions:*

1. *How does the texture of granite differ from the texture of limestone?*
2. *How does layered texture differ from banded texture?*

The **mineral composition** of a rock is, as its name states, a list of the minerals that make up the rock. For a start, there are a few basic minerals to look for. Recognizing those minerals will help you to make an approximate identification, which is sometimes all that a person can make without special equipment.

Task 9 Complete the text with one of these words:

any distinguish equal filling flakes like merely surfaces tan whereas

Most common rocks contain silicate minerals. Silicate minerals can sometimes be recognized¹ _____ by their **color**. Pink or red crystals are potassium feldspar² _____. orthoclase. Glassy, gray to purple-gray grains are quartz. Green colors are usually amphibole, pyroxene, or olivine. The micas are little³ _____. Biotite mica is black. Muscovite mica is clear to⁴ _____. White crystals may be⁵ _____ of the feldspars. If feldspar has⁶ _____ amounts of sodium and calcium, it is usually gray.

Silicate minerals can also be identified by other physical properties.

To⁷ _____ quartz from feldspar, for instance, **hardness** can be used.

Quartz has a hardness of 7, and feldspar has a hardness of 6.

Also, feldspar crystals often have flat cleavage⁸ _____ or crystal faces,⁹ _____. quartz usually looks like clear or gray glass¹⁰ _____ in between other mineral grains.

Task 10 Look at the pictures of specimens on page 87 in AW textbook.

Considered as four pairs, each rock on the right is a metamorphic form of the rock on its left.

Learn the names of these rocks. What are they in Czech?

granite (A) - gneiss [nais] (B)

sandstone (C) - quartzite (D)

limestone (E) - marble (F)

shale (G) - schist (H)

1. Which textures do you think show most clearly?
2. How are they alike? How are they different?
3. How would you describe any patterns in the arrangement of the crystals?

Calcite is also a key mineral for you to be able to recognize in a rock. Limestone and marble, for instance, are made up almost totally of calcite. Calcite is easily distinguished from quartz and feldspar because calcite has a hardness of only 3. Another easy test for calcite is one drop of dilute hydrochloric acid. Calcite will bubble readily in dilute hydrochloric acid. Calcite will also bubble in white vinegar, but it may take as long as fifteen minutes for the bubbles to form in vinegar. In dilute hydrochloric acid, the bubbles form immediately.

Task 11 Explain the underlined words.

Task 12 Find the synonym for the word immediately in the last paragraph.

Check yourself

1. What are the two most important physical properties to look at when identifying a rock?
2. How can you distinguish calcite from quartz in rocks?

(Adapted from Addison Wesley - Chapter 2)