

## Rock Transformations Study Guide

### Define the following vocabulary terms.

1. Matter - anything that has mass and takes up space
2. Rock formation - a region of rock that formed together as a single rock type
3. Sample - a small part that is meant to show what the whole is like
4. Magma - hot liquid rock below the surface of Earth
5. Sediment - small pieces of rock
6. Cementation - the process of sediment being glued together
7. Compaction - the process of sediment being buried and pressed together
8. Igneous rock - the rock type formed when magma cools and becomes solid
9. Sedimentary rock - the rock type formed when sediment is pressed and glued together
10. Energy - the ability to make things move or change
11. Erosion - the movement of sediment from one place to another, often caused by wind or flowing water
12. Weathering - the process of rock breaking down into smaller pieces due to wind or moving water
13. Metamorphic rock - the rock type formed when heat or pressure deep underground changes existing rock
14. Subduction - the process by which rock material moves under Earth's outer layer and into the mantle due to plate motion
15. Uplift - the process by which all the rock formations of a region are pushed up due to plate motion

### Complete the following key concepts.

1. Rocks can form in different ways. This causes them to be different types.

2. When sediment is compacted and cemented together, it forms sedimentary rock.
3. When magma cools, it hardens to form igneous rock.
4. Matter gets transformed by energy, but the same matter is still present.
5. Sediment forms when any type of rock is weathered, a process driven by energy from the sun.
6. Magma forms when any type of rock is melted, a process driven by energy from Earth's interior.
7. Plate motion moves rock formations.
8. Subduction moves rock down, below Earth's outer layer.
9. Uplift moves rock upward toward Earth's surface.
10. Uplift and subduction can expose rock formations to different energy sources, which can transform them.
11. Any type of rock can transform into any type of rock because of plate motion.

**Answer the following unit and chapter questions using your key concepts and what you have learned throughout this unit.**

1. How do rocks form and change (unit question)?

Rocks form and change in many different ways depending on what rock material is present and what energy source those materials are exposed to. If rock material is exposed to energy from the sun, it can be weathered and eroded. If rock material is exposed to energy from Earth's interior, it can be melted or go through metamorphic processes.

2. How did the rock of the Great Plains and Rocky Mountains form (chapter 1)?

Great Plains: sediment transformed into sedimentary rock through compaction and cementation.  
Rock Mountains: magma transformed into igneous rock through cooling.

3. Where did the magma and sediment that formed the rock of the Great Plains and the Rocky Mountains come from (chapter 2)?

Different energy sources drive the processes that form sedimentary and igneous rocks. Energy from Earth's interior is what changes solid rock into magma. The process of weathering any type of rock is ultimately driven by energy from the sun.

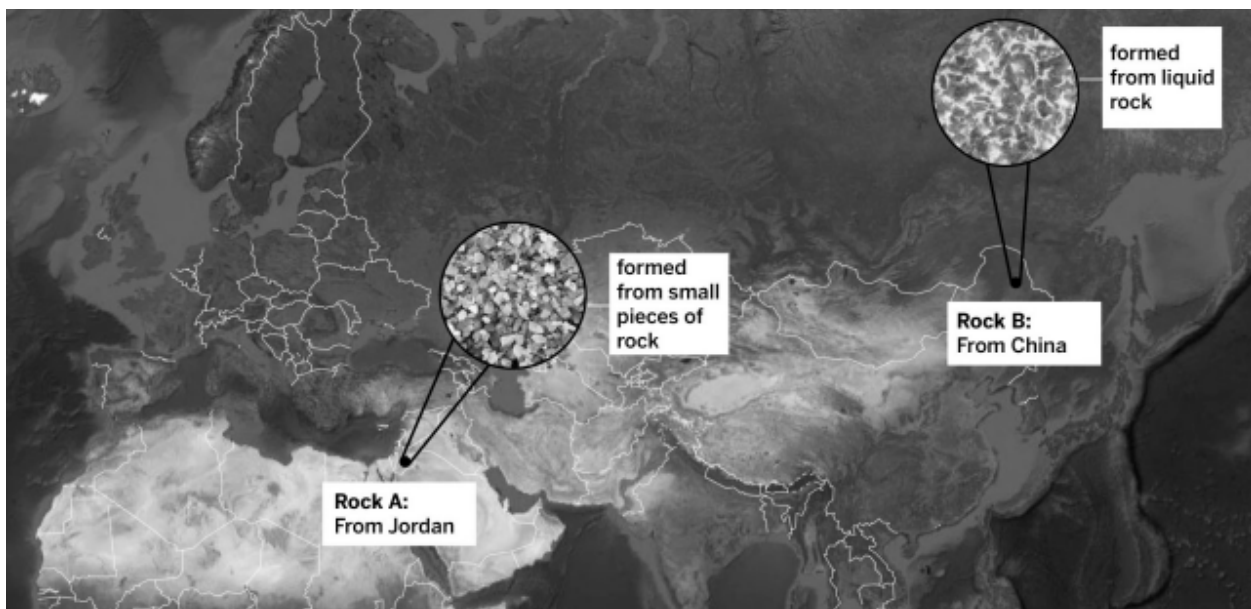
4. How could rock from one of the regions have transformed into a different type of rock in the other region (chapter 3)?

One rock type can be transformed into another type, because rock can be taken from the surface of the Earth down to depths where melting can occur or rock from Earth's interior can be moved up to the surface where it can be broken down into sediment. Plate motion causes subduction and uplift to allow these transformations, as well as the formation of metamorphic rock.

5. What rock transformation processes are happening on Venus (chapter 4)?

This is an unsolved problem because the harsh surface environment on Venus has made lander exploration impossible to date, and its thick clouds make it impossible to take the same visible wavelength, high-resolution images we have of other planetary surfaces.

**Answer the following example multiple choice questions from your test.**



1. Georgina is a rock collector. She is looking at some information about two of the rocks she has collected on her travels. The information is as follows:

- Rock A formed from small pieces of rock.
- Rock B formed from liquid rock in a different place.
- Rocks A and B formed at about the same time.

Are Rocks A and B the same or different types of rock?

The rocks are

- A. the same type because they are both formed from rock material.
- B. the same type because they formed at the same time.

C. different types because they formed in different ways.

D. different types because they formed in different places.

2. Hank passes by a building every day on his way to school. He notices that the rock used to build the walls of the building is a different type than the rock used to build the steps. How could energy have played a role in the different rock types forming?

A. Energy from different sources leads to different types of rock. Energy inside Earth melts rock into liquid rock, but energy from the sun causes rock to weather into small pieces of rock.

B. Energy caused one rock type to form, but not the other. Rock that forms because of energy is a different type of rock than rock that forms without energy.

C. Energy changes rock in different ways, depending on the starting rock type. Energy changes igneous rock into liquid rock and changes sedimentary rock into small pieces of rock.

D. Energy changes rock on different continents in different ways. Each continent on Earth has different rock that might form liquid rock or small rock pieces when exposed to energy.



3. A geology student describes a rock sample she is studying in class. The rock sample is igneous rock, but the student wonders if the material that it formed from was part of a sedimentary rock formation millions of years ago. Could this be correct? Could the material for igneous rock come from sedimentary rock?

A. Yes, if sedimentary rock is exposed to energy from the sun at Earth's surface for a long enough time, it can melt into liquid rock and form igneous rock.

B. Yes, if sedimentary rock is moved below Earth's outer layer and exposed to energy from Earth's interior, it can melt into liquid rock and form igneous rock.

C. No, igneous rock can only form from other igneous rock. Sedimentary rock cannot change into igneous rock.

D. No, igneous rock forms under Earth's outer layer due to energy from Earth's interior, but sedimentary rock only forms at Earth's surface.

4. On the island of Hawaii, Keanu notices that the sand on the beach is black, the same color as the rock formations on the island. Keanu realizes the sand used to be part of the rock formations. How did material from the rock formations turn into sand?

A. Rays from the sun shone down on the rock, and it broke into pieces.

B. If anything were left out for a long time, it would break into small pieces.

C. The sand was formed by earthquakes, tsunamis, and other natural disasters. These disasters were strong enough to break rock into small pieces.

D. Wind and rain interacted with the rock, breaking it into small pieces.



5. On vacation at a lake, Saira's mom sees an interesting-looking rock formation. Saira just learned about rocks in geology class and tells her mom that the formation is made of gneiss, a type of metamorphic rock. How did this metamorphic rock form?

- A. Rocks don't form; they stay as they are.
- B. It melted and cooled.
- C. It broke into sediment and then compacted.
- D. It was heated and put under pressure.

**Answer the following written response questions from your test.**

1. Mining companies have technology that can detect rock formations underneath Earth's outer layer. One mining company detects an igneous rock formation underneath Earth's outer layer. The geologists working for the company wonder if material in this igneous rock used to be sedimentary rock at Earth's surface. Can material in sedimentary rock become igneous rock? Explain your answer.

The igneous rock formed from magma that cooled down.

If sedimentary rock is subducted by plate motion into Earth's interior and is exposed to energy from Earth's interior and melts to form magma, then the igneous rock could have been sedimentary rock in the past.

2. Astronomers studying the planet of Rhombus have detected sedimentary rock on its surface. One astronomer wonders if material in this sedimentary rock used to be in igneous rock deep in Rhombus's interior. Can igneous rock become sedimentary rock? Explain your answer.

The sedimentary rock formed from sediment that was compacted and cemented. If igneous rock is uplifted by plate motion toward Rhombus's surface and is exposed to energy from Rhombus's sun, so wind and water can move and weather the igneous rock into sediment, then the sedimentary rock could have been igneous rock in the past.