



# SCIENCE

STUDENT BOOK

▶ **9th Grade | Unit 3**

---

# SCIENCE 903

## Physical Geology

INTRODUCTION | **3**

### **1. EARTH STRUCTURES** **5**

---

SHAPE | **5**

ROCKS | **7**

LAYERS | **9**

IGNEOUS STRUCTURES | **13**

MOUNTAINS | **19**

SELF TEST 1 | **22**

### **2. EARTH CHANGES** **25**

---

WEATHERING | **25**

EROSION AND SEDIMENTATION | **28**

SELF TEST 2 | **41**

### **3. EARTH MOVEMENTS** **45**

---

ISOSTASY | **45**

FOLDING | **51**

PLATE TECTONICS | **53**

SELF TEST 3 | **57**



**LIFEPAC Test is located in the center of the booklet.** Please remove before starting the unit.

**Author:**

Carl Sandberg, M.Ed.

**Editor-In-Chief:**

Richard W. Wheeler, M.A.Ed

**Consulting Editor:**

Harold Wengert, Ed.D

**Revision Editor:**

Alan Christopherson, M.S

**Westover Studios Design Team:**

Phillip Pettet, Creative Lead

Teresa Davis, DTP Lead

Nick Castro

Andi Graham

Jerry Wingo

Don Lechner



**804 N. 2nd Ave. E.**

**Rock Rapids, IA 51246-1759**

© MCMXCVI by Alpha Omega Publications, Inc. All rights reserved. LIFEPAK is a registered trademark of Alpha Omega Publications, Inc.

All trademarks and/or service marks referenced in this material are the property of their respective owners. Alpha Omega Publications, Inc. makes no claim of ownership to any trademarks and/or service marks other than their own and their affiliates, and makes no claim of affiliation to any companies whose trademarks may be listed in this material, other than their own.

# Physical Geology

## Introduction

“Surely there is a vein for the silver, and a place for gold where they find it. Iron is taken out of the earth, and brass is molten out of the stone....” (Job 28:1-2) “As for the earth, out of it cometh bread; and under it is turned up as it were fire. The stones of it are the places of sapphires: and it hath dust of gold.” (Job 28:5-6) “My substance was not hid from thee, when I was made in secret, and curiously wrought in the lowest parts of the earth.” (Psalm 139:15)

The purpose of God in creating our planet is revealed in Isaiah 45:18: “For thus saith the Lord that created the heavens; God Himself that formed the earth and made it; he hath established it, he created it not in vain, he formed it to be inhabited....”

In fulfilling His intention to create an inhabited planet, God placed within and on the earth all things needed for human life: the minerals of which our bodies are made (Psalm 139:15), which come from the ground by agriculture (Job 28:5).

God has put into the rocks of earth all minerals needed by organisms. He has also taken care that deadly poisons are not present in soil in more than trace amounts. As essential minerals are removed from the soil, rocks chemically disintegrate and make new soil.

Heat, generated by radioactive elements, causes deeply buried elements to expand and come to the surface where minerals needed for life become available. Lowly worms and bacteria reprocess dead bodies of animals and plants into soil nutrients. Psalm 139:15 states that

God formed the substance of our bodies when the minerals were “in the lowest parts of the earth.”

Besides providing the necessities of life, God has put within the stones materials necessary for industry and commerce, as Job said in chapter 28, verses 1–6. The earth’s magnetic field and its atmospheric electric charges gave man information about the nature of atoms and the particles of which they are made. This structure makes electronic communication possible. It reveals scientific principles by which to perform technological wonders. The marvelous ingenuity of man’s mathematical systems and technical inventions demonstrate that the divine Creator made man a special creation like no other.

In space God is highly glorified by His creation of billions of galaxies. The distances between galaxies (measured in millions of light years) give man an understanding that God “inhabits eternity,” and that Jesus’ “goings-forth have been of old, from everlasting.” (Micah 5:2)

Since God is eternal, economy of time means nothing to Him, except within the historical framework of His plan of redemption. The time frame involves the generations of patriarchs and prophets preparing the way, the Gospel age in which salvation is declared to every tribe and nation, and Christ’s coming kingdom. Exactly how God created this planet, we are not told. In Genesis 1:1 the fact of creation is stated, and the account goes on from that point with the various parts of the surface environment. This topic will be taken up in detail in this LIFEPAC®.

## Objectives

**Read these objectives.** The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC. When you have finished this LIFEPAC, you should be able to:

1. Glorify God by explaining how this world is designed as an environment for living creatures, including ourselves.
2. Trace the history of the concept of the earth’s shape.
3. Name the three rock classes, to describe their origin, and name representatives of each class.
4. Describe the earth’s layers and the ways geologists have to investigate them.
5. Name and describe igneous structures.
6. List the types of mountain structures
7. Explain the effects of weathering, erosion, and sedimentation.
8. Name the agents of weathering.
9. Describe evidence of movements in the earth’s crust.
10. Explain the current theory that explains the origin of volcanoes, earthquakes, mid-ocean ridges, ocean trenches, and mountain ranges.

# 1. EARTH STRUCTURES

Section 1 presents evidence from ancient writings that people have known the earth to be a sphere for thousands of years. The sphere is made up of several layers of differing compositions. The top layer—the earth’s

surface—consists of three classes of rock. Two of the classes are derived from the original igneous rock. The surface has experienced movements that have produced a variety of landforms.

## SECTION OBJECTIVES

**Review these objectives.** When you have completed this section, you should be able to:

1. Glorify God by explaining how this world is designed as an environment for living creatures, including ourselves.
2. Trace the history of the concept of the earth’s shape.
3. Name the three rock classes, to describe their origin, and name representatives of each class.
4. Describe the earth’s layers and ways geologists have to investigate them.
5. Name and describe igneous structures.
6. List the types of mountain structures.

## VOCABULARY

**Study these words to enhance your learning success in this section.**

**asthenosphere** (as then’ u sfir). A plastic, semi-liquid region of the earth’s mantle directly beneath the crust.

**crust** (krust). The solid outer layer of the earth.

**mantle** (man’ tul). The part of the earth beneath the crust and above the outer core.

**Note:** All vocabulary words in this LIFEPAAC appear in **boldface** print the first time they are used. If you are not sure of the meaning when you are reading, study the definitions given.

**Pronunciation Key:** hat, āge, cāre, fār; let, ēqual, tērm; it, īce; hot, ōpen, ōrder; oil; out; cup, pūt, rüle; child; long; thin; /ʒh/ for then; /zh/ for measure; /u/ represents /a/ in about, /e/ in taken, /i/ in pencil, /o/ in lemon, and /u/ in circus.

## SHAPE

Ancient Asiatic Indians are said to have thought the earth was flat and supported by pillars. It is said they thought the pillars were moral principles, such as truth and justice. Actually, however, they knew the earth was a sphere and used the diameter of the earth as the base of a triangle to calculate the distance to the moon.

They concluded that this distance is thirty times greater than the diameter of our globe.

Eratosthenes, a Greek scientist who lived in Egypt, is usually credited as the first to calculate the circumference of the earth. At noon on the first day of summer, he measured the angle of the sun’s rays at Alexandria and at Syene (Aswan), both in Egypt. Since the difference in

angle was almost one-fiftieth of a circle, the earth's circumference was fifty times the distance between the towns. Eratosthenes might have been merely confirming a conclusion that Egyptian surveyors had made long before.

Aristotle, the Greek philosopher honored and studied in the Later Middle Ages, said that the earth was a globe because the earth's shadow (seen crossing the moon during an eclipse) is always round. The only shape that gives a round shadow from every direction is a sphere.

Saint Augustine of Hippo wrote, "It has been scientifically proven that the earth is a sphere," although he doubted that people were living on the opposite side of the globe.

Astronomy taught in the Middle Ages was the teaching of the first-century Greek-Egyptian author, Ptolemy. Ptolemy was incorrect that the sun and other planets circled the earth. He was correct when he described the earth as a sphere with an equator, North Pole, and South Pole.

From the fourth to the fourteenth centuries, kings in Europe held a globe to represent the world in their hand during their coronation ceremony. Countless incidental remarks preserved in historical chronicles and poetical works

confirm that the reading public all through the Middle Ages took for granted that the earth is a sphere. Textbooks used in monastery and cathedral schools, as well as in later medieval universities, are unanimous in saying that the earth is a sphere.

Sir Isaac Newton reasoned that the earth bulges slightly at the equator, and that the earth is flattened at the poles. Measurements show that his reasoning was true. The bulge is less than one-sixth of 1 percent of the diameter, and the flattening at the pole is about as large. One of Newton's friends, William Whiston, read a manuscript of an ancient Greek author, Aqatharcides. This author was told by an Egyptian priest and college professor that the greatest pyramid near Cairo was designed to be one-eighth of a minute of latitude in width, or one-480th of a degree of latitude on each side. When sand was dug away from the base of the pyramid, its width was found to be within a few inches of that size. Possibly, ancient Egyptian surveyors knew about the spherical shape of the earth, had measured it, and had passed on their knowledge to Greeks who traveled or lived in Egypt. Therefore, Egyptians of the pyramid age should more properly be given credit for first calculating the circumference of the earth.



### Complete these sentences.

- 1.1 The Greek scientist usually credited as the first to calculate the earth's circumference was \_\_\_\_\_.
- 1.2 The first century Greek-Egyptian whose explanation of astronomy was taught in Europe and the Middle East was \_\_\_\_\_.
- 1.3 Textbooks used in monastery and cathedral schools, and in medieval universities, taught that the earth is a \_\_\_\_\_.



### Answer these questions.

1.4 What evidence did Aristotle present for a spherical earth? \_\_\_\_\_

---



---



---

1.5 According to an ancient Egyptian priest, a pyramid near Cairo was built with a certain basal dimension. What was the dimension? \_\_\_\_\_

---

## ROCKS

The three main categories of rock in the earth's crust are igneous, sedimentary, and metamorphic. Igneous rocks were originally molten; then they were crystallized by cooling. Sedimentary rocks were laid in place by moving water, ice, or wind. Metamorphic rocks are rocks that were under enough pressure, or heat combined with pressure, to twist the crystals without melting the rock.

**Igneous rocks.** Igneous rock that flowed out on the surface is lava; lava blown out of a volcano in explosive eruptions is volcanic ash, or tuff. Igneous rock beneath the surface is magma. Igneous rock that contains separate crystals of quartz (silicon dioxide), feldspar, and mica is granite. Igneous rock with the same minerals as granite, but in microscopic crystals, is rhyolite. A type of igneous rock which has more magnesium than aluminum is basalt, whether it hardened above the ground as lava, below the ground and frozen into rows of pillars, or under water where it makes piles of "pillow lava."

**Sedimentary rocks.** Sedimentary rock made mostly of sand is sandstone. Pieces of rock larger than sand are called gravel, pebbles, cobbles, or boulders, depending on how large they are. Seashells and other forms of calcium

carbonate are cemented together in limestone. Any sedimentary rock that contains rounded stones and sand is called conglomerate. Rock containing broken pieces of rocks that have not been rounded is called breccia. Sedimentary rock made from mud is called siltstone, and rock made from clay is called shale.

**Metamorphic rocks.** Metamorphic rocks differ according to what kind of rock they are made from, and according to the degree to which they have been changed by heat and pressure. Shale can be mildly metamorphosed into slate or further changed into schist. Limestone can be changed by pressure into marble. Sandstone can be metamorphosed into quartzite.

When high heat and pressure distort the crystal structure of previously formed rocks without melting them, the result is a metamorphic rock. Some metamorphic rocks are changed a small amount from their original conditions. Bituminous (tar-containing) coal, for example, can be slightly metamorphosed into anthracite (hard coal, used for steelmaking). Greater pressure can cause further stages of metamorphism, turning anthracite into graphite, the material from which pencil "lead" is made.



**Write true or false.**

- 1.6 \_\_\_\_\_ The equivalent of granite with crystals too small to be seen is rhyolite.
- 1.7 \_\_\_\_\_ Metamorphic rock originated under conditions of high heat and pressure.
- 1.8 \_\_\_\_\_ A characteristic that helps identify granite is crystal size.

**Complete these sentences.**

- 1.9 Rocks that originated from the liquid phase are classified as \_\_\_\_\_ .
- 1.10 Igneous rock that flowed out on the surface of the ground is called \_\_\_\_\_ .
- 1.11 Igneous rock beneath the surface of the ground is called \_\_\_\_\_ .
- 1.12 Lava blown out of a volcano in explosive eruptions is called a. \_\_\_\_\_ , or b. \_\_\_\_\_ .
- 1.13 Granite is composed of crystals of a. \_\_\_\_\_ and the minerals b. \_\_\_\_\_ and c. \_\_\_\_\_ .
- 1.14 A type of igneous rock with more magnesium than aluminum is \_\_\_\_\_ .

**Complete these activities.**

- 1.15 Explain how the three categories of rock are formed.
  - a. igneous \_\_\_\_\_  
\_\_\_\_\_
  - b. sedimentary \_\_\_\_\_  
\_\_\_\_\_
  - c. metamorphic \_\_\_\_\_  
\_\_\_\_\_

- 1.16 Complete the chart of sedimentary rocks.

Pieces	Rock
sand	a.
rounded stones	b.
angular rocks	c.
mud or clay	d.



1.17 Complete the chart of metamorphic rock.

Sedimentary Rock	Metamorphic Rock
shale	a.
limestone	b.
sandstone	c.

## TEACHER CHECK

initials \_\_\_\_\_

date \_\_\_\_\_

### LAYERS

The upper layers of the earth include these:

- the atmosphere: 78 percent nitrogen and 21 percent oxygen
- the hydrosphere: salty water covering 71 percent of the earth to an average depth of about 4 kilometers
- sedimentary rock: covering most of the continents and ocean basins to an average depth of about  $\frac{3}{4}$  kilometers (more than 16 kilometers in some places)
- granite cores of the continents: averaging about 30 kilometers thick (about 50 kilometers thick under mountain ranges)
- a floor of heavier rock, called basalt: under the oceans in layers about 5 kilometers thick

**Crust.** Sedimentary rock layers, granite continent foundations, and basaltic sea floors together are called the earth's **crust**. Just under the crust is a change in the speed of earthquake shock waves, indicating that a different type of rock is found below. Volcanoes sometimes bring up solid rocks along with liquid lava. In some places the entire crust has been broken and tilted, showing parts of the underlying rock.

**Mantle.** The body of rock from the crust down to the iron core of the earth is called **mantle**.

The mantle is made of rocks that contain more iron than rocks of the crust. Rock within the

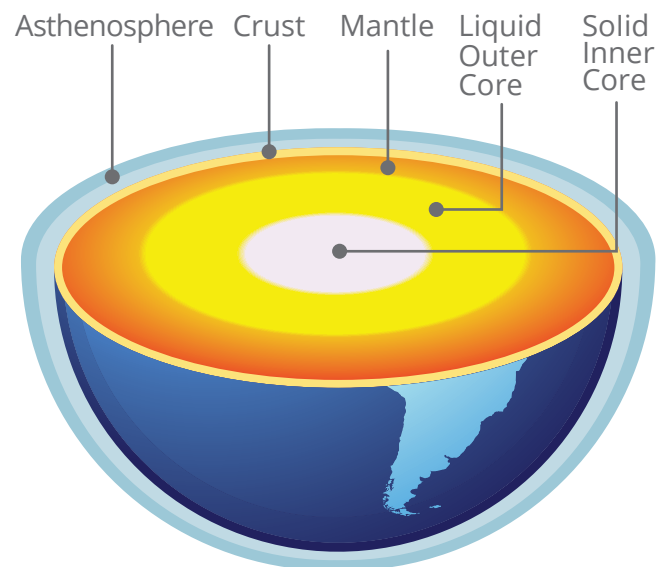


Figure 1 | Major Layers of the Earth

mantle gets heavier with depth until the melted outer core is reached.

Within the mantle, at depths of about eighty to one hundred sixty kilometers, is a partially melted zone called the **asthenosphere**. The movement of rock into the areas where it comes to the surface in volcanoes or remains under the surface to raise ranges of mountains indicates that partly or completely melted rock can be found at almost any depth. The passage of earthquake waves shows that most of the upper mantle is solid.

Temperatures in the interior of the earth are so high that the rock would melt if the pressure were not so great. Radioactive atoms break up at a slow rate, keeping the temperatures high. Some mantle rock partially melts (some minerals melt, but others do not) and forces its way up to the surface. The minerals in the mantle that melt are the silicon compounds that make up the earth's crust. A small decrease in temperature would allow crystals to form and the rock to solidify. However, rock is so poor at transmitting heat that it cools very slowly.

**Core.** The gravitational pull of the earth shows that the weight of the earth is about five and a half times the weight of the same volume of water. The weight of rocks near the surface of the earth is only about three times that of water, so the interior must be made of much heavier materials such as iron and nickel.

The earth's magnetic field shows that the core can hold or cause a strong magnetic field. Iron

is the logical material. Since some meteorites (thought to come from smashed planets) are made of iron with nickel, scientists have concluded the earth's core is made of iron and other heavy metals.

Shock waves started by earthquakes produce two kinds of movement: compression waves, which push molecules closer together temporarily as they move away from the earthquake, and sideways shaking motions (vibrations). Compression shock waves move through both solids and liquids (faster through solids). Sideways vibrations do not move through liquids. Vibrations from earthquakes show that the sideways waves get lost in a liquid zone about 2,900 kilometers under the surface. The compression waves that go through the planet are bent as they go in and out of this liquid outer core. They show that the middle part of the earth's core is solid.



### Write true or false.

- 1.18 \_\_\_\_\_ Compression shock waves move through both solids and liquids.
- 1.19 \_\_\_\_\_ The atmosphere contains 21 percent nitrogen and 78 percent oxygen.
- 1.20 \_\_\_\_\_ Granite mountain cores have thicknesses of fifty kilometers.
- 1.21 \_\_\_\_\_ Mantle rocks differ from crustal rocks by the amount of iron they contain.
- 1.22 \_\_\_\_\_ Temperatures in the earth's interior are above the normal melting point of rock.
- 1.23 \_\_\_\_\_ Rock transfers heat rapidly.

### Write the letter for the correct choice in each blank.

- 1.24 The gravitational pull of the earth is greater than the mass of an equal volume of water by \_\_\_\_\_ times.  
 a.  $1\frac{1}{2}$                       b.  $3\frac{1}{2}$                       c.  $5\frac{1}{2}$                       d.  $7\frac{1}{2}$
- 1.25 Pressure waves passing through the liquid outer core are \_\_\_\_\_.  
 a. bent                      b. reflected                      c. absorbed                      d. canceled

- 1.26** Oceans cover almost \_\_\_\_\_ percent of the earth's surface.  
a. 21                      b. 50                      c. 71                      d. 78
- 1.27** In some places, sedimentary rock extends as deep as \_\_\_\_\_ kilometers.  
a. 50                      b. 16                      c. 71                      d. 2,900

**Complete these sentences.**

- 1.28** Oceans make up the earth's layer called the \_\_\_\_\_ .
- 1.29** The floor of heavier rock under the oceans is composed of \_\_\_\_\_ .
- 1.30** Sedimentary rock layers, granite continent foundations, and basaltic sea floors together are called the earth's \_\_\_\_\_ .
- 1.31** The layer between the crust and the core is the \_\_\_\_\_ .
- 1.32** A partially melted zone in the mantle is called the \_\_\_\_\_ .

**Answer these questions.**

- 1.33** What evidence exists for a heavy core? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 1.34** What two lines of evidence exist for an iron and nickel core?  
a. \_\_\_\_\_  
\_\_\_\_\_  
b. \_\_\_\_\_  
\_\_\_\_\_
- 1.35** What are the two kinds of earthquake shock waves?  
a. \_\_\_\_\_  
\_\_\_\_\_  
b. \_\_\_\_\_  
\_\_\_\_\_
- 1.36** What evidence exists for a liquid outer core? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



View 903 Earthquake Shock Waves, from the Grade 9 SCIENCE EXPERIMENTS Video



Try this experiment to demonstrate earthquake waves.

These supplies are needed:

- pencil
- desk or small table
- long sheet of paper
- string
- brick

Follow these directions. Place a check in the box when each step is completed.

1. Tie the pencil to the brick so the pencil extends past the end of the brick. Hang both from the top of a doorway, pencil point downward, about as high as the top of a table.
2. Place a student desk or small table under the hanging brick, and adjust the height of the pencil so that its point touches on the desk.
3. Place books on both sides of the desk so that a long sheet of paper can be pulled between the two rows of books.
4. Pull the paper and observe the pencil drawing a straight line on the paper.
5. Repeat the experiment while someone stamps his foot nearby.
6. Repeat the experiment with someone bumping the desk hard enough to shake it. If the paper is being pulled steadily when the table is bumped, the line should show marks like the record of earthquake waves made by a seismograph.

Record what you saw.

1.37 Describe the marks drawn by the pencil in each case for the previous experiment.

a. straight pull of paper: \_\_\_\_\_

\_\_\_\_\_

b. stamping foot: \_\_\_\_\_

\_\_\_\_\_

c. bumping of table: \_\_\_\_\_

\_\_\_\_\_



## Earthquake Shock Waves Experiment

# SELF TEST 1

**Match these items** (each answer, 2 points).

- |       |       |                                       |                     |
|-------|-------|---------------------------------------|---------------------|
| 1.01  | _____ | first to calculate earth's diameter   | a. sedimentary      |
| 1.02  | _____ | deduced earth's shape                 | b. crust            |
| 1.03  | _____ | reasoned that earth bulges at equator | c. Ptolemy          |
|       |       |                                       | d. atmosphere       |
| 1.04  | _____ | rock cooled from magma                | e. pyramid builders |
| 1.05  | _____ | rock made from particles              | f. core             |
| 1.06  | _____ | rock changed by heat and pressure     | g. igneous          |
|       |       |                                       | h. mantle           |
| 1.07  | _____ | outer shell of the earth              | i. Newton           |
| 1.08  | _____ | interior layer of rock                | j. metamorphic      |
| 1.09  | _____ | central sphere of iron                | k. Aristotle        |
| 1.010 | _____ | earth's layer of gas                  |                     |

**Write true or false** (each answer, 1 point).

- 1.011 \_\_\_\_\_ Oceans cover almost 50 percent of the earth's surface.
- 1.012 \_\_\_\_\_ Conglomerate is primarily mud or clay.
- 1.013 \_\_\_\_\_ Metamorphosed limestone is marble.
- 1.014 \_\_\_\_\_ The rock that underlies the oceans is granite.
- 1.015 \_\_\_\_\_ The asthenosphere is located in the upper mantle.
- 1.016 \_\_\_\_\_ Some meteorites have the same composition as the earth's core.
- 1.017 \_\_\_\_\_ Igneous rocks contain large amounts of carbon.
- 1.018 \_\_\_\_\_ The mantle is apparently molten throughout.
- 1.019 \_\_\_\_\_ Rapidly cooled rock contains small crystals.
- 1.020 \_\_\_\_\_ Dome mountains are pushed upward by sideways pressure.

**Write the letter of the correct choice in each blank** (each answer, 2 points).

- 1.021** The equivalent of granite that has crystals too small to be seen is \_\_\_\_\_.  
a. basalt                      b. rhyolite                      c. sandstone                      d. biotite
- 1.022** Metamorphic rock originated under conditions of \_\_\_\_\_.  
a. low temperature and low pressure                      b. high temperature and high pressure  
c. low temperature and high pressure                      d. high temperature and low pressure
- 1.023** The type of mountains resulting from sideways pressure on the crust is \_\_\_\_\_.  
a. volcanic                      b. fault block                      c. dome                      d. folded
- 1.024** Shield volcanoes result from \_\_\_\_\_.  
a. liquid lava                      b. cinders                      c. bombs                      d. ash
- 1.025** Igneous intrusions injected between horizontal layers are \_\_\_\_\_.  
a. batholiths                      b. dikes                      c. sills                      d. cones
- 1.026** Mantle rock becomes liquid when \_\_\_\_\_.  
a. temperature is reduced                      b. core rock becomes liquid  
c. pressure is reduced                      d. pressure is increased
- 1.027** The partially melted zone in the upper mantle is the \_\_\_\_\_.  
a. hydrosphere                      b. atmosphere                      c. biosphere                      d. asthenosphere
- 1.028** Igneous rocks are made mainly of compounds of \_\_\_\_\_.  
a. carbon and hydrogen                      b. silicon and oxygen  
c. carbon and silicon                      d. carbon and oxygen
- 1.029** Magma that does *not* reach the surface is called \_\_\_\_\_ rock.  
a. intrusive                      b. extrusive                      c. metamorphic                      d. imbricated
- 1.030** Extrusive rock is *not* associated with \_\_\_\_\_ mountains.  
a. shield                      b. seamount                      c. cone                      d. remnant

**Complete each sentence** (each answer, 3 points).

**1.031** The mountain type that results from fluid lava is the \_\_\_\_\_ .

**1.032** Volcanoes are located along zones of \_\_\_\_\_ in the crust.

**1.033** Submarine mountains that were once active volcanoes are called \_\_\_\_\_ .

**1.034** A large mass of intrusive igneous rock that is beneath the earth's surface is a \_\_\_\_\_ .

**1.035** Cores of continents are made chiefly of the rock called \_\_\_\_\_ .

**1.036** Extraterrestrial indicators of the earth's internal composition are \_\_\_\_\_ .

**1.037** The deepest part of the earth is the \_\_\_\_\_ .

**1.038** The most abundant gas in the atmosphere is \_\_\_\_\_ .

**1.039** The category of rock that results from pressure and heat is \_\_\_\_\_ .

**1.040** The sedimentary rock that may become quartzite is \_\_\_\_\_ .

 <p>64 80</p>	<b>SCORE</b> _____	<b>TEACHER</b> _____	initials	date
---	--------------------	----------------------	----------	------



SCI0903 – May '14 Printing

ISBN 978-0-86717-783-1



9 780867 177831

 **Alpha Omega**  
PUBLICATIONS

804 N. 2nd Ave. E.  
Rock Rapids, IA 51246-1759

800-622-3070  
[www.aop.com](http://www.aop.com)