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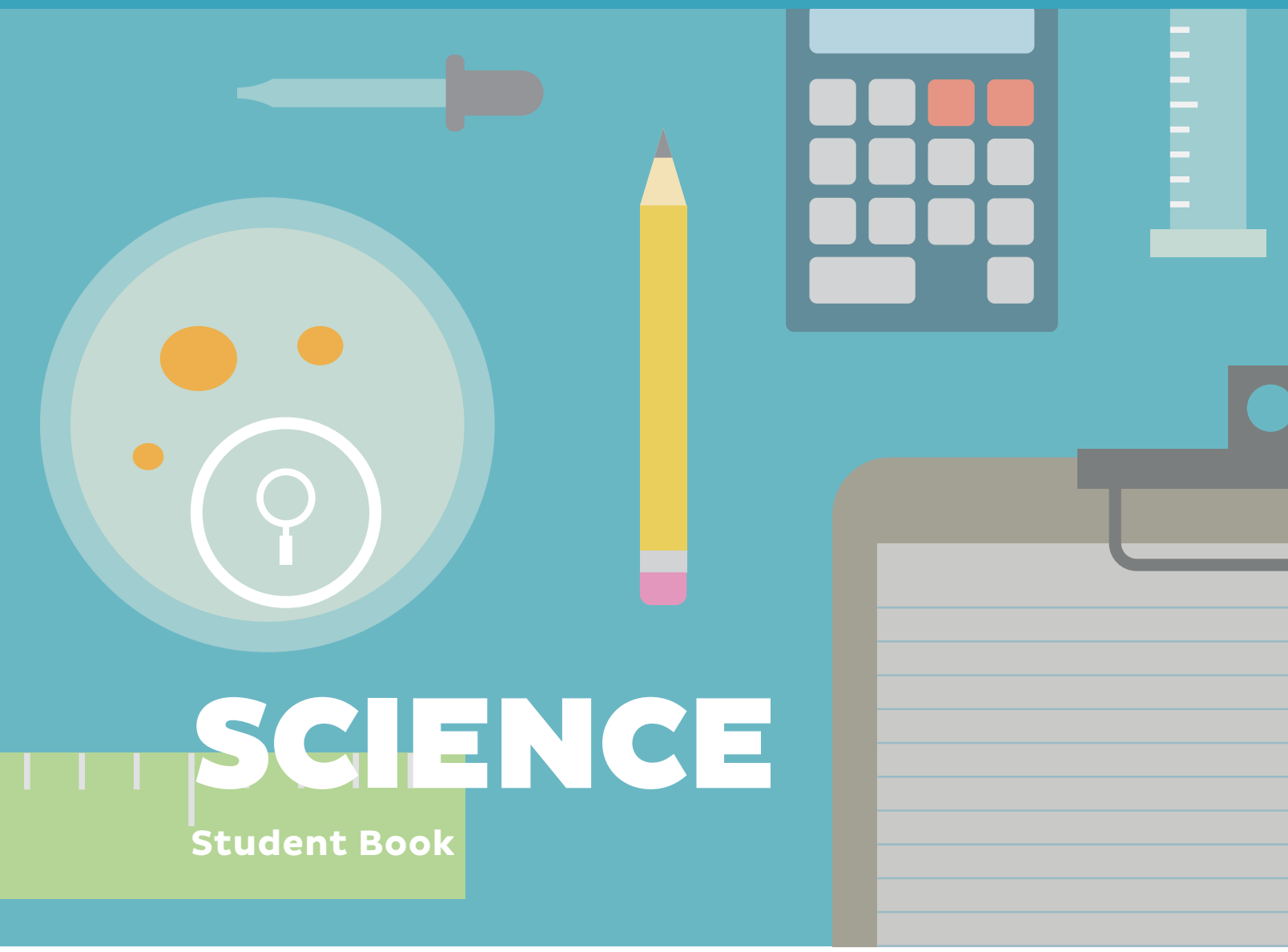

SCIENCE

Student Book

5th Grade | Unit 8

Alpha Omega
PUBLICATIONS

SCIENCE 508
RECORDS IN ROCK: GEOLOGY

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RECORDS IN ROCK: GEOLOGY

The earth is the home that God has created for us. It is a wonderful home. The earth has three main parts that we can normally see: the air around the earth, the waters upon the surface of the earth, and the solid part of the earth. This third part of the earth consists mainly of rock. It is very interesting to study. As you learned in the previous LIFEPAC®, fossils are found in the rocks of the earth. By studying the fossils found in the earth, we can learn much about God's creation and the physical record that He has given to us.

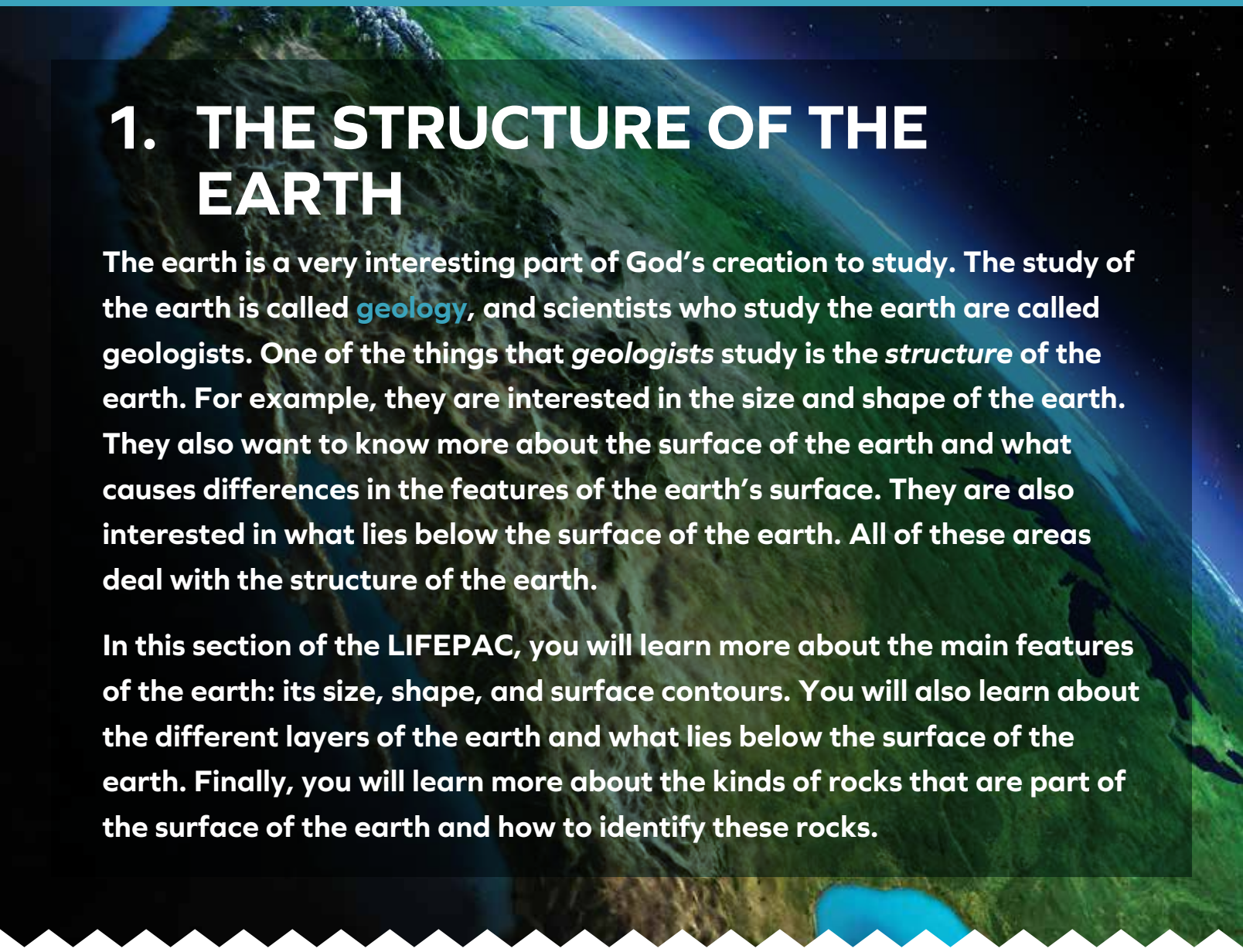
However, there are many other things about the solid part of the earth besides fossils that are interesting to study. For example, the rocks themselves are interesting. They come in many types, sizes, shapes, and colors. They can be fun to observe and collect. They can also help us learn more about God's creation and about the history of the earth.

In this LIFEPAC, you will learn more about the solid part of the earth. You will learn not only about the surface parts of the earth, but also about parts that lie deep within the earth. You will also learn about forces that change the solid parts of the earth and how the earth changes over time.

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC. Each section will list according to the numbers below what objectives will be met in that section. When you have finished this LIFEPAC, you should be able to:

1. Describe the earth's surface features.
2. Identify the main parts of the earth.
3. Describe the types of rock in the earth.
4. Describe the forces that change the earth's surface.
5. Tell how the surface of the earth is changing.



1. THE STRUCTURE OF THE EARTH

The earth is a very interesting part of God's creation to study. The study of the earth is called geology, and scientists who study the earth are called geologists. One of the things that *geologists* study is the *structure* of the earth. For example, they are interested in the size and shape of the earth. They also want to know more about the surface of the earth and what causes differences in the features of the earth's surface. They are also interested in what lies below the surface of the earth. All of these areas deal with the structure of the earth.

In this section of the LIFEPAC, you will learn more about the main features of the earth: its size, shape, and surface contours. You will also learn about the different layers of the earth and what lies below the surface of the earth. Finally, you will learn more about the kinds of rocks that are part of the surface of the earth and how to identify these rocks.

Objectives

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

1. Describe the earth's surface features.
2. Identify the main parts of the earth.
3. Describe the types of rock in the earth.

Vocabulary

Study these new words. Learning the meanings of these words is a good study habit and will improve your understanding of this LIFEPAC.

aggregates (ăg′ rĭ-gĭts). A clustered mass of individual particles held together. Rocks are aggregates of minerals.

cleavage (klē′ vj). The way in which something splits apart.

conglomerate (kən glom′ ər ət). Something made up of several different materials, such as a rock made up of different kinds of pebbles.

core (kôr). The central part of something. The part that is located at the center.

crust (krust). The outside rock layer that covers the earth.

dense (dens). Thickly or tightly packed together.

element (el′ə mənt). A basic substance made of atoms that are chemically alike.

equator (i kwā′ tər). An imaginary circle around the earth exactly halfway between the poles of the earth.

geology (jē ol′ə je). The study of the earth, both its physical parts and its history

granite (gran′ it). A very hard rock made of small particles of igneous rocks.

igneous (ig′ nē əs). Formed by great heat or actions of volcanoes.

landforms (land′ formz). The physical features of the earth. Mountains, valleys, and hills are landforms.

luster (lus′ tər). Degree of brightness of shine on a surface.

magma (mag′ mə). Melted material usually found deep inside the earth. It is made up of minerals.

mantle (man′ tl). The earth layer just below the crust.

metamorphic (met ə môr′ fik). Description of something that has changed form. A rock that has changed from one form to another.

minerals (mĭn′ ər-əls). The common solid materials found on Earth that make up rock. Their atoms are usually arranged in a regular pattern and form crystals.

pressure (presh′ ər). The force of weight pushing against or squeezing something.

sedimentary (sed ə men′ tər ē). Formed as materials settled to the bottom of a liquid.

silt (silt). Very fine mineral particles.

Note: *All vocabulary words in this LIFEPAC appear in* **boldface** *print the first time they are used. If you are unsure of the meaning when you are reading, study the definitions given.*

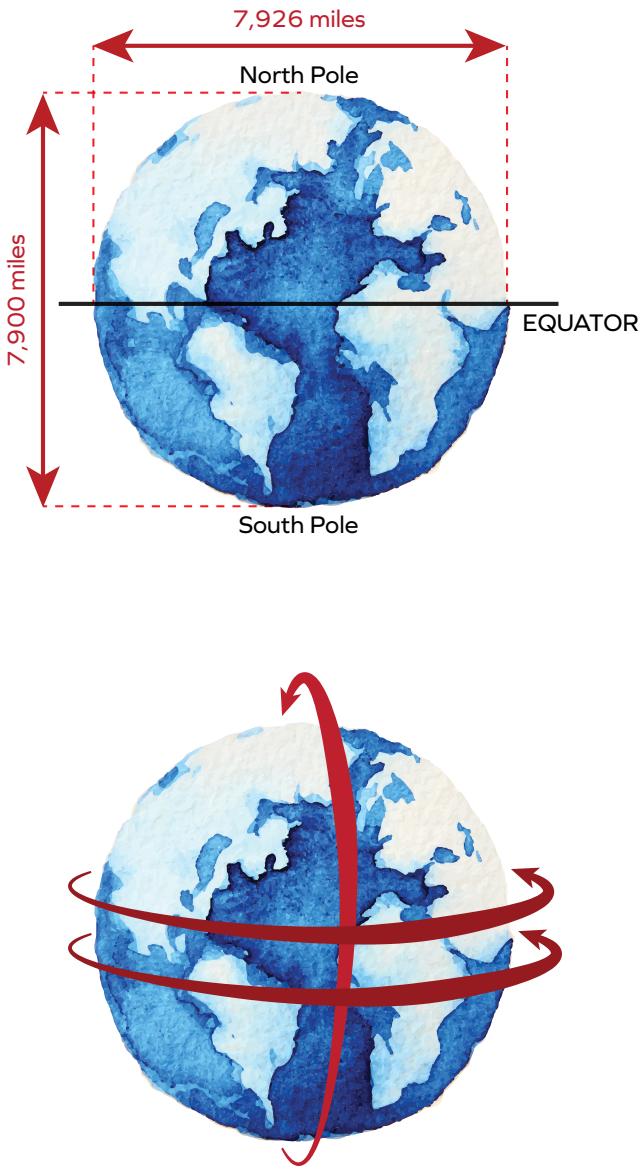
Pronunciation Key: h**a**t, **ā**ge, c**ã**re, f**ä**r; l**e**t, **ē**qual, t**ė**rm; **i**t, **ī**ce; h**o**t, **ō**pen, **ô**rder; **oi**l; **ou**t; c**u**p, p**ů**t, r**ü**le; **ch**ild; lo**ng**; **th**in; /ŦH/ for **th**en; /zh/ for mea**s**ure; /u/ or /ə/ represents /a/ in **a**bout, /e/ in take**n**, /i/ in penc**i**l, /o/ in lem**o**n, and /u/ in circ**u**s.

Features of the Earth

Viewed from space, the earth appears as a large sphere (ball). It has vast patches of white clouds, blue oceans, and brown and green land areas. At the top of the earth is the North Pole, and the South Pole is near the bottom of the earth. The white areas surrounding the poles are large ice-covered landmasses. This view of the earth from space, showing its overall structure, is truly beautiful. Let's consider some details about the overall structure of the earth.

Size and shape. The earth is shaped like a large sphere. However, the earth is not perfectly round. It is slightly flattened at the poles. This means that the diameter of the earth measured from the North Pole to the South Pole is slightly less that the diameter across the middle of the earth at the **equator**. From pole to pole, the diameter of the earth is about 7,900 miles (12,714 kilometers). At the equator, the diameter of the earth is about 7,926 miles (12,756 kilometers). Therefore, the distance from pole to pole is 26 miles (42 kilometers) less than the diameter of the earth at the equator. This is why the earth is actually slightly flattened at the poles, although it may look perfectly round when viewed from far away in space.

In the same way, the distance around the earth is shorter at the poles than at the equator. At the poles, the earth is 24,860 miles (40,008 kilometers) around. At the equator, it is slightly greater: 24,902 miles (40,075 kilometers) around. However, the equator is not actually the "fattest" part of the earth. The distance around the earth is greatest along a circle slightly south of the equator. Therefore, the earth's shape is a little like a pear, which has its fattest part just below its middle. But this bulge in the earth's shape is so small that the earth still looks like a perfectly round sphere when viewed from space.



| The Size and Shape of the Earth Vary Slightly. The "fattest" part of the earth from north to south is 24,860 miles around, and from east to west is 24,902.

It is interesting that long ago, some people thought that the world was flat. Unlike people today, they had no way to get above the surface of the earth to see it from afar. Furthermore, no one had traveled around the earth at that time to tell of its shape. People had no instrument to examine the shape of the earth. On the surface, the earth looked pretty flat, so it was easy to believe that the earth was flat.

| Today, an airplane can fly around the world in less than two days.

As time went on, people began to think of the earth as ball-shaped. They began to gain enough information to show that the earth was round. Finally, from 1519 to 1522, one of the five ships and crew that were in an expedition to the spice islands of South East Asia started by the explorer Ferdinand Magellan sailed completely around the world, proving the earth was round. After that, people began to think of the earth with new understanding.

The great size of the earth surprised most people. Most people were not aware of all the land areas of the world. They were also surprised by the large size of the oceans of the world, especially the Pacific Ocean. People thought the earth was smaller than it really was. Even Christopher Columbus believed the earth was smaller. When he reached America, he thought he had landed in India.

Today, it is common to think of a round earth. In fact, you have probably seen globes of the earth showing that the earth is a round sphere. You have probably also seen many pictures of the earth from space, showing that the earth is round. Most of the earth's surface has been explored today. All of this evidence makes it easy for us to accept that the earth is round.

In some ways today, people are beginning to think of the earth as "smaller." Even though the physical size of the earth is the same, it takes far less time to travel around the earth today. Magellan's original voyage around the earth took almost three years. Today, a jet airplane can travel around the world in less than two days. And astronauts can circle our earth in space in about 90 minutes! Furthermore, our modern communications allow us to be instantly in touch with people and events around the earth. For all of these reasons, we think of the earth as "smaller" today than it was a century or two ago.

Write *true* or *false*.

1.1 _____ Viewed from space, the earth looks like a large sphere.

1.2 _____ The earth is slightly flattened at the poles.

1.3 _____ The distance around the earth is the same at the poles and at the equator.

1.4 _____ The diameter of the earth at the equator is about 7,926 miles.

1.5 _____ People long ago knew that the earth was round.

1.6 _____ A ship of Christopher Columbus was the first to sail around the earth.

1.7 _____ In some respects, people today view the earth as "smaller" than it was a century ago.

Landforms. When we view the earth near its surface, we see that the surface of the earth has many **landforms**. Hills, valleys, mountains, rivers, and plains are examples of different landforms. Other landforms include oceans, mesas, volcanoes, and gorges. Perhaps you have been on a mountain or seen an ocean. It is likely that you live near a lake or river. You live on and near various kinds of landforms.

People who climb mountains are often amazed by the great height of the peaks. Deep ocean floors are more than three and a half miles below the surface, with the deepest point—the Challenger Deep southwest of Guam—being almost seven miles down. It seems that the surface of the earth is not smooth at all. Landforms, such as the tallest mountains and the deepest parts of the ocean, can be very large when viewed close-up.

Globes are smooth. Pictures taken from outer space do not show great differences on the earth's surface. How can this be? The landforms are tiny when compared to the *total* earth surface. A piece of dust on a globe might compare to the highest mountain. A drop of water would be deeper than the deepest ocean. The earth is actually a smooth planet. Humans are so much smaller than landforms that small differences appear great to us.

Although the basic size and shape of the earth remain the same, the earth's landforms are constantly changing. Some changes happen slowly and others occur very suddenly. The changes in the earth's surface are important to us because they affect our lives and give us clues about the history of the earth.

508.A COMPARE AN ORANGE AND THE EARTH

You will view an orange at a distance and then close-up. Then you will compare what you see with landforms of the earth.

View 508 COMPARE AN ORANGE AND THE EARTH: Grade 5 Science experiments video

These supplies are needed:

orange
magnifying glass

Follow these directions carefully. Put a check in the box after each step is completed.

- ☐ **1.** Place the orange on a table about 10 feet (3 meters) from you.
- ☐ **2.** Sketch what you see in Figure 1. (Do not use the magnifying glass in this step.)
- ☐ **3.** Bring the orange to your desk.
- ☐ **4.** Observe it with the magnifying glass.
- ☐ **5.** Sketch what you see in Figure 2.

| Figure 1

| Figure 2

Teacher check:

Initials _____ Date _____

Answer these questions.

1.8 List some likenesses in your observations. _____

_____

_____

1.9 List some differences in your observations. _____

_____

_____

1.10 Why were there differences in the two observations? _____

_____

_____

1.11 Compare this observation with the earth and its landforms.

_____

_____

_____

_____

Complete this activity. Many landforms have names. For example, the Atlantic Ocean is a large body of water off the east coast of the United States. Write the names of famous landforms after the clues. You may use an atlas, other books, or the Internet to help in this activity.

1.12 High, rocky range in Colorado. _____

1.13 Deep river valley in northern Arizona. _____

1.14 Large level area in central United States. _____

1.15 Large body of water on the western border of Oregon. _____

1.16 Long, wide river valley from Minnesota through Louisiana.

_____

1.17 Body of water bordering Texas, Louisiana, Mississippi, Alabama, and Florida.

_____

1.18 Honolulu is located on one of these landforms. _____

1.19 Low mountains reaching from Georgia to Pennsylvania.

_____

Use the Bible. Landforms are mentioned many times in the Bible. Sometimes the way they were formed is explained. Some verses compare certain landforms to something or someone else. Complete the following activities with a friend.

Friend's name _____

1.20 Read Psalm 125:1–2. Discuss it together. How did the author use landforms to explain his ideas? _____

_____

_____

1.21 Read Deuteronomy 11:10–12. What landforms did the new land have?

_____

1.22 In Matthew 5:14, Christ used a landform to explain something important. What was He telling about? _____

_____

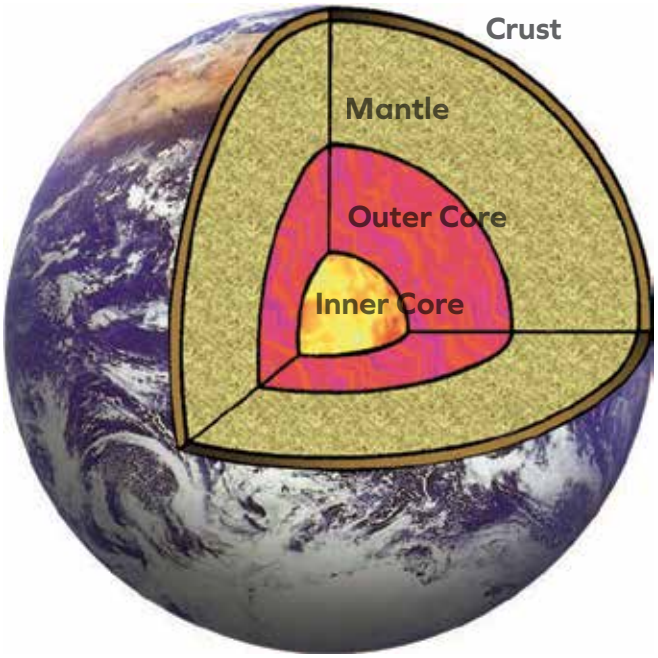
1.23 Find another Bible passage where a landform is used to help explain ideas. Passage: _____ Tell how the landform helped explain the idea. _____

_____

_____

Layers of the Earth

The earth is round, large, and has landforms. These features help describe the earth, but what is the earth made of? Is it a solid sphere composed of water, soil, and rocks? The surface is important. The parts of the earth beneath the surface are also important.



| Layers of the earth

Crust. The earth is made of several layers. The outer layer is known as the **crust**. Rocks and soil on the surface are part of the crust. Under the earth's land areas is a type of rock called **granite**. Granite is part of the crust layer. The crust is not the same depth all over the earth. The depth ranges from five to twenty miles (8 to thirty-two kilometers). The crust may seem like a deep layer to us. When compared to the whole earth, the crust is very thin. The crust supports all life on Earth.

The materials of the crust have less *mass* than the materials deeper in the earth. Scientists think that gravity pulls the heaviest material toward the center of the earth. The materials having less mass are left at the surface. Scientists also believe that the rocks of the crust are harder than the rocks deep in the earth.

Write the correct answer on each line.

1.24 The crust could be as deep as thirty-two _____ thick.

a. kiloliters b. meters c. kilometers d. centimeters

1.25 The materials in the crust probably have less _____ than those inside.

a. color b. mass c. strength d. height

1.26 The _____ of the earth is not part of its crust.

a. center b. surface c. water d. landforms

1.27 The Grand Canyon is a _____ .

a. ocean b. volcano c. mountain d. landform

1.28 No _____ exists below the crust.

a. life b. mass c. rock d. layers

Mantle. The layer below the crust is a thick layer of rock called the **mantle**. The mantle is much thicker than the crust. the mantle is thought to be about 1,800 miles (2,900 kilometers) deep.

No one has been inside the mantle because it is too far below the earth's surface. Scientists use special instruments to learn more about the earth's deeper layers. They have found that rocks in the mantle are very hot. The weight of the crust causes much **pressure** on the mantle. This pressure causes heat to build up. Some scientists also believe that chemical actions of certain rocks produce heat.

The rocks in the mantle are heavier than those in the crust, but they are not as hard. They are *not* connected in a solid mass. Filling the spaces between the rocks is a material called **magma**. Magma is a hot, melted material. Scientists believe the hot rocks of the mantle can shift. Sometimes the crust changes as a result of this movement.

Complete these statements.

1.29 The crust is _____ than the mantle.

1.30 A hot material in the spaces between mantle rocks is _____ .

1.31 The mantle's rocks are heated by _____ on them.

1.32 Changes in the crust can happen if the mantle _____ .

Complete this activity. Some words have several meanings. You have been using words that have more than one meaning. The dictionary tells how the meanings differ. Use the dictionary to help you find a different meaning for each of the following words. Then write a complete sentence using the new meaning.

1.33 mantle _____

_____

1.34 pressure _____

_____

1.35 gravity _____

_____

1.36 crust _____

_____

1.37 space _____

_____

1.38 mass _____

_____

Core. The earth's center is known as the **core**. It is surrounded by the mantle. The part of the core nearest the mantle is the *outer* core. At the very center of the earth is the *inner* core. Scientists believe the inner core is much different from the outer core.

The core is thought to be made of iron and nickel. This core material is probably melted in the outer core. Studies of the earth show that earthquakes send shock waves through the outer core. These waves move as if they were traveling through a thick, hot liquid. If the outer core is a melted mass, it would be able to flow slowly. Evidence shows that there are no solid rocks in the outer core. The outer layer of the core is about 1,400 miles (2.250 kilometers) thick.

The inner core is considered to be solid. Great pressure from the outer core, mantle, and crust seem to force the materials into a **dense** ball. The inner core is nearly 1,600 miles (2,600 kilometers) thick. Scientists believe the inner core is very hot—the temperature may be as high as 9,000 degrees Fahrenheit (5,000 degrees Celsius).

Match these items.

1.39 _____ very thin

1.40 _____ inner and outer

1.41 _____ at the surface

1.42 _____ between the center and surface

1.43 _____ earth's center

1.44 _____ melted iron and nickel

1.45 _____ magma flows between rocks

1.46 _____ soil and rocks usually are not melted

a. crust

b. mantle

c. core

1.47

Write a summary.

Sometimes it is important to write a summary of written items. To write a summary, you need to choose the most important ideas. Then write these ideas in a shortened form. Often a single paragraph can be used as a summary of several pages of a book.

In this activity, reread the section, "Layers of the Earth." Then write a paragraph as a summary for that section. (Write a first draft on another piece of paper before copying it into the LIFEPAC.)

Teacher check:

Initials _____ Date _____

Rocks on the Earth's Surface

The earth's crust is mostly made of rocks. They make up the hard, solid part of the earth. In most places, the rock of the earth is covered by a layer of soil. Trees, plants, and other living organisms usually grow in the soil, but sometimes they also grow on rock or in the cracks of rock. Soil itself is usually made up of tiny bits of rock combined with other organic materials from decayed plants and animals. Rock lies beneath the oceans, lakes, and rivers of the earth. Rock is also located under the polar icecaps.

Perhaps you have noticed as you travel on highways cut through the hills and mountains that there are different layers of rock exposed. Also, layers of rock can be observed where rivers have cut through rock to form canyons. The Grand Canyon in the United States is one of these places where many layers of rock are seen. There are also great cliffs of rock on seashores in places like Maine, or in countries like England and Norway. Even in some desert regions, rock cliffs and pinnacles of rock may be found among the vast stretches of sand.

| Layers of the Grand Canyon

What are rocks? Rocks are mostly **aggregates**, or combinations, of one or more **minerals**. The minerals in rock vary from rock to rock, producing different types of rock. You will learn more about the different types of rock later in this section of the LIFEPAC. However, the minerals themselves vary considerably. Before discussing the different types of rock, let's find out more about minerals.

Minerals. Every rock has minerals. Some rocks are made of several different types of minerals. There are about 3,000 different types of minerals, but only about 100 minerals are commonly found. Minerals include such common ones as rock salt and pencil "lead," and such rare

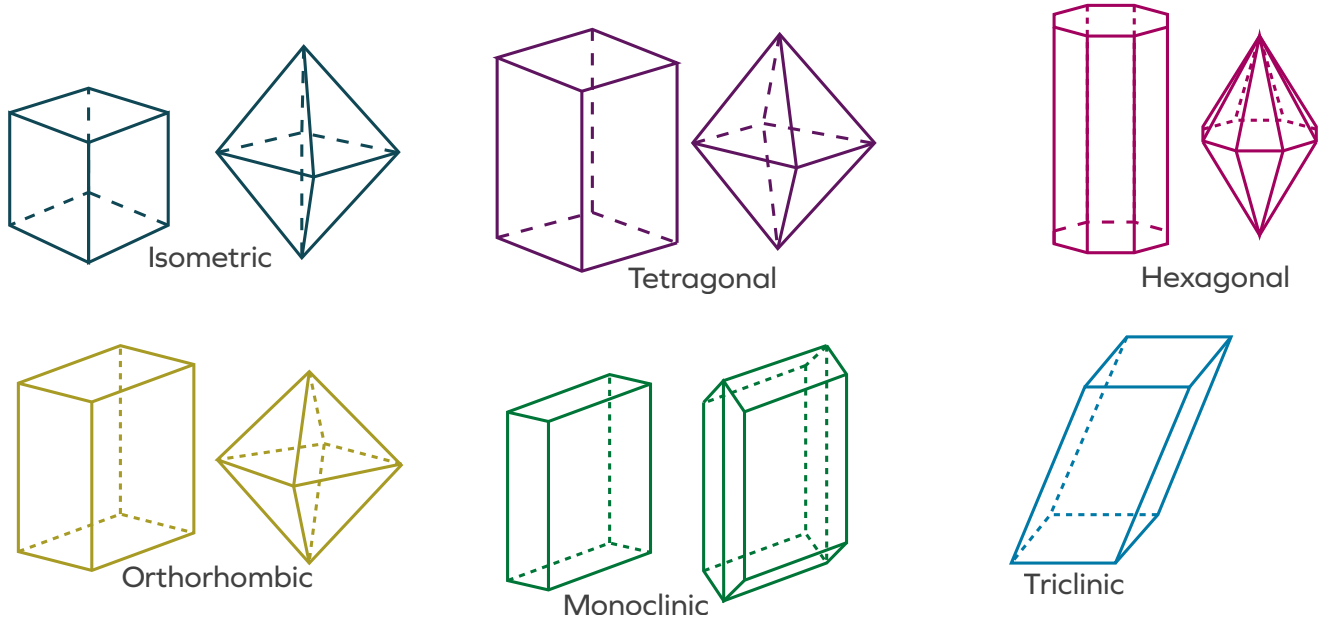
minerals as gold, silver, and gems.

People who study minerals (*mineralogists*) use the term mineral to describe a substance that has four features. (1) A mineral is found in nature. Synthetic or man-made substances are not minerals. (2) A mineral has the same chemical makeup wherever it is found on the earth. Sand is not a mineral because samples of sand from different places on the earth have different chemical makeups. (3) The atoms of a mineral are arranged in a regular pattern and form solid units called *crystals*. Crystals have special forms and have flat sides called *faces*. Most crystals have six faces, but some have eight. There are six main kinds of crystals. (Some scientists split one of these kinds into two different ones, making a total of seven kinds of crystals.) (4) Almost all minerals are made up of substances that were never alive. The exceptions have undergone a transformation from living things to minerals over many years.

As you learned in a previous LIFEPAC of this Science series, living things contain minerals. When the living things die, the minerals can return to the earth. They are part of the *chemical cycle*. In Genesis 3:19, the Bible tells us, "…for dust thou art, and unto dust shalt thou return." A bone from a cow is not a mineral, but the cow's bone would contain minerals as part of it. If the bone decayed, the minerals in the bone would return to the earth.

Many minerals are actually **elements** that are found in nature. Copper is an element. Copper is also a mineral. The elements iron, tin, gold, silver, lead, and zinc are also minerals. All of these minerals can be found in rocks.

Laboratory tests can help identify the minerals contained in rocks. There are also other tests that can be used to identify minerals. Minerals' color, **luster**, streak, hardness, and **cleavage** are used to help identify them. (You will learn more about these characteristics of minerals later in this section of the LIFEPAC.)



| Six main kinds of crystals

Complete this activity. Some of these items are minerals. Others are not minerals. Circle the items that are minerals. For those items that are not minerals, tell why they are not.

1.48 oak leaf _____

1.49 aluminum _____

1.50 nickel _____

1.51 plastic bag _____

1.52 pencil "lead" _____

1.53 apple _____

1.54 sand _____

1.55 iron _____

1.56 sulfur _____

1.57 acorn _____

Teacher check:

Initials _____ Date _____

508.B EXAMINE A MINERAL

View 508 EXAMINE A MINERAL: Grade 5 Science experiments video

You will examine a commonly found mineral—table salt—with a magnifying glass.

These supplies are needed:

small amount of table salt
colored paper
magnifying glass

Follow these directions carefully. Check the box when each step is completed.

- ☐ **1.** Sprinkle a small amount of salt on the colored paper.
- ☐ **2.** Use the magnifying glass to examine the salt.
- ☐ **3.** Draw one piece of salt in the box at the side.

Teacher check:

Initials _____ Date _____

Write the correct answer on each line.

1.58 The salt was shaped like a _____ .

a. crystal b. ball c. star d. sphere

1.59 It had _____ sides.

a. curved b. fat c. flat d. crooked

1.60 Each piece of salt had _____ sides.

a. six b. eight c. thirteen d. ten

1.61 Salt is _____ , and is likely to be found in limestone.

a. found in nature b. man-made

c. made from living things d. dense

Kinds of rocks. All rocks are different. Shape and size are often the most obvious differences. Crystal structure and patterns also make them different. Some rocks contain different minerals than others. All rocks can be grouped into three main kinds of rocks. They are **sedimentary**, **igneous**, and **metamorphic**. The mature earth God created may have had each of these kinds in it. Since then, some rocks change and new ones form.

| Layers of sedimentary rock

Sedimentary. The sedimentary rocks are the most common rocks on the earth's surface. Sedimentary rocks are formed by natural forces. Sediment builds up on the earth. Rock chips, soil, **silt**, and other minerals form these sediments. Often water or air moves sediment to new areas. The sediments may pile up in low or protected places. After a while the pressure of water or other sediment forces the lower sediment together. Water carries natural cements through the sediments. This cement glues the sediment together and it hardens into rock.

Many of our sedimentary rocks were probably formed at the time of the Flood. The water that covered the whole earth probably carried many sediments that became rock. Today sedimentary rocks form very slowly.

Sedimentary rock is found in *layers*. The layers look like they were built one by one on top of another. Some of the layers appear very thin. Other layers seem very thick. Even within one small rock, layers can be seen.

| Conglomerate rock

Shale is a very common sedimentary rock made of very tiny grains of clay. Since the grains of clay are small and light, they are found under quiet water. *Sandstone* is similar to shale, but it contains larger grains of sand. Sandstone is found near shores and in valley floors. **Conglomerate** is a sedimentary rock formed when a mass of large pebbles are cemented together.

Limestone is formed from a dissolved mineral known as lime. Sometimes clays are mixed with lime. Most limestone is found in warm seawater or where a sea was once located. Coral and chalk are types of limestone.

Complete this activity.

1.62 Identify the "sediments" as either conglomerate, shale, or sandstone by writing the term under each box.

1.63

Complete this activity.

The following rocks contain interesting elements. Instead of minerals, these elements are really other words we use for rock. The words are not written correctly. They are jumbled. Your task is to write them the correct way. Notice the beginning letter is in boldface (ck**r**o = rock).

a. note**s** _____

b. beel**p**b _____

c. lit**s** _____

d. dan**s** _____

e. re**b**loud _____

f. var**g**el _____

g. blobe**c** _____

Teacher check:

Initials _____ Date _____

Igneous. Heat and pressure can force magma toward the earth's surface. When magma gets near enough to the surface to cool down, it forms igneous rock. Sometimes magma pours out onto the surface through volcanoes and cools rapidly. If gas is in the magma, it produces a light, bubbly igneous rock. Magma does not always reach the surface. Beneath the surface, it cools more slowly, forming large crystals. The slowest cooling magma forms the largest crystals. Two common igneous rocks are granite and basalt.

Metamorphic. A third kind of rock is the metamorphic rock. Heat and pressure can cause a rock to change from one form into another. The rock produced by the change is termed metamorphic. Both igneous and sedimentary rocks can be changed to metamorphic rock.

The change to a metamorphic rock is both a physical and chemical change. The physical change causes the rock to look different from before. You have learned that a chemical change causes a new material to form. A new rock that looks different and has different minerals is formed. Some more common metamorphic rocks include slate and marble. Each metamorphic rock comes from a certain type of rock. Marble was once limestone. Slate was formed from shale. Neither marble nor slate would come from any other rocks.

Match these items.

1.64 _____ slate

1.65 _____ from packed clay

1.66 _____ has bits of sand

1.67 _____ was once shale

1.68 _____ cooled magma

1.69 _____ quartz

1.70 _____ limestone

1.71 _____ chemical change is important

1.72 _____ settling is important

1.73 _____ chalk

1.74 _____ most of surface rocks

1.75 _____ granite

1.76 _____ can come from volcanoes

1.77 _____ conglomerate

a. sedimentary rock

b. igneous rock

c. metamorphic rock

Identifying rocks. People have identified rocks for many years. Certain rocks were considered precious. Other rocks were used for tools. Today we have many reasons to identify rocks. Jewelry is often made from rare rocks. Metals from rocks are used for many things. Useful items come from iron. Money and jewelry are made from gold and silver. Some people make stone fireplaces. Limestone is used by farmers to improve the soil. Identifying rocks is important to help us understand the earth's history.

How can you identify rocks? You have learned that rocks can be placed in three main groups. It is easy to learn which rocks fit in these groups, but it is difficult to be more detailed. The variety of rocks is great.

Several things can help identify rocks. Guidebooks and encyclopedias give clues and data about many rocks. Today, there is also a great amount of information about rocks, minerals, and gems on the Internet. Information from all of these resources can be used to help identify rocks.

| Geologist examining luster of a rock

Knowledge of where rock deposits are located can also help in identifying rocks. Rocks can be seen in many places. Road cuts, mines, beaches, and deserts are common sites for rocks. Mountainsides, stream beds, and other landforms provide many different rocks. Sometimes these landforms are sources for information. Large areas may show layers or other deposits. Rocks that are too big to move can be identified and grouped also.

Finally, simple ways to *test* rocks can be used to identify them. There are five basic physical tests that are useful for rocks. One physical test for rocks is to check their *color*. Certain kinds of rocks always have a similar color. Other kinds of rock may vary in color.

Another test involves studying the rock's *luster*. *Luster* is how light reflects from the rocks' surfaces. Some rocks have a dull luster. A metal-like luster may be seen in other rocks.

A third test considers a rock's *streak*. The mark left by rubbing a rock against a very hard surface is called *streak*. The amount of the rock left on the hard surface and the color of the mark help identify the rock.

The *hardness* of a rock can also be tested. Any soft rock can be scratched by one that is harder. Diamond is the hardest rock. A diamond will scratch all other rocks. Lists of hardness can be found in guidebooks.

The fifth simple test to help identify rocks is *cleavage*. Rocks have different ways of splitting or cracking known as *cleavage*. Certain rocks break into blocks. Some have a grain like surface when they split. Sometimes curved surfaces are left on rocks after they are broken. Still other rocks split into flat sheets.

Complete this list.

1.78 List five physical tests for identifying rocks.

a. _____

b. _____

c. _____

d. _____

e. _____

Use the library or Internet.

You will need a friend for this activity.

Friend's name _____

The following list includes names of many rocks. Your partner and you should each choose one rock to learn about.

obsidian	marble	albite	steatite
mica	galena	pyrite	mercury
topaz	apatite	tufa	jasper
calcite	garnet	diopside	gneiss

My choice: _____ Friend's choice: _____

Use the library or Internet to get as much information as you can about your rock. Then answer the following questions.

1.79 What are some important characteristics of your rock?

_____

_____

_____

_____

_____

1.80 How is your rock similar to your partner's rock? _____

_____

_____

_____

_____

1.81 How is your rock different from your partner's rock? _____

_____

_____

_____

_____

Teacher check:

Initials _____ Date _____

Go on a rock hunt.

1.82 Here are several activities that will help you learn more about rocks. They can be done at home. (You may get someone there to help you.) Choose at least one of these things to do. Put a check next to the activity you choose. After you make your choice, take this page to your teacher. Discuss your decision with your teacher before starting to work. Select a goal for the completion date.

_____ _____

goal date actual completion date

☐ **1.** Choose a natural rock deposit near your home. It may be a roadcut, stream bed, cliff, or large rock. Draw a diagram of the deposit on poster paper. Include written explanations. Bring the poster to school for display.

☐ **2.** Hunt for ten rocks you think are different kinds. Try the "hardness test" on your rocks. Hardness is a measure of how easy it is to scratch a mineral. Soft rocks can be scratched with your fingernail. Harder rocks are scratched by a steel knife, blade, or pin, and the hardest rocks resist scratching by all materials except diamond—the hardest mineral known to man. Place them in order from softest to hardest. Number them from one to ten. Glue these rocks to a piece of cardboard for display at school.

☐ **3.** Find as many different kinds of rocks as possible. Use a guidebook to help you identify them. Using paper or cardboard, make a display of your rocks. Glue them to the display paper and write their names next to the rocks. You might also include an interesting fact about each rock. Find a place to display your project.

Teacher check:

Initials _____ Date _____

Review the material in this section to prepare for the Self Test. The Self Test will check your understanding of this section. Any items you miss on this test will show you what areas you will need to restudy in order to prepare for the unit test.

SELF TEST 1

Match these items (each answer, 3 points).

1.01 _____ a large sphere

1.02 _____ Magellan

1.03 _____ diameter at poles

1.04 _____ landforms

1.05 _____ mantle

1.06 _____ core

1.07 _____ minerals

a. hills, valleys, rivers, plains

b. layer below crust

c. at earth's center

d. earth viewed from space

e. commanded first ship to sail around earth

f. about 3,000 types

g. a common sedimentary rock

h. discovered America

i. 7,900 miles

j. 24,902 miles

Answer *true* or *false* (each answer, 2 points).

1.08 _____ People long ago thought the earth was flat.

1.09 _____ The earth is perfectly round at the poles.

1.10 _____ You would have to travel some distance to see a landform.

1.011 _____ Granite is part of the crust layer of the earth.

1.012 _____ The materials of the crust have less mass than materials deeper in the earth.

1.013 _____ The outer layer of the earth's core is about 1,400 miles.

1.014 _____ Sand is an example of a mineral.

Draw this diagram (this answer, 5 points).

1.015 Draw a diagram of the earth. Label the main parts using these terms: *inner core, outer core, mantle, crust*.

Write the correct answer on each line (each answer, 3 points).

1.016 _____ is a very common sedimentary rock made of tiny grains of clay.

a. Limestone b. Slate c. Shale d. Granite

1.017 Many sedimentary rocks were probably formed at the time of _____ .

a. Earth's creation b. the Flood
c. Adam d. Abraham

1.018 Marble rock was once _____ .

a. shale b. limestone c. granite d. wood

1.019 One physical test for rocks is to check their _____ .

a. size b. weight c. color d. flatness

1.020 Melted rock from a volcano is called _____ .

a. lava b. magma c. strength d. faulting

1.021 The earth's landforms are _____ .

a. always the same b. constantly changing
c. very rare d. mainly mountains

1.022 _____ have special forms and have flat sides called *faces*.

a. Landforms
b. Crystals
c. Aggregates
d. Elements

Complete these activities (each answer, 3 points).

1.023 Name three landforms.

a. _____
b. _____
c. _____

1.024 List five physical tests for identifying rocks.

a. _____
b. _____
c. _____
d. _____
e. _____

Answer these questions (each answer, 5 points).

1.025 How are igneous rocks formed? _____

_____

_____

1.026 How are metamorphic rocks formed?_____

_____

_____

1.027 How are sedimentary rocks formed?_____

_____

_____

Teacher check: Initials _____

Score _____ Date _____

80/100

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