7-1 What are folds and faults?

Objective Compare folding and faulting in the earth's crust.

TechTerms

- **anticline** (AN-tih-klyn): upward fold
- **fault:** break in the earth's crust along which movement has occurred
- **fracture** (FRAK-chur): break in a rock
- **syncline** (SIN-klyn): downward fold

Folding Over millions of years, pressure in the earth's crust caused sedimentary rock layers to bend, or fold. Flat rock layers were squeezed from the sides. The pressure caused the flat rock layers to move into new positions without breaking. The rocks may have cracked, but the rock layers stayed together.

Folds look like waves in rock layers. The layers curve up in some places. An upward fold is an **anticline** (AN-tih-klyn). A downward fold is a **syncline** (SIN-klyn). Some folds are small enough to be seen in a small rock. Other folds are very large. You often can see anticlines and synclines in road cuts.

Describe: What is a fold?

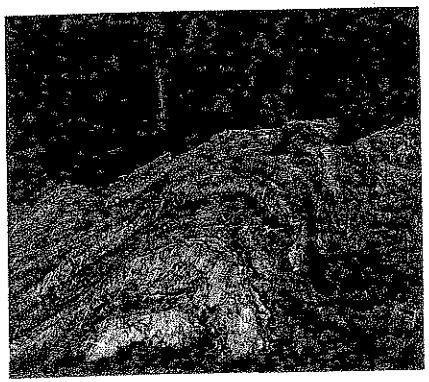


Figure 1 Folding rock layers

Faulting Pressure deep inside the earth can break rocks. A break in a rock is called a **fracture** (FRAK-chur). If the rocks on either side of a fracture move, the break is called a **fault.**

Four kinds of faults are shown in Figure 2. Faulting causes rocks to move up and down or side to side. The rock layers move only a short distance. Each time movement along a fault occurs, the rock layers move farther apart. The pressure eases. When the pressure builds up again and is released, movement occurs again.

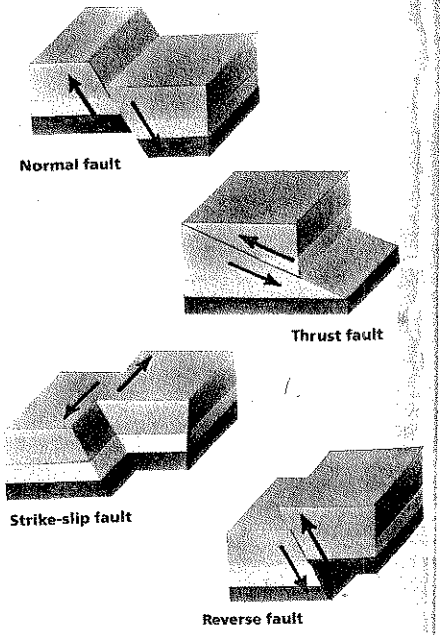


Figure 2 Faults

Observe: How do the rock layers move along a strike-slip fault?

Name _____ Class _____ Date _____

7-1 What are folds and faults?

Lesson Review

Use the diagrams to answer the questions. Write your answers in the provided spaces.

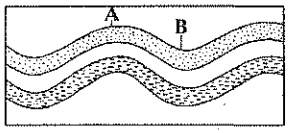


Figure 1

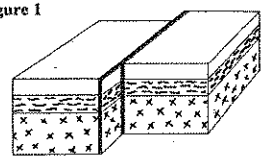


Figure 2

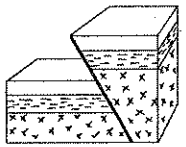


Figure 3

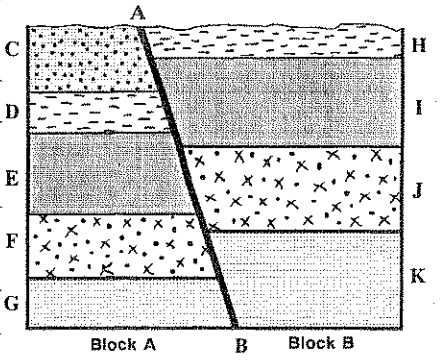
1. What is shown in Figure 1? _____
2. What is shown in Figures 2 and 3? _____
3. In which diagram(s) has fracture occurred? _____
4. What is shown by label A in Figure 1? _____
5. What is shown by label B in Figure 1? _____
6. In which direction have the rock layers in Figure 2 moved, side-to-side or up-and-down? _____
7. In which direction have the rock layers in Figure 3 moved, side-to-side or up-and-down? _____
8. What kind of fault is shown in Figure 3? _____
9. What is an anticline? _____
10. What is a syncline? _____

Skill Challenge

Skills: *interpreting a diagram, inferring*

Use the diagram to answer the following.

1. What is line AB called? _____
2. In which direction did the rock layers move? How do you know? _____
3. Which layer in Block A does not have a matching layer in Block B? _____
4. How can you explain the missing layer from Block B? _____



7-2 What are mountains?

Objective ▸ Identify the organization of the world's mountain systems.

TechTerm

▸ **elevation** (el-uh-VAY-shun): distance above or below sea level

Mountains A mountain is a landform that reaches a high **elevation** (el-uh-VAY-shun). Elevation is the distance above or below sea level. For a hill or mound of land to be classified as a mountain, its summit, or top, must be at least 600 m higher than that of the surrounding land.

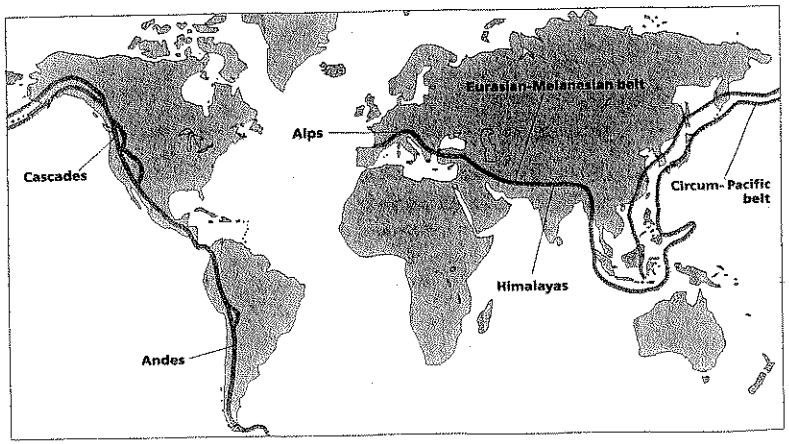
Compare: How does the elevation of a mountain compare with the elevation of the surrounding area?

Young and Old Mountains Mountains, like rivers, can be described in three stages. The three stages are young, mature, and old. A young mountain has a steep slope. Its peaks are sharp and jagged. The valleys in young mountains are narrow. As a mountain becomes mature, the peaks are worn down by weathering. Weathering makes the peaks rounded. The slopes become less steep and more gentle. As the mountain becomes old, its peaks become almost flat. There are no jagged peaks. An old mountain looks like rolling hills. The valleys in old mountains are wide.

Classify: The Appalachians have very rounded peaks. Are these mountains young or old?

Mountain Systems Most mountains do not stand alone. They are part of a group of mountains. A group of mountains with the same general shape and structure is called a mountain range. For example, Mount St. Helens in Washington State is part of the Cascade range. Groups of mountain ranges form mountain systems. The Appalachian mountain system is in the eastern United States. The Blue Ridge and Great Smokey mountain ranges are part of the Appalachian system. Mountain systems make up mountain belts. There are two major mountain belts. Look at the mountain belts on the map.

Observe: What are two major mountain belts?



Name _____ Class _____ Date _____

7-2 What are mountains?

Lesson Review

Complete the table by placing a check mark in the correct column or columns.

Table 1 Classification of Mountains

Characteristic	Young	Mature	Old
1. Wide valley			
2. Sharp, jagged peaks			
3. Gentle slope			
4. Elevation greater than 600 meters			
5. Narrow valleys			
6. Rounded peaks			
7. Almost flat peaks			
8. Looks like rolling hills			

Skill Challenge

***Skills:** calculating, analyzing, applying concepts*

Use the diagrams to complete the following.

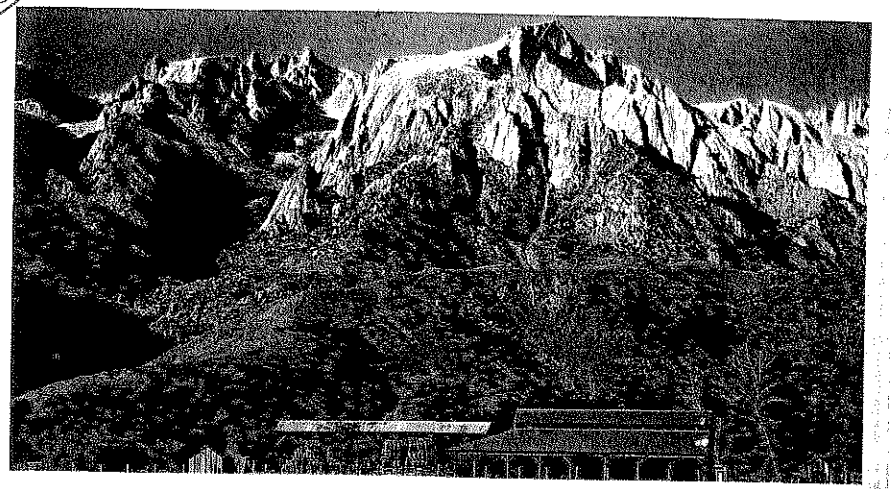
Landform A **Landform B** **Landform C**

1. Label the summit and valley on Landform A.
2. Calculate the height of each landform. Use the scale of 1 cm = 200 m.

   A = _____ m B = _____ m C = _____ m
3. Which of the landforms shown are mountains? Explain. _____
4. Which landform shown is not a mountain? Explain. _____
5. Which landform is a young mountain? _____
6. Which landform is an old mountain? _____

# of mountains?

7-3



Objective ▸ Identify three types of mountains and how they were formed.

Folded Mountains Mountains formed by the folding of rock layers are called folded mountains. Most folded mountains formed when the continents collided. The movements of the continents squeezed rock layers together. Over millions of years, the pressure built up. The rock layers of the crust buckled and folded. Large upfolds, or anticlines, formed folded mountains. The largest mountains in the world are folded mountains. The Himalayas and Urals are folded mountains. In the United States, the Appalachian mountains are folded mountains.

Describe: How are folded mountains formed?

Fault-block Mountains You may recall that fractures can form in the earth's crust. These fractures may break the crust into large blocks. Sometimes faulting lifts these large blocks. One side of the fault slips up past the crust on the other side. If the blocks are pushed up enough, a mountain is formed. Mountains formed in this way are called fault-block mountains. The Grand Tetons in Wyoming are fault-block mountains. The Sierra Nevadas in California also are fault-block mountains.

List: Name two fault-block mountains in the United States.

Dome Mountains Some mountains form when hot melted rock called magma (MAG-muh) rises through the crust. Sometimes the magma forms giant pools in the crust. As the pools get bigger, the magma pushes up the rock layers above it. A rounded mountain forms on the earth's surface. The molten rock cools and hardens. The pushed-up rock layers are worn away, leaving separate peaks. These mountains are called dome mountains. The Black Hills of South Dakota are dome mountains.

Observe: What does a dome mountain look like?

Name _____ Class _____ Date _____

7-3 What are the types of mountains?

Lesson Review

Complete each statement by writing "folded," "fault-block," or "dome" in the space provided.

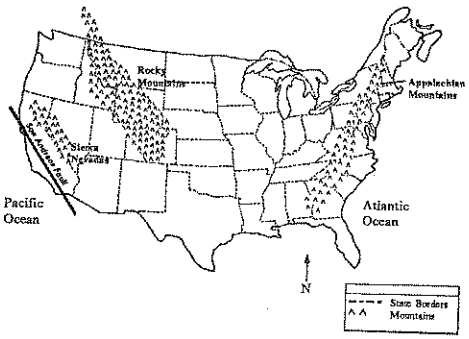
1. A mountain that looks like a rounded hill probably is a _____ mountain.
2. Mountains formed by upward movements of chunks of the earth's crust are _____ mountains.
3. The tallest mountains usually are _____ mountains.
4. Mountains that formed when the continents collided are _____ mountains.
5. Mountains formed by giant pools of magma beneath the earth's surface are _____ mountains.
6. Large anticlines form _____ mountains.

Skill Challenge

Skills: *map reading, inferring*

Use the map to answer the following.

1. What three mountain systems are shown? _____
2. In what two states are the Sierra Nevadas located? _____
3. Name three states through which the Rocky Mountains pass. _____ _____



4. Which of the mountain systems shown covers the largest area of the United States? _____
5. Find the San Andreas Fault on the map. How does the location of the San Andreas Fault relate to the location of the Sierra Nevadas? _____
6. What kind of mountains do you think the Sierra Nevadas are? Explain your answer. _____

7-4 What are plains and plateaus?

Objective ▸ Compare and contrast plains and plateaus.

TechTerm

▸ **landform:** physical feature of the earth's surface

Plains Plains are large, flat areas that are not far above sea level. The two kinds of plains are coastal plains and interior plains. Coastal plains are located along coastlines. Interior plains are located inland. All plains gently slope over great distances.

Plains are formed in several ways. One way is for land of uneven elevation to be worn down by erosion. The Great Plains of the United States were formed this way. Another way is for earth material to be deposited by a body of water. Some plains are formed when sediments are deposited in a body of water. Then the water level drops or the land rises. A flat, dry area of land remains.

Name: What are the two kinds of plains?

Plateaus Plateaus have much higher elevations than do plains. Yet, plateaus are large flat areas just like plains. Most plateaus are located inland. Some are near oceans. These plateaus end with a cliff.

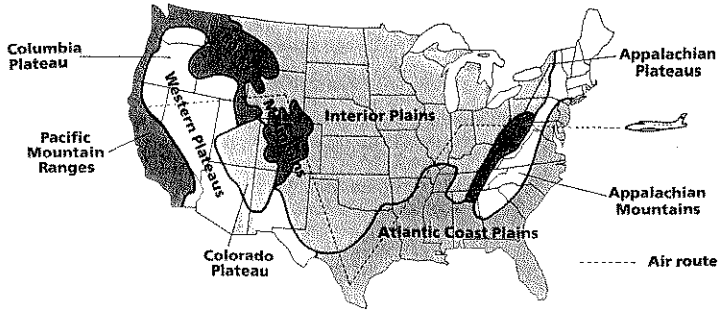
Many plateaus have canyons. A canyon is a steep-sided valley formed by a river. The Colorado Plateau has been cut through by the Colorado River. The river formed the Grand Canyon.

Plateaus are formed by the same forces that build mountains. Large areas of the crust are raised upward. The Colorado Plateau was formed in this way. Some plateaus are formed by lava pouring out of a volcano. The lava cools and hardens, forming a large raised table-like area. The Colombia Plateau in Washington State is a lava plateau.

Describe: What is a plateau?

Landform Regions Mountains, plains, and plateaus (pla-TOHS) are the three main kinds of landforms. A **landform** is a physical feature of the earth's surface. These landforms make up regions in the world. The map shows the locations of the landform regions in the United States.

Observe: In what landform region do you live?



Name _____ Class _____ Date _____

7–4 What are plains and plateaus?

Lesson Review

Match each term in Column B with its description in Column A. Write the correct letter in the space provided.

Column A	Column B
_____ 1. flat area near a coastline that is not far above sea level	a. landform
_____ 2. steep-sided valley formed by a river	b. lava plateau
_____ 3. flat area located inland that has a low elevation	c. coastal plain
_____ 4. large, flat area with a high elevation	d. interior plain
_____ 5. plateau formed by volcanic material	e. plateau
_____ 6. physical feature of the earth's surface	f. canyon

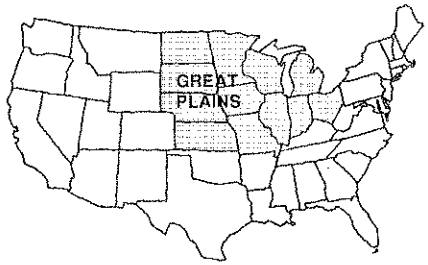
Skill Challenge

***Skills:** analyzing, relating concepts, inferring*

Use the table and the map to answer the questions.

Table 1 Some States and Their Crops

State	Crop
Idaho	Potatoes
Iowa	Corn
Kansas	Wheat
Wisconsin	Alfalfa



1. How many states make up the Great Plains? _____

2. Name five states that are part of the Great Plains. _____

_____

3. Name three crops that are grown in the Great Plains. _____

4. The twelve states in the Great Plains are nicknamed the "breadbasket" of the United States. Why do you think these states were given this name? _____

_____

7-5 What are volcanoes?

Objective ▸ Describe volcanism and the formation of a volcano.

TechTerms

- **crater** (KRAY-tur): funnel-shaped pit at the top of a volcanic cone
- **lava:** magma on the earth's surface
- **vent:** opening from which lava flows
- **volcanism** (VAHL-kuh-niz-um): movement of magma on or inside the earth
- **volcano** (vahl-KAY-noh): vent and the pile of volcanic material around the vent

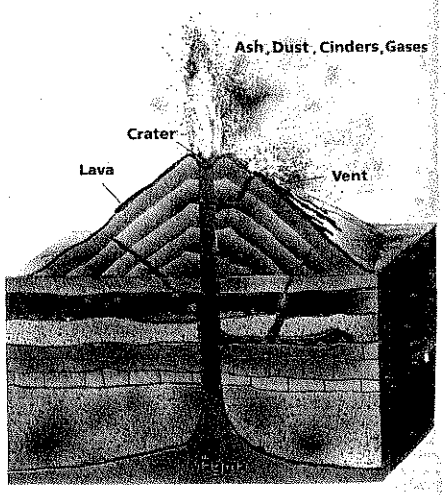
Volcanism Any movement of magma on or inside the earth is called **volcanism** (VAHL-kuh-niz-um). Sometimes magma flows between rock layers of the crust and hardens. A sill forms. If magma cuts across rock layers and hardens, a dike forms. You already know that magma forms dome mountains. They form when magma pushes up the crust of the earth. Sometimes magma breaks through the crust. The magma flows onto the surface of the earth. Magma on the earth's surface is called **lava.**

Define: What is lava?

Volcano Would you like to watch a mountain form? In 1943, a Mexican farmer did just that! First the ground started shaking. A few weeks later, the farmer found large cracks, or fissures (FISH-ers), on his farmland. Hot gases came out of the fissures. The fissures widened. Lava began to come out. The opening from which lava flows is called a **vent.** Dust, ash, and rock particles were thrown out of the vent. A **volcano** (vol-CAY-no) was formed. A volcano is the vent and the volcanic cone. The volcanic cone is the pile of lava, dust, ash, and rock particles around the vent. After several months, a volcanic cone built up that was 450 m high. It had a base 5 km wide. The volcano was called Paricutín (pah-ree-koo-TEEN).

List: What are four kinds of volcanic material?

Craters and Calderas At the top of a volcanic cone, there may be a funnel-shaped pit. This pit is called a **crater** (KRAY-tur). A crater is formed as material is blown out of the vent of a volcano.



Sometimes the walls of the crater fall back into the vent. The crater gets wider. Sometimes the top of a volcano explodes. A wide opening is left. This wide opening is a caldera (cal-DUR-uh). Some calderas fill with water. They form large lakes such as Crater Lake in Oregon. Crater Lake is 9.6 km long and 8 km wide. It is about 600 m deep.

Compare: What is the difference between a crater and a caldera?

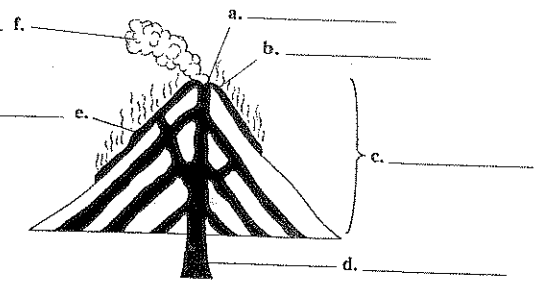
Name _____ Class _____ Date _____

7-5 What are volcanoes?

Lesson Review

Part A *Use the terms in the box to label the parts of the volcano.*

Term List
magma
lava
vent
crater
volcanic cone
dust, ash, and rock



Part B *Write true if the statement is true. If the statement is false, change the underlined term to make the statement true. Write your answers in the spaces provided.*

_____ 1. Any movement of magma on or within the earth is called volcanism.

_____ 2. Magma that reaches the earth's surface is called sill.

_____ 3. The opening from which lava flows from a volcano is called a caldera.

_____ 4. A volcano is a vent and a volcanic cone.

_____ 5. When the walls of a crater fall back into a vent or the top of a volcano, a caldera is formed.

Skill Challenge

Skills: *applying definitions, identifying*

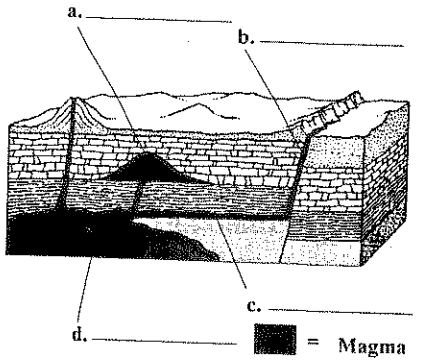
Read the definition for each of the terms listed. Then, use the definitions to label the diagram with the terms in bold type.

sill: sheetlike structure formed when magma between rock layers hardens into igneous rock

dike: vertical structure formed when magma cuts across rock layers and hardens into igneous rock

laccolith: domelike structure formed when magma pushes rock layers above it upward

batholith: large, irregularly-shaped structure of hardened magma that extends deep into the earth's crust



7-6 How do volcanoes differ?

Objective ▸ Identify and describe the three kinds of volcanic cones.

TechTerms

- **cinder cone:** volcanic cone made up of rock particles, dust, and ash
- **composite** (kum-PAHZ-it) **cone:** volcanic cone made up of alternating layers of lava and rock particles
- **shield cone:** volcanic cone made up of layers of hardened lava

Volcanic Eruptions Volcanic eruptions may be quiet or explosive (eck-SPLO-siv). During a quiet eruption, lava flows freely through a vent or a fissure. Explosive eruptions shoot rocks, lava, gases, ash, and dust high into the air. Different kinds of volcanic eruptions form different volcanic cones.

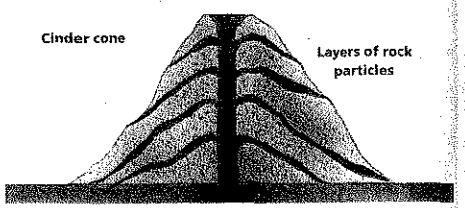
Name: What are the two kinds of volcanic eruptions?

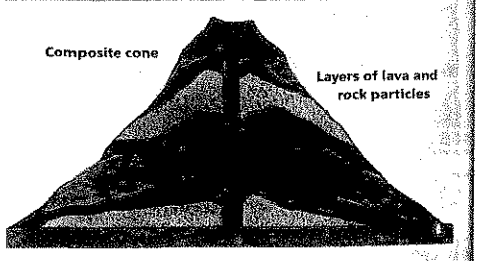
Shield Cones A **shield cone** is made up of hardened lava. A shield cone forms from quiet eruptions. Lava flows over a large area and hardens. Layers of lava build up to form a cone. The cone has a wide base. The sides of the cone have gentle slopes. Mauna Loa in the Hawaiian Islands is the largest shield cone. It is more than 4 km above sea level.

Describe: What forms a shield cone?

Cinder Cones Volcanoes made up of rock particles thrown out of a vent are called **cinder cones.** They are formed by explosive eruptions. Cinder cones have steep sides and narrow bases. Cinder cones are usually not very high. The rock particles are loose and roll down the slope. Paricutin in Mexico is a cinder cone.

Name: What kind of eruption forms a cinder cone?





Composite Cones A **composite** (kum-PAHZ-it) cone is formed from layers of lava and rock particles. These cones are formed from both quiet and explosive eruptions. During a quiet eruption, lava forms a wide base. An explosive eruption adds a layer of dust, ash, and rock particles. Then another quiet eruption adds a lava layer. After many quiet and explosive eruptions, a very high volcanic cone is formed. The cone is wide with steep sides. In the United States, Mount St. Helens and Mount Hood are composite volcanoes.

Infer: How could you tell if a layer of a composite cone was formed by a quiet or an explosive eruption?

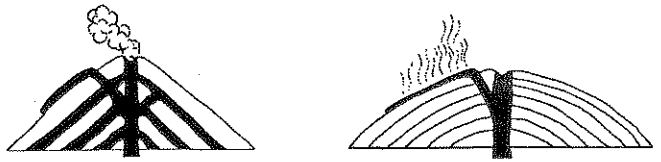
Name _____ Class _____ Date _____

7-6 How do volcanoes differ?

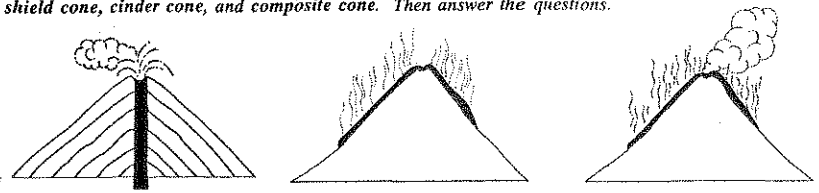
Lesson Review

Part A *In the space provided, classify each volcano as "quiet" or "explosive."*

1. _____ 2. _____



Part B *In the spaces provided, identify the kind of volcano shown in each drawing. Use the terms shield cone, cinder cone, and composite cone. Then answer the questions.*



1. _____ 2. _____ 3. _____

4. What material makes up a shield cone? _____
5. Does a shield cone form from a quiet eruption or an explosive eruption? _____
6. What kind of eruption forms a cinder cone? _____
7. What kind of eruptions form composite cones? _____
8. How could you tell if a layer of a composite cone was formed from a quiet or an explosive eruption? _____

Skill Challenge

Skills: *classifying, modeling, researching*

Part A *Classify each volcano as a cinder cone, a shield cone, or a composite cone.*

_____ 1. Mount Hood
_____ 2. Mauna Loa
_____ 3. Paricutin
_____ 4. Mount St. Helens

Part B *Choose two of the volcanoes. On a separate sheet of paper, draw a model of each volcano showing the layers of its cone. Color lava layers red. Color ash layers brown. Include a scale on your model to show the height of each volcano.*

7-7 What are earthquakes?

Objective ▸ Explain what happens during an earthquake.

TechTerms

- **earthquake:** sudden, strong movement of the earth's crust
- **epicenter** (EP-ih-sen-ter): place on the surface of the earth directly above the focus
- **focus** (FOH-kus): place inside the earth where an earthquake starts
- **seismic** (SIZE-mik) **waves:** earthquake waves
- **seismograph** (SIZE-muh-graf): instrument that detects and measures earthquakes

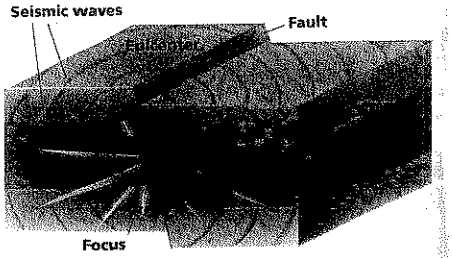
Earthquake! The earth's crust is always moving, but usually very slowly. Small movements of the crust that you may or may not feel are called tremors (TREM-ers). There are more than six million tremors each year. Sudden, strong movements of the earth's crust are called **earthquakes.** They can cause a lot of damage.

Define: What is an earthquake?

Focus and Epicenter Earthquakes begin deep inside the earth. The place inside the earth where an earthquake starts is the **focus** (FOH-kus). The place on the surface of the earth directly above the focus is called the **epicenter** (EP-ih-sen-ter). The surface of the earth shakes the hardest at the epicenter.

Define: What is the focus?

Causes of Earthquakes Earthquakes are caused mostly by faulting. Usually, the rocks on both sides of a fault are pushed together very tight. The rocks do not move. Geologists say that the fault is "locked." Pressure in the rocks increases. When the pressure becomes too great, the rocks break at a weak point. Rocks first slip and move at the focus. As the rocks move, they release energy in the form of vibrations. These vibrations are called **seismic** (SYZ-mik) **waves,** or earthquake waves.

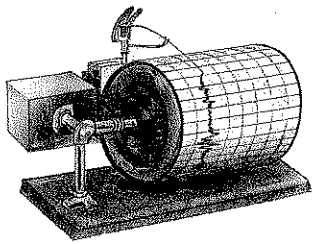


Seismic waves travel out from the focus in all directions. Imagine throwing a pebble into a pond. At the point where the pebble hits the water, you see waves move outward in all directions. Earthquake waves move out from the focus in the same way.

Name: What is the main cause of earthquakes?

Measuring Earthquakes A **seismograph** (SIZE-muh-graf) is an instrument that detects and measures earthquakes. A seismograph can even measure very small tremors that people cannot feel. It makes a record of the movements in the earth's crust on a piece of paper. The record is called a seismogram (SIZE-muh-gram). It looks like wavy lines. The higher the wavy lines are on the seismogram, the stronger is the earthquake.

Describe: What is a seismogram?



Name _____ Class _____ Date _____

7–7 What are earthquakes?

Lesson Review

Write true if the statement is true. If the statement is false, change the underlined term to make the statement true. Write your answers in the spaces provided.

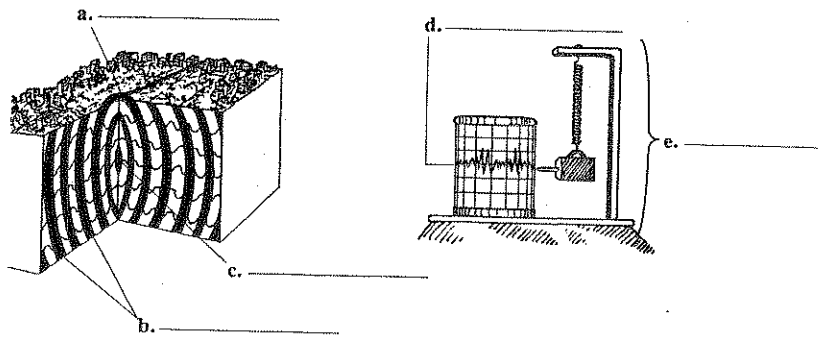
1. An instrument that detects and measures earthquakes is a seismic wave.
2. The place inside the earth where an earthquake starts is called the focus.
3. Most earthquakes are caused by folding.
4. The place on the earth's crust directly above the place where an earthquake starts is called the focus.
5. Small movements of the earth's crust are called tremors.
6. A seismogram is a record of the movements of the earth's crust.
7. Vibrations released during an earthquake are called focus waves.
8. A sudden, strong movement of the earth's crust is called a tremor.
9. The higher the lines on a seismogram, the weaker the earthquake.
10. During an earthquake, the earth's surface shakes hardest at the epicenter.

Skill Challenge

Skills: *identifying, analyzing*

Use the listed terms to label the diagrams. Write your answers in the provided spaces.

epicenter focus seismograph seismogram seismic waves



7-8 What are seismic waves?

Objective ▸ Describe the three kinds of seismic waves and what they tell scientists about earthquakes.

TechTerms

- **L-waves:** surface waves
- **P-waves:** fastest earthquake waves
- **S-waves:** second earthquake waves to be recorded at a seismograph station

Primary Waves The fastest moving seismic (SYZ-muk) waves are primary waves, or **P-waves.** P-waves are push-pull waves. They cause particles in materials to move back and forth in place. The wave itself moves out from the focus. The particles move together and apart along the direction of the wave. P-waves move through solids, liquids, and gases.

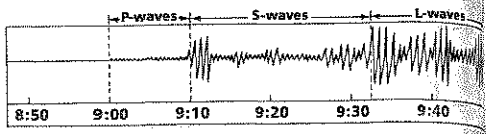
Describe: What kind of waves are primary waves?

Secondary Waves The second waves to be recorded by a seismograph are secondary waves, or **S-waves.** S-waves move slower than P-waves. S-waves travel only through solids. S-waves cause the particles in materials to move from side to side. The waves move at right angles to the direction in which the waves are traveling.

Compare: Are S-waves or P-waves faster moving?

Surface Waves Surface waves are called long waves, or **L-waves.** L-waves are the slowest moving waves. They are the last waves recorded on a seismogram. They cause the surface to rise and fall like ocean waves. L-waves cause the most damage because they bend and twist the surface of the earth.

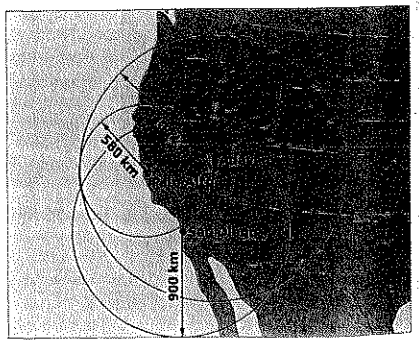
List: What are three names that can be used for the slowest moving seismic waves?



Studying Earthquake Waves Studying a seismogram can tell scientists much about an earthquake. They can tell where the epicenter is and the force of the earthquake. Look at the seismogram. When did the first P-wave arrive? The time shows 9:00 am. When did the first S-wave arrive? It arrived at 9:10 am. There was a 10 minute difference between the times the P and S waves arrived. Using this time, scientists can tell the distance of the epicenter from the seismograph. Table 1 on page 141 shows the time it takes P-waves and S-waves to travel different distances. This is called travel time.

Describe: What two things does a seismogram tell you?

Finding the Epicenter To find the epicenter, seismograms from three stations are needed. A circle is drawn on a map around each station. Each station is at the center of its circle. There is only one point where all three circles cross. The epicenter is near the point where all three circles cross.



Observe: Where is the epicenter of the earthquake shown on the map?

Name _____ Class _____ Date _____

7–8 What are earthquake waves?

Lesson Review

Complete the table by placing a check mark in the correct column or columns.

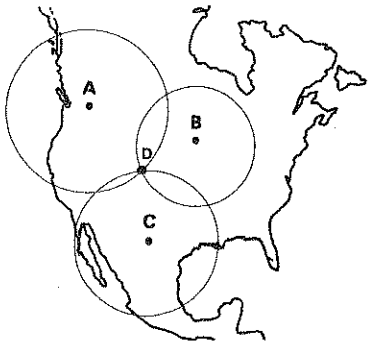
Table 1 Characteristics of Earthquake Waves

Characteristics	P-waves	S-waves	L-waves
1. Travel through gases			
2. Travel through liquids			
3. Travel through solids			
4. Fastest waves			
5. Surface waves			
6. Slowest waves			
7. Push-pull waves			
8. Used to find the epicenter			
9. Cause the most damage			
10. Used to find travel time			

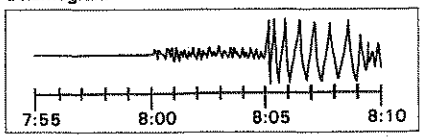
Skill Challenge

Skills: *analyzing; interpreting a diagram*

Use the diagrams to answer the following questions.



Seismogram



1. Which seismograph station would have recorded P-waves first? _____
2. Which seismograph station would have recorded P-waves last? _____
3. What letter represents the epicenter of the earthquake? _____
4. At which letter would the most damage to buildings have occurred? _____
5. When were the first P-waves recorded? Time: _____
6. When were the first S-waves recorded? Time: _____
7. What was the travel time? _____

7-9 What are the effects of earthquakes?

Objective ▸ Understand the power of earthquakes and the damage that they can cause.

TechTerms

- ▸ **Richter** (RIK-ter) **scale:** scale that measures the energy released by an earthquake
- ▸ **tsunami** (tsooh-NAHM-mee): ocean wave caused by an earthquake

The Richter Scale In 1935, Charles Richter (RIK-ter) developed a scale to measure the energy released by earthquakes. The scale is called the Richter scale. On the Richter scale, an earthquake is given a number between 1 and 9. If a stronger earthquake occurs, a higher number will be used. The higher the number is, the stronger is the earthquake.

An earthquake measuring 7 or more on the Richter scale can cause a great deal of damage. Earthquakes that measure 2.5 or less on the Richter scale are usually not felt by people. The largest earthquake recorded so far measured 8.9 on the scale.

Explain: What is the Richter scale?

Earthquake Damage Many new buildings are built to be "earthquake-proof." They do not fall during an earthquake. Old buildings, however, may be destroyed completely during an earthquake. Tall buildings may sway. Sometimes tall buildings may move back and forth so much that they tip over. Earthquakes also damage electrical lines, telephone lines, and water pipes. Explosions are caused by broken electric and gas lines. Fires caused by broken gas lines often destroy many buildings.

Explain: What is meant by "earthquake proof?"

Tsunami A great wave that is sometimes caused by an earthquake is called a **tsunami** (tsooh-NAHM-mee). A tsunami forms when the epicenter

of an earthquake is on the ocean floor. Out in the open ocean, a tsunami is not very high. Near the shore, the height of the tsunami increases. A tsunami may be 30 m to 40 m high. When a tsunami hits land, it can cause a lot of damage. In 1964, a tsunami was caused by an earthquake in Alaska. The tsunami almost destroyed an entire fishing fleet. Some of the fishing boats were swept into downtown Kodiak, Alaska.

Describe: What is a tsunami?

Predicting Earthquakes Scientists use past earthquakes to predict future earthquakes. Their predictions may be off by 25 years or more. Scientists use small movements in the earth's crust as a signal to a future earthquake. They look at the ground in the area to see if it has moved up or down. Laser field stations record the smallest movements along faults. Lasers are thin, strong light beams. The laser beam is shot into a reflector. By measuring the time it takes the beam to hit the reflector and come back, scientists can find out if any movement has happened along a fault. Using earthquake information, scientists have developed a Seismic Risk Map. The map shows where earthquakes may occur and the kind of damage they may cause.

Infer: Why would predicting an earthquake be helpful?

Name _____ Class _____ Date _____

7–9 What are the effects of earthquakes?

Lesson Review

Write true if the statement is true. If the statement is false, change the underlined term to make the statement true.

_____ 1. The seismic scale is used to measure the energy released by earthquakes.

_____ 2. An earthquake measuring 2.5 or more on the Richter scale can cause a great deal of damage.

_____ 3. An earthquake measuring 2.5 or less on the Richter scale usually is not felt by people.

_____ 4. Many new buildings are built to remain standing during an earthquake. These buildings are said to be earthquake proof.

_____ 5. A tsunami forms when the epicenter of an earthquake is on the desert floor.

_____ 6. A tsunami is a large wave that is sometimes caused by an earthquake.

_____ 7. A laser is a beam of light that can be used to detect movements along faults.

_____ 8. A Richter Risk Map shows where earthquakes may occur and the kind of damage they may cause.

Skill Challenge

Skills: *sequencing, inferring, classifying*

The numbers below are numbers from the Richter Scale. Place the numbers in order from the weakest earthquake (a) to the strongest earthquake (j). Then, in the spaces provided, classify each earthquake according to how much damage it is likely to cause.

8.9 7.0 1.2 2.5 6.9 4.2 5.0 9.0 3.3 7.7

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

f. _____ **g.** _____ **h.** _____ **i.** _____ **j.** _____

No Damage	Little to Moderate Damage	Great Damage
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

7-10 What is the Ring of Fire?

Objective ▸ Identify three volcano and earthquake zones.

TechTerm

▸ **Ring of Fire:** major earthquake and volcano zone that almost forms a circle around the Pacific Ocean

Zones of Activity Most big earthquakes and volcanic eruptions occur in three areas, or zones. In these zones scientists think there is a lot of movement and activity in the earth's crust. There are many active volcanoes. Active volcanoes are volcanoes that have erupted at least once within recorded history. There are 500 to 600 active volcanoes on land. There are many more under the oceans.

State: How many major volcano and earthquake zones are there?

The Ring of Fire The **Ring of Fire** is the major volcano and earthquake zone that almost forms a circle around the Pacific Ocean. Most of the active volcanoes on landmasses are located in the Ring of Fire. Many earthquakes occur in this area. The western coasts of North and South America are in the Ring of Fire.

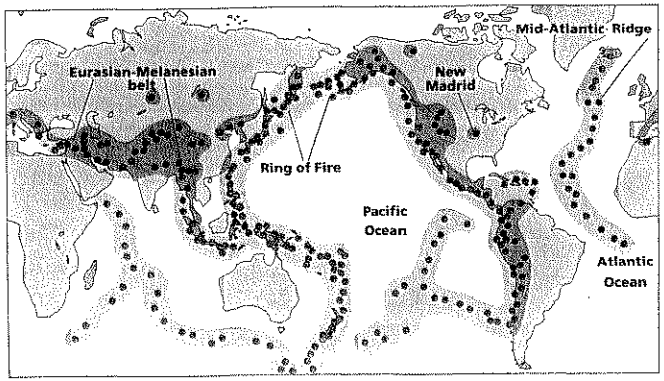
Identify: What is the name of the earthquake and volcano zone around the edge of the Pacific Ocean?

Mid-Atlantic Ridge A second major volcano and earthquake zone is in the Atlantic Ocean. This zone is the Mid-Atlantic Ridge. It is a long underwater chain of volcanic mountains. In this zone, earthquakes and volcanoes are caused by the formation of new parts of the earth's crust. Iceland is part of this zone. Iceland is a volcanic island.

Describe: What is the Mid-Atlantic Ridge?

A Mountain Belt Zone Many of the countries in Europe have big earthquakes. Many also have active volcanoes. These countries are in the third zone. The third major volcano and earthquake zone is a major mountain belt. Scientists think this zone is so active because the mountains along the belt were formed when parts of the earth's crust crashed into each other.

Observe: Along which mountain belt is the third major volcano and earthquake zone?



Name _____ Class _____ Date _____

7–10 What is the Ring of Fire?

Lesson Review

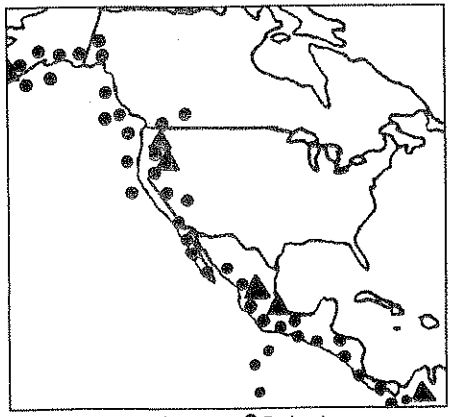
Complete the following. Write your answers in the spaces provided.

1. There are _____ major earthquake and volcano zones in the world.
2. The Ring of Fire is the major earthquake and volcano zone that almost forms a ring around the _____ Ocean.
3. Most of the active volcanoes on land masses are located in the _____.
4. The _____ coasts of North and South America are located in the Ring of Fire.
5. The second major earthquake zone is the _____ of the Atlantic Ocean.
6. Iceland is a _____ located in the mid-Atlantic Ridge.
7. The third major volcano and earthquake zone is a _____ in Europe.
8. A volcano that has erupted once within recorded history would be classified as an _____ volcano.

Skill Challenge

Skills: *observing, interpreting, inferring*

Use the map of the Ring of Fire to answer the questions. Write your answers in the spaces provided.



Legend: ▲ Volcano ● Earthquake — San Andreas Fault

1. Name four states that are part of the Ring of Fire. _____
2. What feature in California is responsible for its many earthquakes? _____
3. How do you think living along the Ring of Fire affects people living along the western coast of the United States? _____
4. The Hawaiian Islands are in the Ring of Fire. Do you think the Hawaiian Islands were formed by earthquakes or volcanoes? _____