

Quiz 11/Reteach/Review

This lesson provides an opportunity for students to review what they've learned about the restless Earth. For some, it may be an opportunity to understand an idea they didn't fully grasp the first time around.

Big Ideas

See list of big ideas, Days 1-59.

Materials

Teacher:

1. vocabulary list – RE word list.doc
2. list of big ideas – RE big ideas.pdf

Students:

1. Quiz 11

Activities & Allotted Time (40 minutes total)

- 10 minutes – quiz
- 10 minutes – go over quiz
- 20 minutes – reteach/review sections 6.2 & 6.3

Reteach/Review Sections 6.2 & 6.3

After going over the quiz and reviewing the meanings of vocabulary words and the big ideas from the entire unit, use the section review questions on pages 165 and 171 and the chapter review questions on page 174-175 to identify areas that need additional attention.

Day 60 – Quiz 11/Reteach/Review

Quiz 11 – Page 1

1. Earthquakes are caused by energy that is released when _____.
 a. deformed rock bounces back to its original shape
 b. tectonic plates grind against each other
 c. seismic waves travel in all directions
2. Which statement best describes the relationship between volcanoes, large earthquakes, and tectonic plates?
 a. Volcanoes typically occur in the centers of tectonic plates and large earthquakes typically occur along the borders between tectonic plates.
 b. Volcanoes and large earthquakes typically occur along the borders between tectonic plates.
 c. Volcanoes and large earthquakes typically occur near the centers of tectonic plates.
3. Magma that contains a lot of _____ tends to cause explosive eruptions.
 a. water or silicon
 b. carbon or hydrogen
 c. nitrogen or glycerin
4. An opening that allows magma and gases to flow out onto Earth's surface is called a _____.
 a. fault
 b. volcano
 c. ridge
5. Where do most volcanoes occur?
 a. in hot spots like the Hawaiian Islands
 b. along transform plate boundaries
 c. near the edges of tectonic plates
6. Magma erupts as _____.
 a. liquid rock called lava
 b. solid rock called pyroclastic material
 c. either lava or pyroclastic material

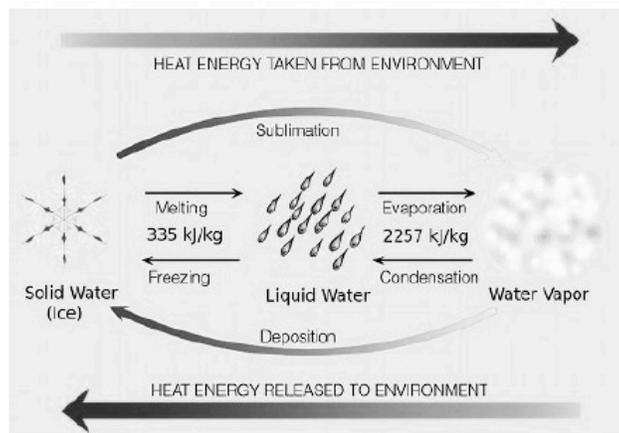
Inside the Restless Earth



Day 60 – Quiz 11/Reteach/Review

Quiz 11 – Page 2

7. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the diagram.



According to the above diagram, when heat energy is released to the environment, processes such as _____ and _____ can occur.

- a. sublimation; deposition
 - b. condensation; freezing
 - c. melting; evaporation
 - d. evaporation; sublimation
8. How can a volcanic eruption result in climate change?

During an explosive eruption, huge clouds of volcanic
ash and gases are blasted into the atmosphere. These
clouds can block sunlight and cause global
temperatures to drop.

Inside the Restless Earth

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End-of-Section Survey – Chapter 6

activity	did as described	modified	didn't do	comments
Day 52 Warm-Up (page 386)				
vis 6.1a – Relative Scale & Magnification (pages 387-388)				
chp 6.1, parts 1 & 2 (page 385-386 & Holt, pages 156-157)				
Day 53 Warm-Up (page 390)				
vis 6.1b – Cut-Away & Captions (pages 391-394)				
chp 6.1, parts 3 & 4 (page 389 & Holt, page 158)				
Day 54 Warm-Up (page 396)				
vis 6.1c – Labels (pages 397-399)				
chp 6.1, part 5 (page 395 & Holt, pages 159-161)				

End-of-Section Survey – Chapter 6

activity	did as described	modified	didn't do	comments
Quiz 10 (pages 401-402)				
Reteach/Review Chp. 5.1 & 6.1 (page 400)				
Day 56 Warm-Up (page 404)				
chp 6.2, part 1 (Holt, page 162)				
Day 57 Warm-Up (page 406)				
vis 6.2a – Cut-Away & Labels (pages 407-409)				
vis 6.2b – Caption, Cut-Away & Labels (pages 410-413)				
chp 6.2, parts 2 & 3 (Holt, pages 163-165)				

End-of-Section Survey – Chapter 6

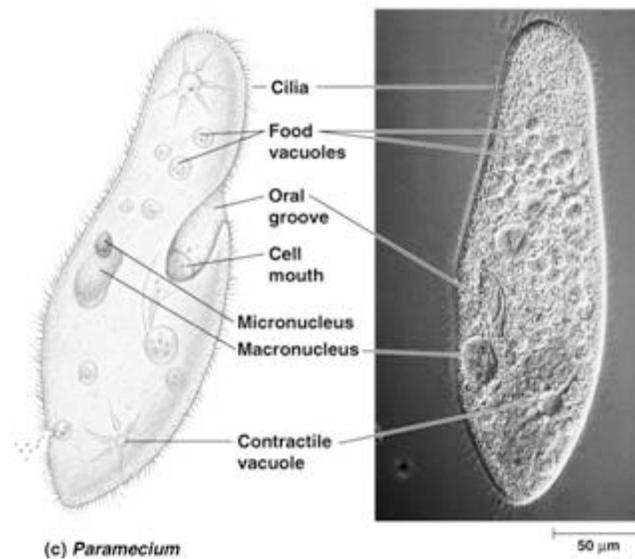
activity	did as described	modified	didn't do	comments
Day 58 Warm-Up (page 415)				
vis 6.3a – Arrows & Color (pages 416-419)				
vis 6.3b – Captions (pages 420-421)				
chp 6.3, parts 1 & 2 (page 414 & Holt, pages 166-167)				
Day 59 Warm-Up (page 423)				
vis 6.3c – Labels & Color (pages 424-430)				
chp 6.3, parts 3-6 (page 422 & Holt, pages 168-171)				
Quiz 11 (pages 432-433)				
Reteach/Review Chp. 6.2 & 6.3 (page 431)				

Quiz 1 – Page 1

1. Which of the following appeared earliest (closest to when Earth was formed)?
 - a. dinosaurs
 - b. humans
 - c. insects
2. Which of the following appeared most recently (closest to today)?
 - a. dinosaurs
 - b. humans
 - c. insects
3. When was Earth formed?
 - a. about 200 thousand years ago
 - b. about 150 million years ago
 - c. about 4.6 billion years ago
4. When did humans first appear?
 - a. about 200 thousand years ago
 - b. about 150 million years ago
 - c. about 4.6 billion years ago
5. A geologic time scale shows _____.
 - a. the dates when different fossils were formed
 - b. when major changes occurred during Earth's history
 - c. the ages and locations of different layers of rocks
6. Which of the following is the correct order from largest to smallest division of geologic time?
 - a. eras, periods, epochs, eons
 - b. eons, eras, periods, epochs
 - c. epochs, eons, eras, periods

Quiz 1 – Page 2

7. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the diagram.

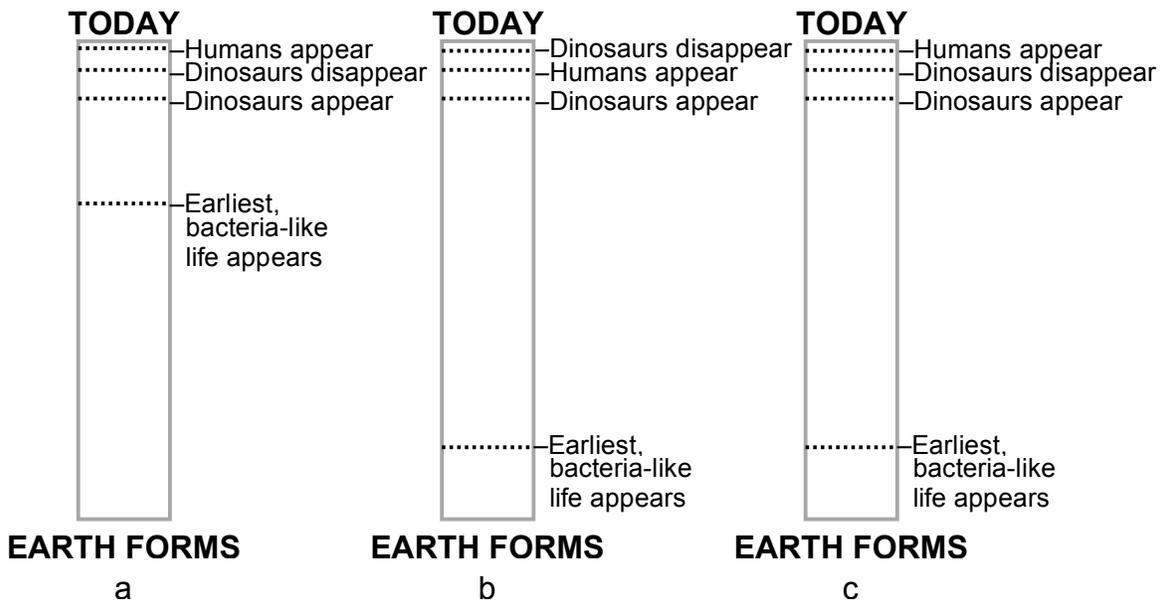


- The image on the left is _____.
- a. a magnified version of the object on the right
 - b. a drawing of the object on the right
 - c. a miniature version of the object on the right
 - d. a different object than the object on the right

8. What is extinction, and what can cause it to happen?

Quiz 2 – Page 1

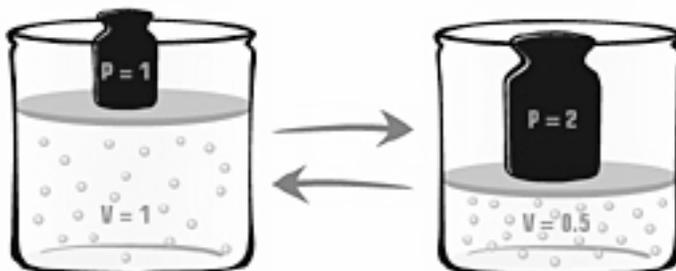
1. What does a proportional time scale show?
 - a. How many years ago different events occurred.
 - b. The locations at which different events occurred.
 - c. How different parts of Earth's history compare to the whole.
2. Which of the figures below most closely represents changes in life on earth over time?



3. Which of the following is true about both rocks and minerals?
 - a. Both can be elements or compounds.
 - b. Both are solids, and neither is man-made.
 - c. Both can be organic or inorganic.
4. What type of structure does a mineral have?
 - a. crystalline
 - b. amorphous
 - c. can be crystalline or amorphous
5. What type of structure does a rock have?
 - a. crystalline
 - b. amorphous
 - c. can be crystalline or amorphous

Quiz 2 – Page 2

6. Which property measures the ability of a mineral to resist scratching?
- density
 - hardness
 - luster
7. **Note to student:** We know you didn't study this recently, but we want you to try to answer the question based on the information in the diagram.



Boyle's Law: The volume of a gas is inversely proportional to its pressure. That is, if the pressure increases, the volume decreases. Similarly, the volume would increase if the pressure decreased.

According to the above model of Boyle's Law, if one were to increase the volume of a gas, the pressure of the gas would _____.

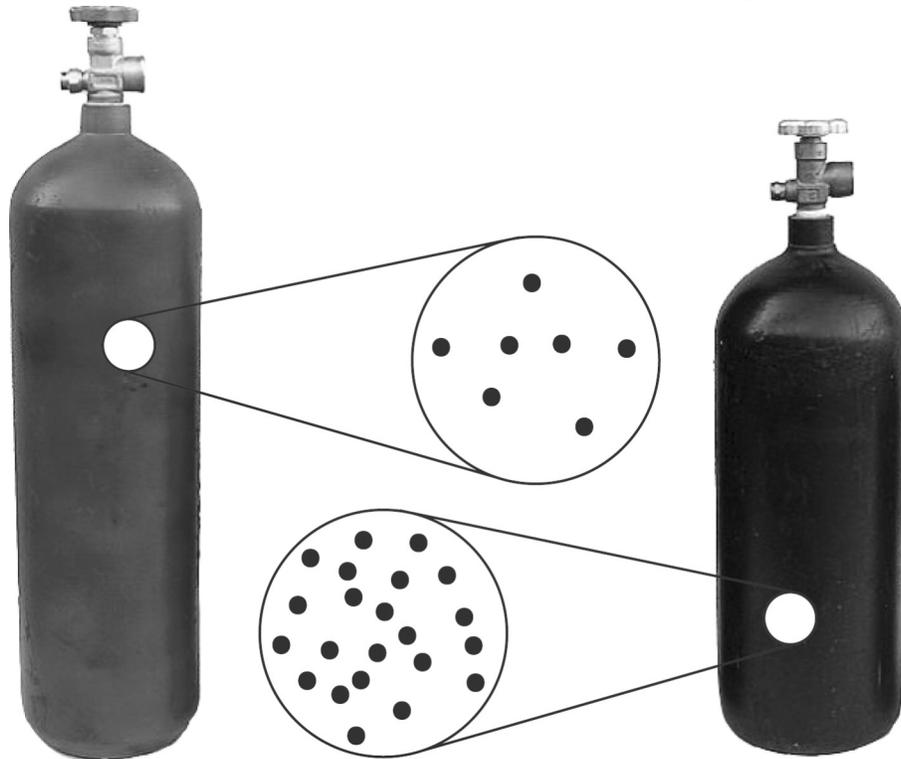
- decrease
 - increase
 - remain the same
 - increase, then decrease
8. Name and describe two properties that can be used to identify minerals.

Quiz 3 – Page 1

1. Which substance is the same type of matter (element, compound, or mixture) as a rock?
 - a. oxygen
 - b. carbon dioxide
 - c. air
2. Which property can be used to identify a mineral?
 - a. size
 - b. weight
 - c. heaviness-for-size
3. A mineral's properties are determined by _____.
 - a. how it forms and what it is made of
 - b. whether it is organic or inorganic
 - c. how pure it is
4. Returning the land to its original condition after mining is completed is called _____.
 - a. excavation
 - b. surface mining
 - c. reclamation
5. Minerals are _____.
 - a. elements only
 - b. compounds only
 - c. either elements or compounds
6. Minerals that have shiny surfaces, do not let light pass through them, and are good conductors of heat and electricity are called _____.
 - a. metallic minerals
 - b. nonmetallic minerals
 - c. gemstones

Quiz 3 – Page 2

7. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the diagram.



In the above diagram of air tanks, what does the image inside the larger circle represent?

- a. a magnified version of the tank's contents
 - b. a view of objects that are not part of the tank's contents
 - c. a life-size view of the tank's contents
 - d. a miniature view of the tank's contents
8. How do igneous rocks form?

Quiz 4 – Page 1

1. What does a numeric time scale show?
 - a. How many years ago different events happened.
 - b. The locations at which different events happened.
 - c. How different parts of Earth's history compare to the whole.
2. If you could travel back in time to when the Earth was first formed as a planet, how many years back in time would you have to travel?
 - a. about 4.6 thousand years
 - b. about 4.6 million years
 - c. about 4.6 billion years
3. Which of the following correctly lists the organisms in the fossil record from most recent to earliest?
 - a. reptiles, mammals, plants
 - b. mammals, reptiles, plants
 - c. plants, reptiles, mammals
4. What type of minerals make up most of Earth's crust?
 - a. silicate minerals
 - b. nonsilicate minerals
 - c. native elements
5. One difference between rocks and minerals is _____.
 - a. all minerals are elements and all rocks are compounds
 - b. all minerals are compounds and all rocks are mixtures
 - c. all minerals are pure substances and all rocks are mixtures
6. A mineral that is composed of only one element is called a _____.
 - a. gemstone
 - b. silicate mineral
 - c. native element
7. Which of the following is not a property of minerals?
 - a. naturally formed
 - b. organic
 - c. crystalline

Quiz 4 – Page 2

8. Mrs. Smith's class tested three minerals (A, B, C) for hardness. This table shows their results:

Mineral	Scratched by fingernail?	Scratched by penny?
A	yes	yes
B	no	yes
C	no	no

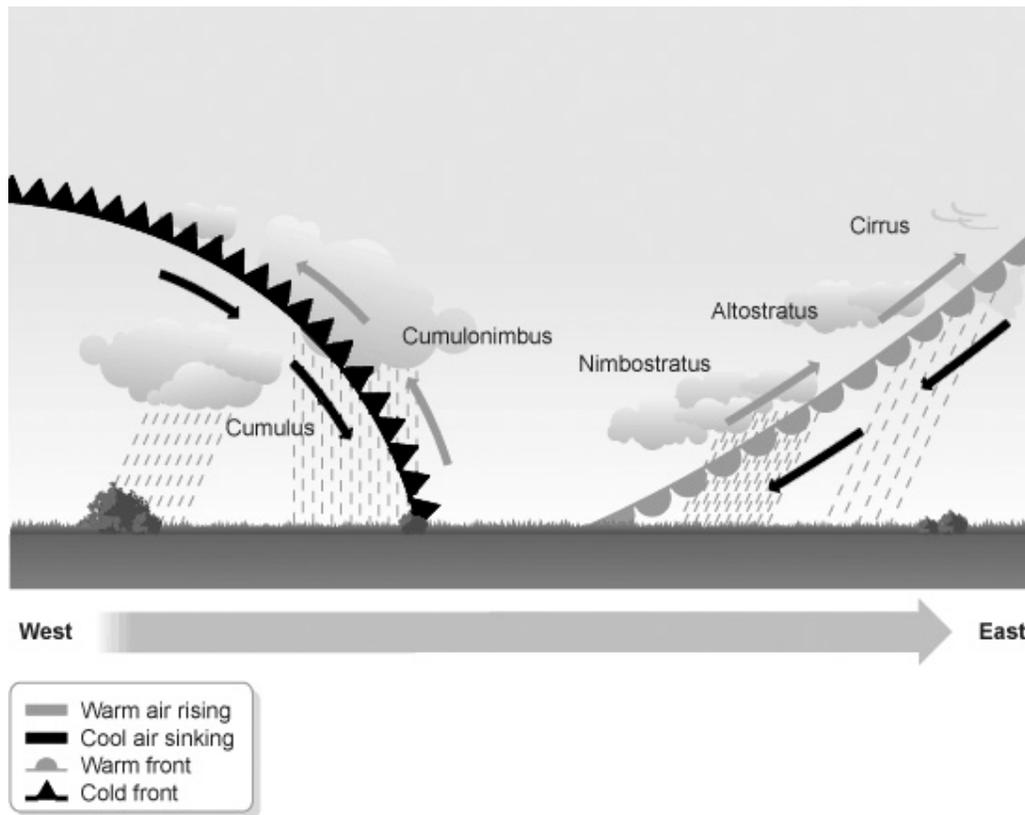
- Which mineral is the softest?
- A
 - B
 - C
9. Suppose you found a new mineral (X). Which test would show whether X is harder than all three of the minerals in question 8?
- scratch X with A
 - scratch X with B
 - scratch X with C
10. Which of the following best describes what you would find if you could tunnel deep down inside the Earth?
- The mantle is rigidly solid because the extreme pressure prevents solid rock from melting.
 - The mantle is completely liquid because the extreme heat melts any solid rock that moves below the crust.
 - The upper mantle is rigid and the lower mantle is soft because heat and pressure get more extreme the deeper you go.
11. What type of rock is formed when molten rock cools and hardens?
- igneous
 - metamorphic
 - sedimentary
12. What type of rock is formed when particles settle and get compacted and cemented together?
- igneous
 - metamorphic
 - sedimentary

Quiz 4 – Page 3

13. Granite forms deep below Earth's surface, from slowly cooling magma. What feature results from this process?
- Granite has small crystals.
 - Granite has large crystals.
 - Granite has no crystals.
14. Based on the description in item 13, what type of igneous rock is granite?
- extrusive
 - intrusive
 - could be extrusive or intrusive
15. When solid rock melts, it forms _____.
- lava
 - magma
 - sediments
16. What's the difference between rocks and minerals?

Quiz 4 – Page 4

17. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the diagram.



As indicated in the diagram above, the weather fronts are moving from the _____ to the _____ .

- a. north to south
- b. west to east
- c. east to west
- d. south to north

Quiz 5 – Page 1

1. What type of rock can form at or near earth's surface?
 - a. igneous
 - b. sedimentary
 - c. both igneous and sedimentary

2. The tiny holes in igneous rocks like pumice were formed by _____.
 - a. bubbles of gas that escaped when lava hardened
 - b. tiny worms crawling in mud that later hardened
 - c. extreme heat and pressure deep beneath Earth's surface

3. What type of rock can be made up of rock fragments, dissolved minerals, or the remains of plants or animals?
 - a. igneous
 - b. sedimentary
 - c. metamorphic

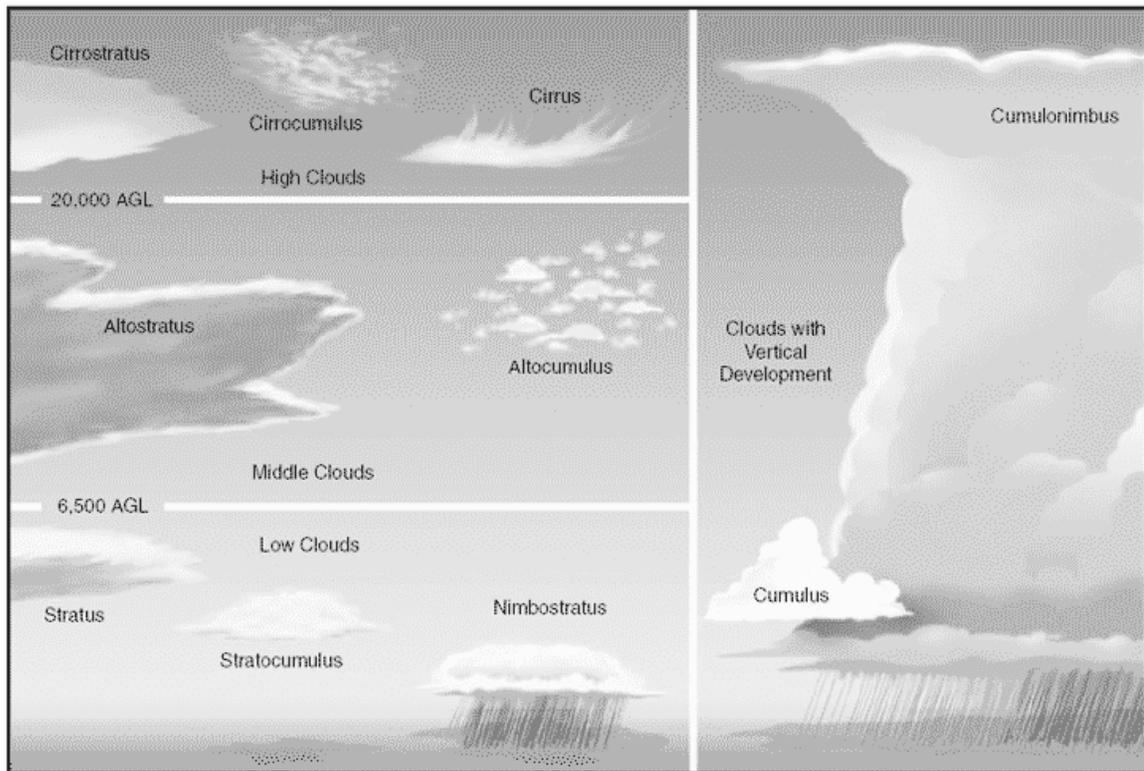
4. Ripple marks in rocks are formed by _____.
 - a. flowing water and wind
 - b. heating and cooling
 - c. drying and cracking

5. The formation of layers in sedimentary rock formations is called _____.
 - a. cementation
 - b. solidification
 - c. stratification

6. Weathering is when _____.
 - a. rocks break apart to form small pieces or bits
 - b. loose bits of rock are carried from one place to another
 - c. loose bits of rock settle and pile up

Quiz 5 – Page 2

7. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the figure.



According to the above figure, which of the following would be considered a "high cloud?"

- a. altocumulus
 - b. cirrocumulus
 - c. stratocumulus
 - d. cumulus
8. What is the rock cycle?

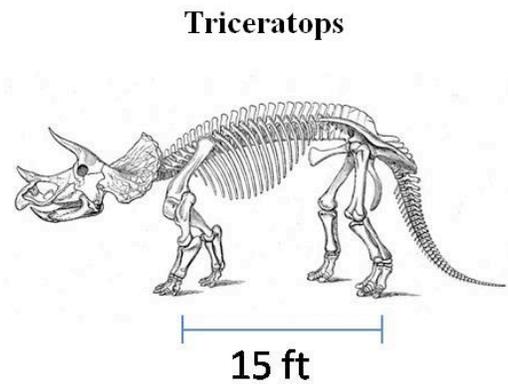
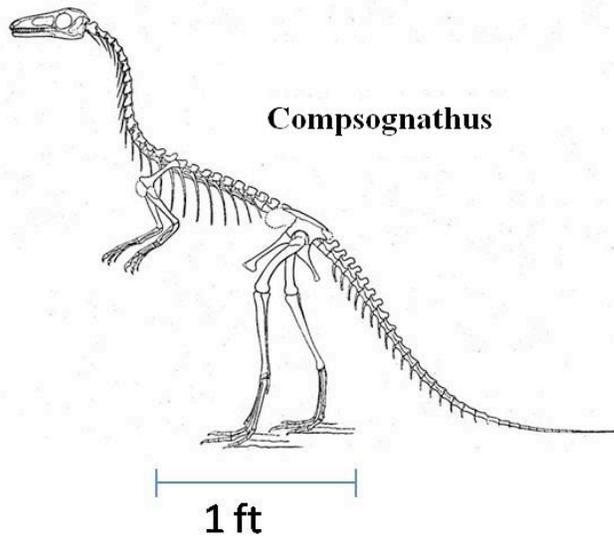
Quiz 6 – Page 1

1. Which statement best describes how sediments settle?
 - a. The heaviest particles tend to settle first, and the lightest particles tend to settle last.
 - b. The smallest particles tend to settle first, and the largest particles tend to settle last.
 - c. All the particles settle at approximately the same time, regardless of weight or size.
2. In which type of rock is the fossil imprint of a fern leaf most likely to be found?
 - a. igneous
 - b. metamorphic
 - c. sedimentary
3. What type of rock is formed when an existing rock changes because of heat and/or pressure?
 - a. igneous
 - b. metamorphic
 - c. sedimentary
4. When a metamorphic rock is forming, why doesn't the rock melt and become magma?
 - a. The minerals that make up the rock do not have a melting point.
 - b. The increased pressure raises the rock's melting point.
 - c. A cementing agent keeps the rock from changing to a liquid.
5. Which statement is true?
 - a. Sedimentary rocks form on, near, or deep below Earth's surface.
 - b. Metamorphic rocks only form below Earth's surface.
 - c. Igneous rocks only form on or near Earth's surface.
6. Metamorphic rocks with mineral crystals arranged in parallel layers or bands are called _____ .
 - a. foliated
 - b. nonfoliated
 - c. stratified

Quiz 6 – Page 2

7. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the diagram.

Dinosaur Skeletons



- According to the diagram above _____.
- a. compsognathus was 1 foot long
 - b. triceratops was 1 foot long
 - c. compsognathus was larger than triceratops
 - d. triceratops was larger than compsognathus
8. What changes can happen to a rock because of heat and pressure?

Quiz 7 – Page 1

1. The color of a mineral in powdered form is called _____.
 - a. luster
 - b. streak
 - c. pigment
2. Pumice is an igneous rock that has very low density. What does this mean?
 - a. It does not have much ability to resist scratching.
 - b. Its surface does not reflect light very well.
 - c. It is not very heavy for its size.
3. What is the main difference between intrusive and extrusive igneous rock?
 - a. where they form
 - b. chemical composition
 - c. mineral composition
4. Clastic sedimentary rocks are formed from _____.
 - a. fragments of rocks and minerals
 - b. solutions of dissolved minerals
 - c. the remains of plants and animals
5. What is the process in which sedimentary rocks are arranged in layers?
 - a. strata
 - b. stratification
 - c. foliation
6. If there were no weathering or erosion, which type of rock would be LEAST common?
 - a. igneous
 - b. metamorphic
 - c. sedimentary

Quiz 7 – Page 2

7. Which statement is true?
 - a. Sedimentary rocks form on or near Earth's surface.
 - b. Igneous rocks only form below Earth's surface.
 - c. Metamorphic rocks form on, near, or below Earth's surface.

8. When a rock is changing because of pressure, its grains _____.
 - a. become smaller and less dense
 - b. tend to line up with each other
 - c. gradually change to volcanic glass

9. Metamorphic rocks form from _____.
 - a. molten rock
 - b. sediments
 - c. existing rocks

10. What rock-forming process happens when a rock is heated by nearby lava?
 - a. contact metamorphism
 - b. regional metamorphism
 - c. clastic metamorphism

11. Which process moves rock fragments from one place to another?
 - a. weathering
 - b. erosion
 - c. transport
 - d. deposition

12. Which process allows loose bits of rock to settle?
 - a. weathering
 - b. erosion
 - c. transport
 - d. deposition

Quiz 7 – Page 3

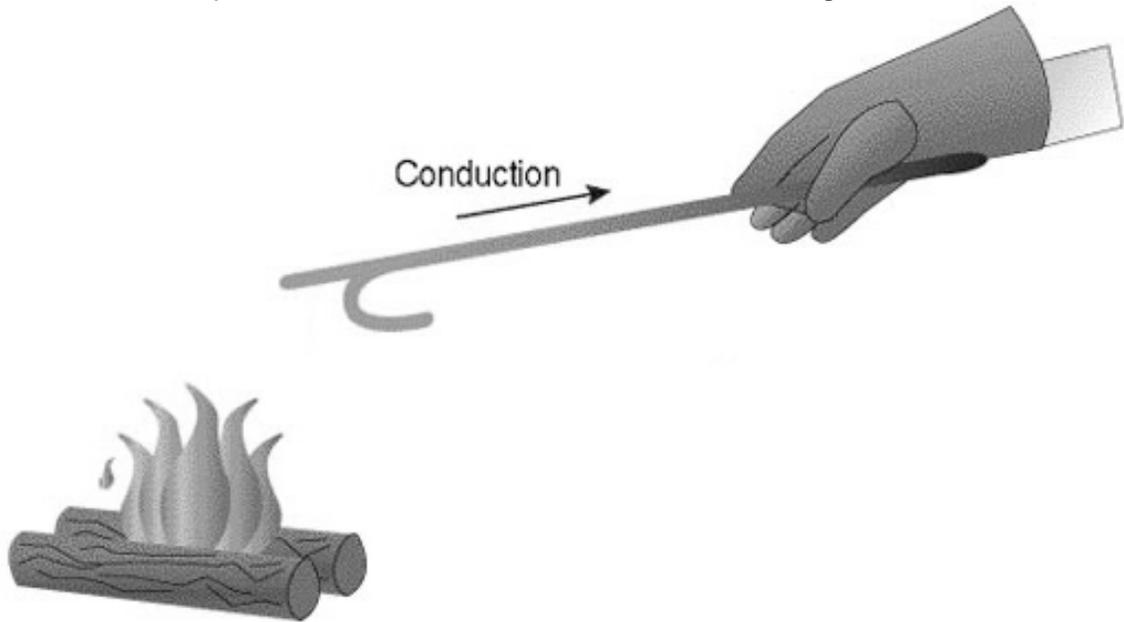
13. What type(s) of rock can weather, erode, move, and settle to form sediments?
 - a. sedimentary
 - b. metamorphic and igneous
 - c. igneous, metamorphic, and sedimentary

14. What type(s) of rock can change because of extreme heat and pressure?
 - a. metamorphic
 - b. igneous and sedimentary
 - c. igneous, metamorphic, and sedimentary

15. Which process involves movements inside the Earth?
 - a. erosion
 - b. deposition
 - c. uplift

16. How do geologists classify rocks?

17. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the diagram.



- According to the above diagram, heat is being _____ the gloved hand.
- a. convected toward
 - b. conducted toward
 - c. conducted away
 - d. radiated toward

Quiz 8 – Page 1

1. If you were able to dig a tunnel to the center of the Earth, what conditions would you find?
 - a. Temperature would increase, and pressure would decrease.
 - b. Temperature and pressure would both increase.
 - c. Temperature would decrease, and pressure would increase.

2. The changes that take place in the rock cycle do not _____.
 - a. chemically change matter
 - b. physically change matter
 - c. create or destroy matter

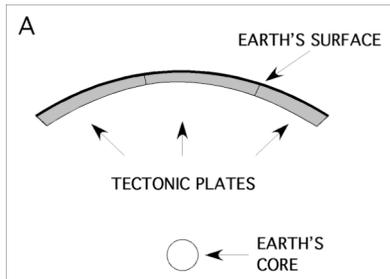
3. If you think about the minerals that make up the Earth, where are the densest minerals located?
 - a. near the center of the Earth
 - b. near the surface
 - c. between the center and the surface

4. How does oceanic crust compare with continental crust?
 - a. oceanic crust is thicker than continental crust
 - b. oceanic crust is denser than continental crust
 - c. oceanic crust contains lighter minerals than continental crust

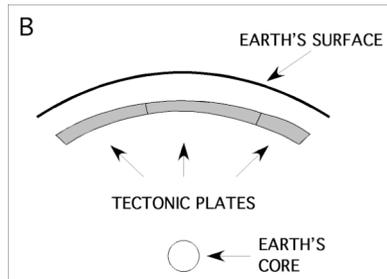
5. Which layer includes a section of the mantle that is solid but bends like clay and flows very slowly?
 - a. asthenosphere
 - b. lithosphere
 - c. mesosphere

Quiz 8 – Page 2

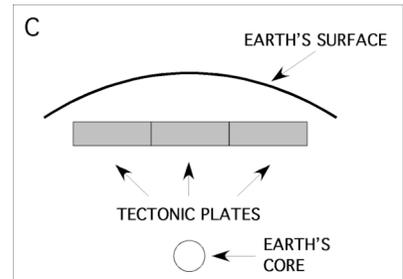
6. Which diagram most closely represents the correct location of the Earth's tectonic plates?



a



b

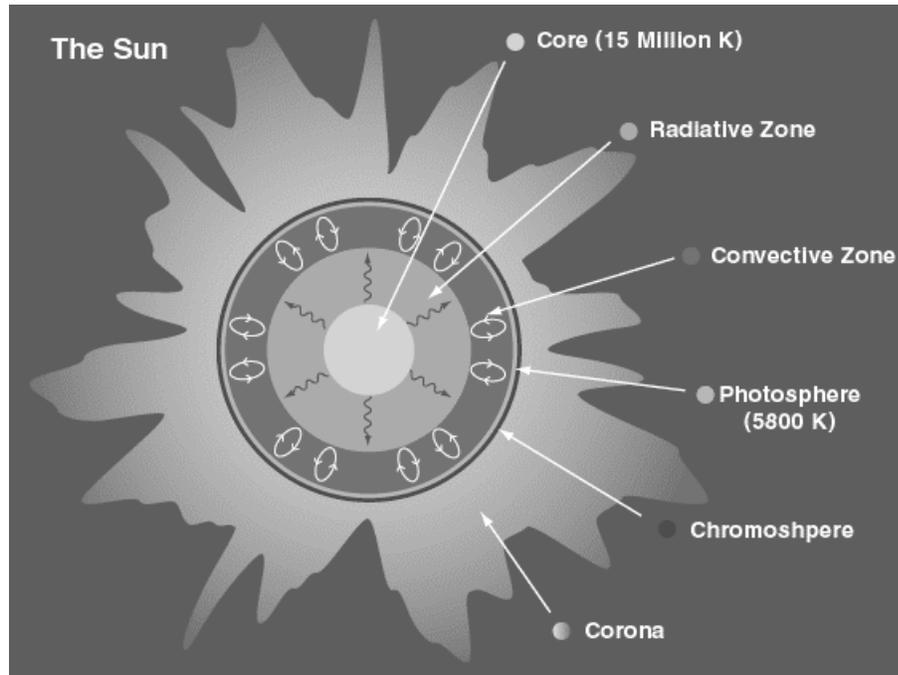


c

7. What is continental drift?

Quiz 8 – Page 3

8. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the figure.



According to the figure above, what is the correct order of the layers of the sun, starting from the center and moving outward?

- corona, chromosphere, photosphere, convective zone
- core, radiative zone, photosphere, convective zone
- corona, radiative zone, convective zone, photosphere
- core, radiative zone, convective zone, photosphere

Quiz 9 – Page 1

1. What processes change sediments into sedimentary rock?
 - a. weathering and erosion
 - b. compaction and cementation
 - c. stratification and folding

2. Metamorphism can best be defined as _____.
 - a. compaction and cementation of rock fragments
 - b. solidification of magma by cooling
 - c. changing of a rock by heat and/or pressure

3. Metamorphic rocks _____.
 - a. always contain fossils
 - b. sometimes contain fossils
 - c. rarely contain fossils

4. What processes will change a sedimentary rock into an igneous rock?
 - a. melting; cooling; hardening
 - b. heating; recrystallization; deformation
 - c. deposition; compaction; cementation

5. Which statement about metamorphic rocks is the most complete?
 - a. They are formed from sedimentary rocks.
 - b. They are formed from sedimentary and igneous rocks.
 - c. They are formed from all three types of rocks.

6. An igneous rock changes to sediment by _____.
 - a. heat and pressure
 - b. weathering and erosion
 - c. melting and cooling

Quiz 9 – Page 2

7. Which layer includes the crust and rigid outer area of the mantle?
 - a. lithosphere
 - b. mesosphere
 - c. asthenosphere

8. The hypothesis that Earth's continents were once connected into a single landmass is called _____.
 - a. continental drift
 - b. sea-floor spreading
 - c. magnetic reversal

9. The process in which new oceanic crust forms as tectonic plates move apart and magma rises and solidifies is called _____.
 - a. continental drift
 - b. sea-floor spreading
 - c. magnetic reversal

10. When an oceanic plate collides with a continental plate, _____ sinks into the asthenosphere.
 - a. the denser oceanic plate
 - b. the denser continental plate
 - c. whichever plate is denser

11. What happens when part of a fluid is warm and part is cool?
 - a. The warm part sinks and the cool part rises.
 - b. The warm part rises and the cool part sinks.
 - c. The warm and cool parts move toward each other.

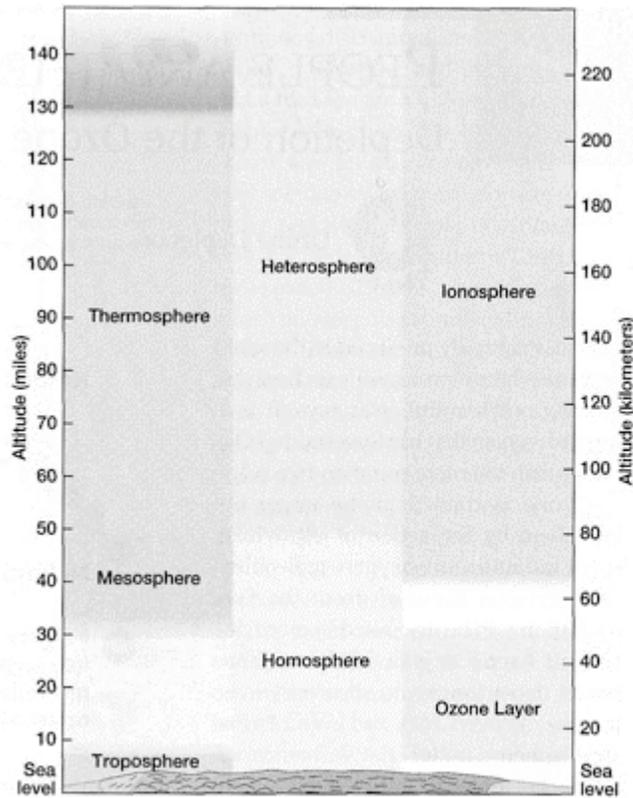
12. At a divergent plate boundary, tectonic plates are moving _____.
 - a. toward each other
 - b. away from each other
 - c. past each other sideways

Quiz 9 – Page 3

13. When a rock layer breaks and forms two blocks of rock that grind past each other, the surface where they meet is called a _____.
- a. monocline
 - b. fault
 - c. ridge
14. About how far does a tectonic plate move in a year
- a. a few centimeters
 - b. a few meters
 - c. a few kilometers
15. What causes tectonic plate to move?
- a. magnetic-pole reversals
 - b. convection currents in the mantle
 - c. energy from ocean currents
16. What is a convection current and how does it form?

Quiz 9 – Page 4

17. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the figure.



The vertical distribution pattern of the various atmospheric spheres

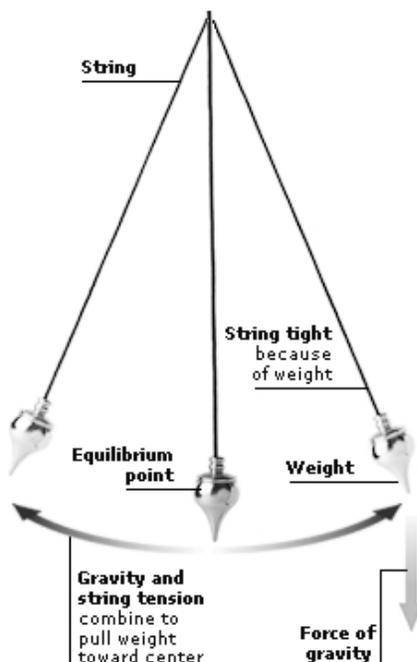
- According to the above figure, if you were to travel 30 kilometers above sea level, you would find yourself in the _____.
- a. troposphere
 - b. ozone layer
 - c. mesosphere
 - d. ionosphere

Quiz 10 – Page 1

1. What type of boundary is formed when tectonic plates move toward each other?
 - a. convergent
 - b. divergent
 - c. transform
2. Magma tends to form at divergent plate boundaries because _____.
 - a. temperature increases above the rock's melting point
 - b. pressure increases, which lowers the rock's melting point
 - c. pressure decreases, which lowers the rock's melting point
3. What causes convection currents in the mantle?
 - a. ridge push and slab pull
 - b. temperature differences within the mantle
 - c. seismic waves within the mantle
4. What causes many earthquakes and volcanoes?
 - a. tectonic plate movements
 - b. magnetic reversals
 - c. uplift and subsidence
5. Where do most earthquakes occur?
 - a. near ridges in the middle of tectonic plates
 - b. along faults near transform boundaries
 - c. near the boundaries between tectonic plates
6. Earthquakes release energy in _____ that travel away from the earthquake in all directions.
 - a. seismic waves
 - b. pyroclastic materials
 - c. subduction zones

Quiz 10 – Page 2

7. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the diagram.



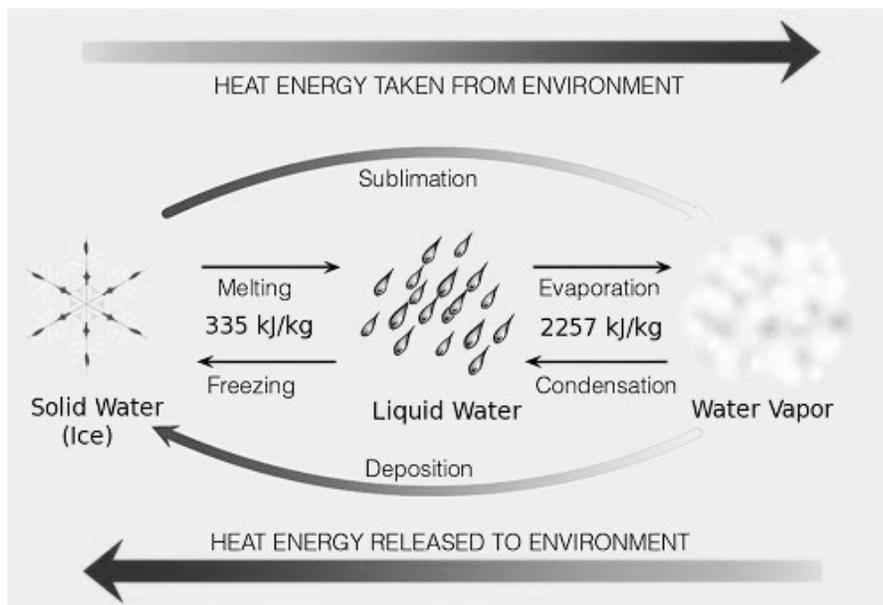
- According to the above model of a pendulum, both _____ and _____ are responsible for pulling the weight towards the center.
- a. equilibrium and gravity
 - b. tension of the string and mass of the weight
 - c. tension of the string and gravity
 - d. gravity and density of the weight
8. Where do most earthquakes happen, and why do they happen there?

Quiz 11 – Page 1

1. Earthquakes are caused by energy that is released when _____.
 - a. deformed rock bounces back to its original shape
 - b. tectonic plates grind against each other
 - c. seismic waves travel in all directions
2. Which statement best describes the relationship between volcanoes, large earthquakes, and tectonic plates?
 - a. Volcanoes typically occur in the centers of tectonic plates and large earthquakes typically occur along the borders between tectonic plates.
 - b. Volcanoes and large earthquakes typically occur along the borders between tectonic plates.
 - c. Volcanoes and large earthquakes typically occur near the centers of tectonic plates.
3. Magma that contains a lot of _____ tends to cause explosive eruptions.
 - a. water or silicon
 - b. carbon or hydrogen
 - c. nitrogen or glycerin
4. An opening that allows magma and gases to flow out onto Earth's surface is called a _____.
 - a. fault
 - b. volcano
 - c. ridge
5. Where do most volcanoes occur?
 - a. in hot spots like the Hawaiian Islands
 - b. along transform plate boundaries
 - c. near the edges of tectonic plates
6. Magma erupts as _____.
 - a. liquid rock called lava
 - b. solid rock called pyroclastic material
 - c. either lava or pyroclastic material

Quiz 11 – Page 2

7. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the diagram.



According to the above diagram, when heat energy is released to the environment, processes such as _____ and _____ can occur.

- a. sublimation; deposition
 - b. condensation; freezing
 - c. melting; evaporation
 - d. evaporation; sublimation
8. How can a volcanic eruption result in climate change?

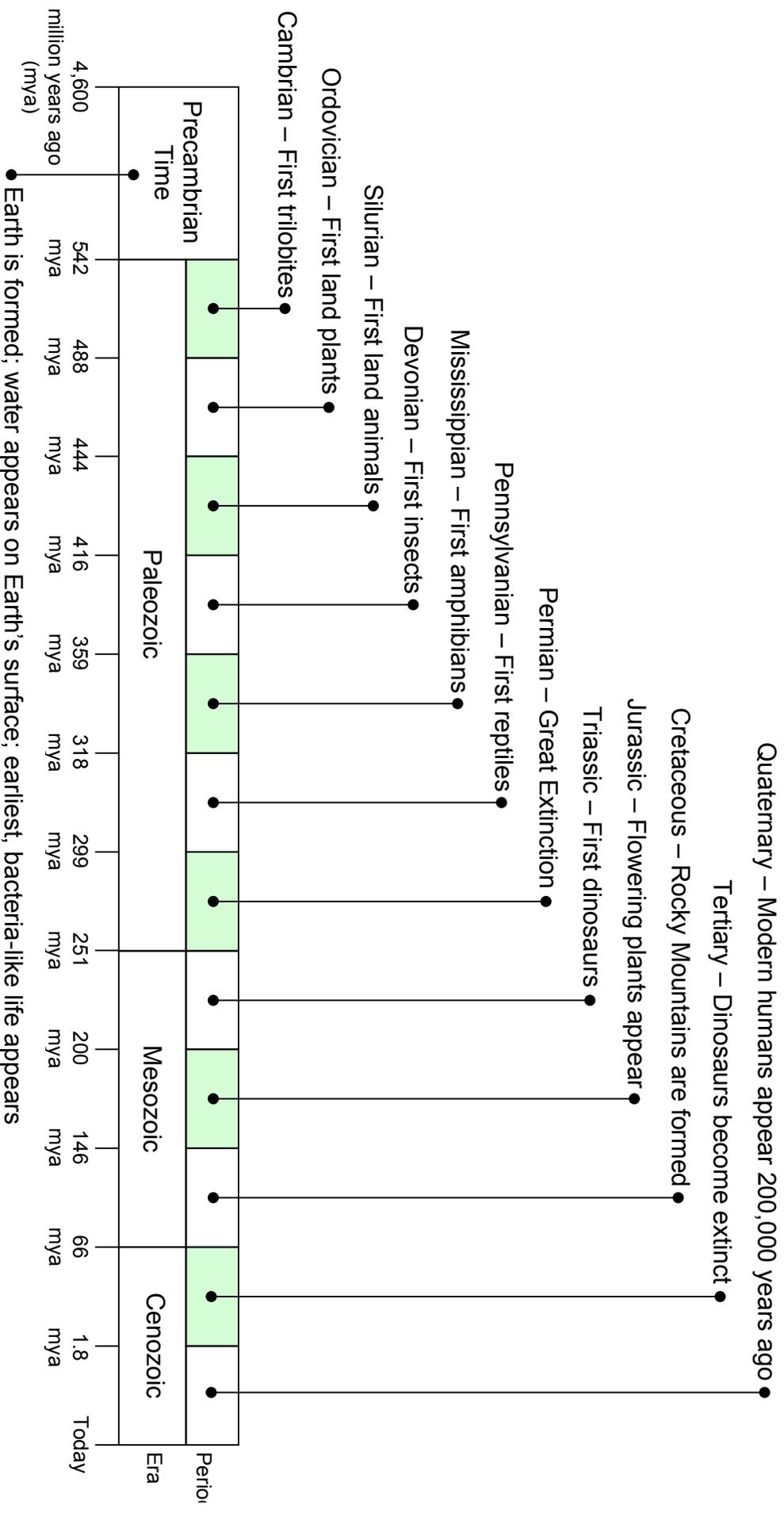
Compare Time Scales – Numeric Scale – Table

1

Era	Period	Dates (mya = million years ago)	Major Event
Cenozoic	Quaternary	1.8 mya to today	Modern humans appear (200,000 years ago)
	Tertiary	66 to 1.8 mya	Dinosaurs become extinct (66 mya)
	Cretaceous	146 to 66 mya	Rocky Mountains are formed (144 mya)
Mesozoic	Jurassic	200 to 146 mya	Flowering plants appear (150 mya)
	Triassic	251 to 200 mya	First dinosaurs (245 mya)
	Permian	299 to 251 mya	Great Extinction (270 mya)
Paleozoic	Pennsylvanian	318 to 299 mya	First reptiles (300 mya)
	Mississippian	359 to 318 mya	First amphibians (350 mya)
	Devonian	416 to 359 mya	First insects (400 mya)
	Silurian	444 to 416 mya	First land animals (420 mya)
	Ordovician	488 to 444 mya	First land plants (450 mya)
	Cambrian	542 to 488 mya	First trilobites (540 mya)
Precambrian Time		4,600 to 542 mya	Earliest, bacteria-like life appears (3,500 mya) Water appears on Earth's surface (4,000 mya) Earth is formed (4,600 mya)

Compare Time Scales – Numeric Scale – Timeline

2

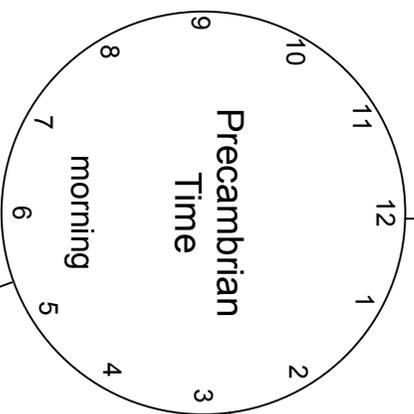


Compare Time Scales – Proportional Scale – Clock

3

START

midnight – Earth is formed



earliest, bacteria-like life appears – 5:20 am

2:40 am – water appears on Earth's surface

end of mesozoic era; dinosaurs become extinct – 11:39 pm

Rocky Mountains are formed – 11:14 pm

flowering plants appear – 11:12 pm

end of paleozoic era; first dinosaurs – 10:42 pm

Great Extinction – 10:33 pm

first reptiles – 10:24 pm

first amphibians – 10:04 pm

first insects – 9:52 pm

first land animals – 9:46 pm

first land plants – 9:39 pm

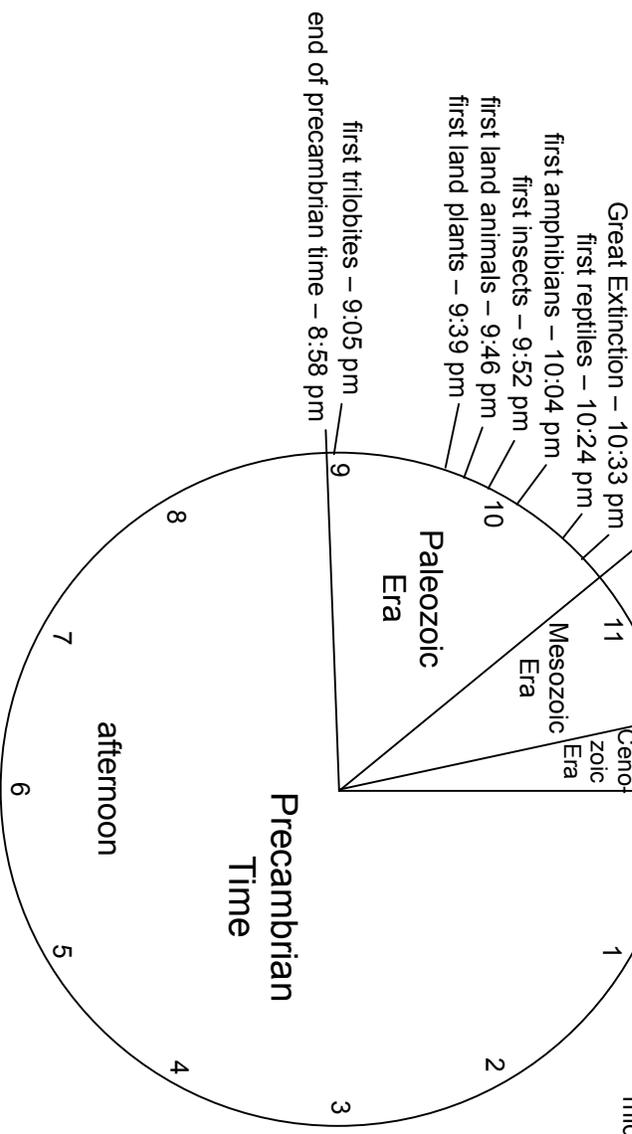
first trilobites – 9:05 pm

end of precambrian time – 8:58 pm

END

midnight – today

modern humans appear
seconds before
midnight



Compare Time Scales – Proportional Scale – Football Field 4

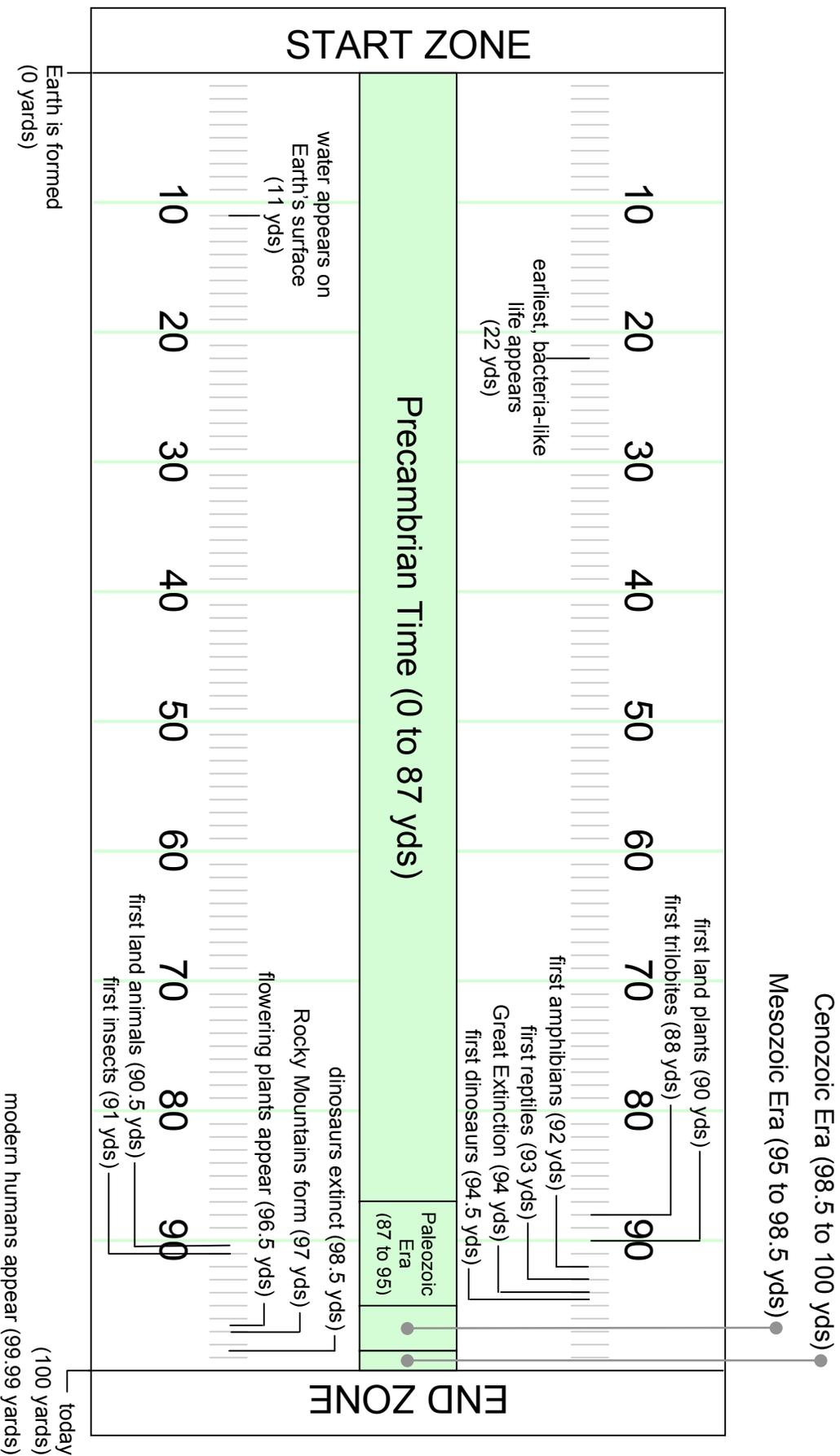


	Table	Timeline
Where in the diagram does it say Earth is formed?		
Where in the diagram is today?		
Look at the three eras and precambrian time. At first glance, which looks like it lasted longest?		
When did precambrian time begin?		
When did precambrian time end?		
How long did precambrian time last?		
When did the paleozoic era begin?		
When did the paleozoic era end?		
How long did the paleozoic era last?		
When did modern humans appear?		

Compare Proportional Time Scales

6

	Clock	Football Field
Where in the diagram does it say Earth is formed?		
Where in the diagram is today?		
Look at the three eras and precambrian time. At first glance, which looks like it lasted longest?		
At what point does precambrian time begin?		
At what point does precambrian time end?		
How much of the diagram is precambrian time?		
At what point does the paleozoic era begin?		
At what point does the paleozoic era end?		
How much of the diagram is the paleozoic era?		
At what point do modern humans appear?		

Diamond



Mineral

Diamond is a natural solid that is made entirely of carbon. It forms when very high temperature and pressure cause carbon atoms to form crystals. It is the hardest mineral on Earth.

color: pale yellow or colorless
common uses: jewelry; tools for cutting
& drilling

density: 3.5 g/cc
hardness: 10

Coal



Rock

Coal is a natural solid that forms when the buried remains of trees and ferns are exposed to heat and pressure. It is made mostly of organic carbon, with varying amounts of sulfur, hydrogen, oxygen, and nitrogen. Coal has an amorphous structure.

color: black or brownish black
common uses: fuel; generating electricity

density: varies
type: metamorphic

Calcite



Mineral

Calcite is a natural solid that is made of calcium carbonate. The chemical formula for calcium carbonate is CaCO_3 . Calcite is an inorganic solid that is noted for its almost perfect cleavage, which means that it splits along smooth surfaces.

color: colorless or white to tan
common uses: cement; building materials; soil treatment

density: 2.7 g/cc
hardness: 3

Limestone



Rock

Limestone is a natural solid that forms when the shells of sea creatures are pressed tightly together. It is made mostly of calcite, with varying amounts of other minerals like quartz and aragonite. Limestone has a crystalline structure.

color: white to tan or gray
common uses: crushed stone; cement; building materials

density: varies
type: sedimentary

Quartz



Mineral

Quartz is a natural solid that is made of silicon dioxide. The chemical formula for silicon dioxide is SiO_2 . Quartz forms when molten rock that contains a lot of silica cools slowly and forms large crystals.

color: colorless or white
common uses: jewelry; glass; computer chips

density: 2.6 g/cc
hardness: 7

Granite



Rock

Granite is a natural solid that forms deep beneath Earth's surface, when molten rock cools and hardens. It is made mostly of quartz and feldspar, with varying amounts of other minerals like mica. Granite crystals are often large, smooth, and shiny.

color: usually light pink or gray
common uses: building materials; countertops; monuments

density: varies slightly
type: igneous

Compare Rocks & Minerals

What is it? (rock or mineral)	Diamond	Coal	Calcite	Limestone	Quartz	Granite
Is it naturally formed? (i.e., not man-made)						
Is it organic? (i.e., comes from living things)						
What is its state? (solid, liquid, or gas)						
What kind of structure does it have? (crystalline or amorphous)						
What kind of substance is it? (element, compound, or mixture)						
Does it have a predictable density?						

Minerals Only

Both Minerals & Rocks

Rocks Only

Trilobite Hunter

Imagine your class is on a field trip to a local quarry. The teacher asks everybody to find the coolest rock you can and bring it back to her. You and your friend go to opposite sides of the quarry.



Your friend brings back a rock that hardly weighs anything and is full of tiny holes. You bring back a gray rock marked with what looks like a picture of a bug.

Your teacher says, “That’s a trilobite fossil. You can sell that rock on the internet for a lot of money.”

Your friend says, “Where can I find a trilobite fossil?”

The teacher answers, “if you want to find fossils, you have to know about how rocks form and where rocks that contain fossils are likely to be found.”

Throughout this chapter, see if you can figure out the answers to these questions:

- What kinds of rocks are likely to contain fossils?
- Where should you look for trilobite fossils?

Granite



Igneous

Granite forms when molten rock cools and hardens. This happens when magma is trapped underground. The temperature there is very warm, so the magma hardens slowly. This slow cooling results in the formation of large crystals that are easily visible without a hand lens.

Granite makes up a large portion of Earth's crust and mountain ranges. It is very hard and long-lasting, so it is often used for headstones and other monuments. Granite does not contain fossils.

Pumice



Igneous

Pumice forms when molten rock cools and hardens. This happens when a volcano erupts and lava explodes into the air. The temperature there is very cool, so the lava hardens quickly. This fast cooling results in the formation of tiny pieces of volcanic glass.

Pumice also contains tiny holes that were once gas bubbles in foamy lava. The holes make it so light that some can even float in water. The volcanic glass makes pumice useful as an abrasive in skin soaps and household cleaners. Pumice does not contain fossils.

Sandstone



Sedimentary

Sandstone forms when grains of sand get compacted and cemented together. When a river carrying sand slows, the sand settles and piles up. Over time, new layers form on top of old layers, squeezing and compacting the sand in the bottom layers. A chemical called a cementing agent that holds the grains of sand together.

Because the remains of plants and animals often settle along with grains of sand, sandstone often contains fossils. Its color depends on what it is made of. A lot of sand is mostly quartz, which is clear or white. But some sand is black or gray because it contains a lot of volcanic rock crystals.

Limestone



Sedimentary

Limestone forms when the remains of sea creatures get compacted and cemented together. When these organisms die, their shells settle and pile up. Over time, new layers form on top of old layers, squeezing and compacting the pieces in the bottom layers. Shells are made of calcium carbonate, which acts as a cementing agent that holds the pieces together.

Because it is made from shell pieces, limestone often contains fossils. Its color depends on what it is made of. Calcium carbonate is white, but limestone usually contains sand and mud as well, so it is often tan.

Slate



Metamorphic

Slate forms when shale, a sedimentary rock, changes due to heat and pressure. This process happens deep beneath Earth's surface.

Shale is a smooth, hard rock with very fine grains arranged in layers. Slate is also smooth with very fine grains, but it is harder and more compact. Shale often contains fossils, but slate rarely does. The biggest change is that slate can be easily split into sheets of different thicknesses. For this reason, it is often used to make roofing tiles and paving stones.

Schist



Metamorphic

Schist forms when slate, a metamorphic rock, changes due to extreme heat. This process happens deep beneath Earth's surface.

Slate is smooth, fairly shiny, and hard. Schist is rough and shiny, and small pieces tend to flake off easily. The biggest change is in grain size. Slate has very fine grains. Schist has medium to coarse crystals that are flat and arranged in layers. Fossils are rarely found in slate or schist.

Compare Properties

Properties of SHALE (original)	
Properties of SLATE that are the same	
Properties of SLATE that are different	
Properties of SLATE (original)	
Properties of SCHIST that are the same	
Properties of SCHIST that are different	

Igneous Rock

Metamorphic Rock

molten rock

sediments

Sedimentary Rock

changes due
to heat &/or
pressure

cools & hardens

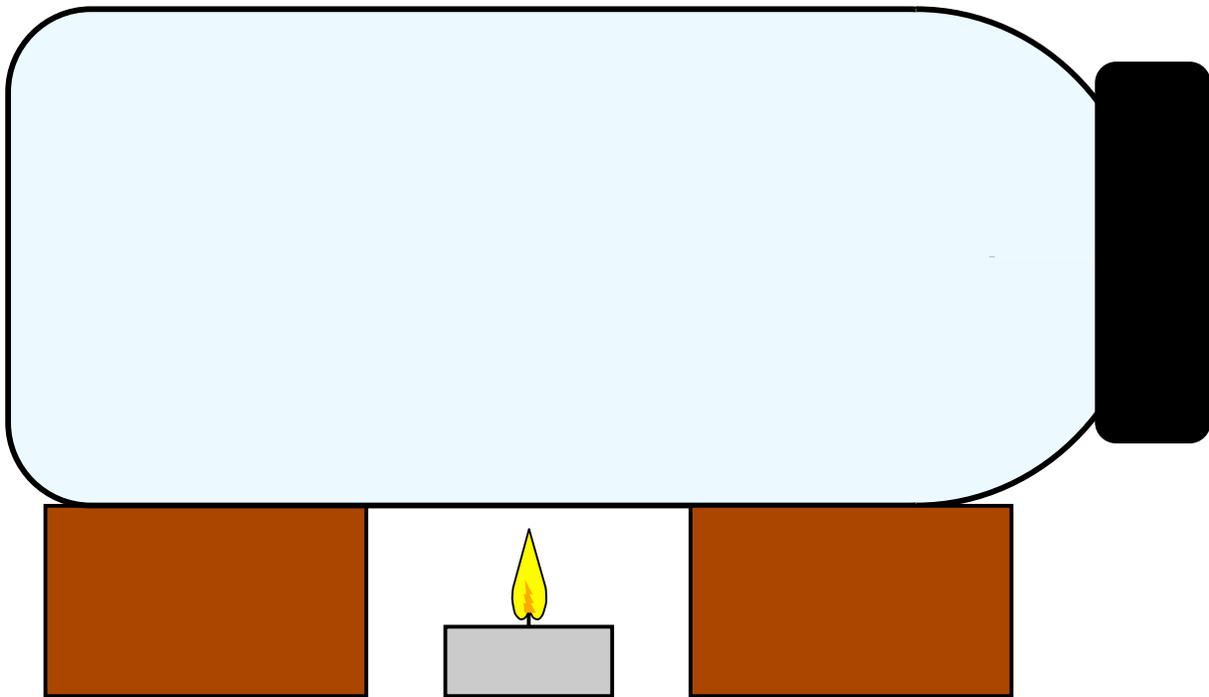
get compacted
& cemented
together

melts due to
extreme heat

weathers,
erodes, moves
& settles

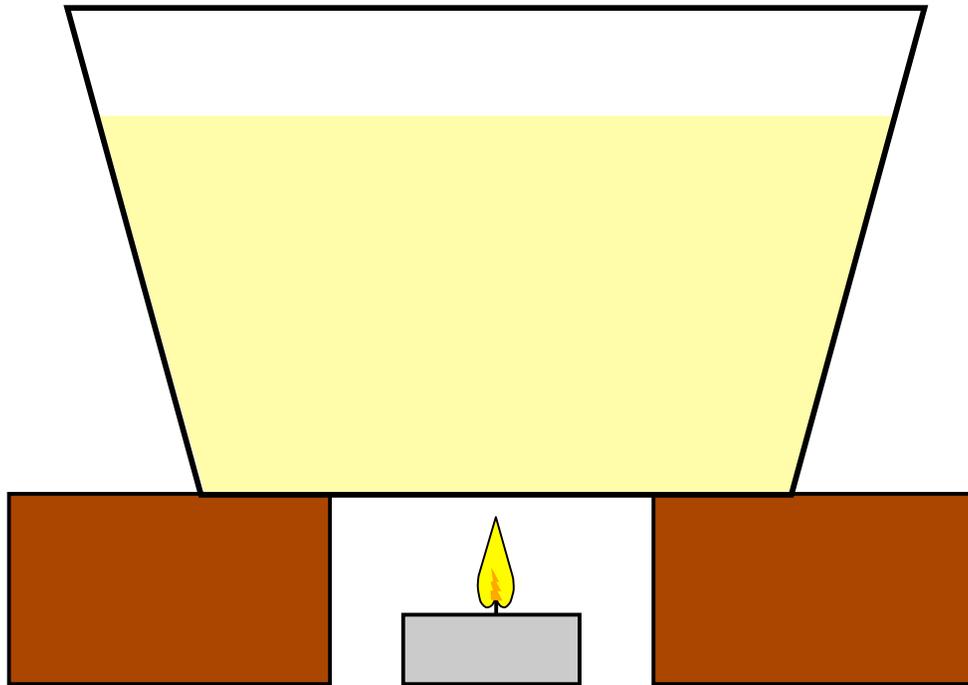
Rheoscopic Fluid

Use drawings and/or words to show what happens to the fluid after the candle is lit.

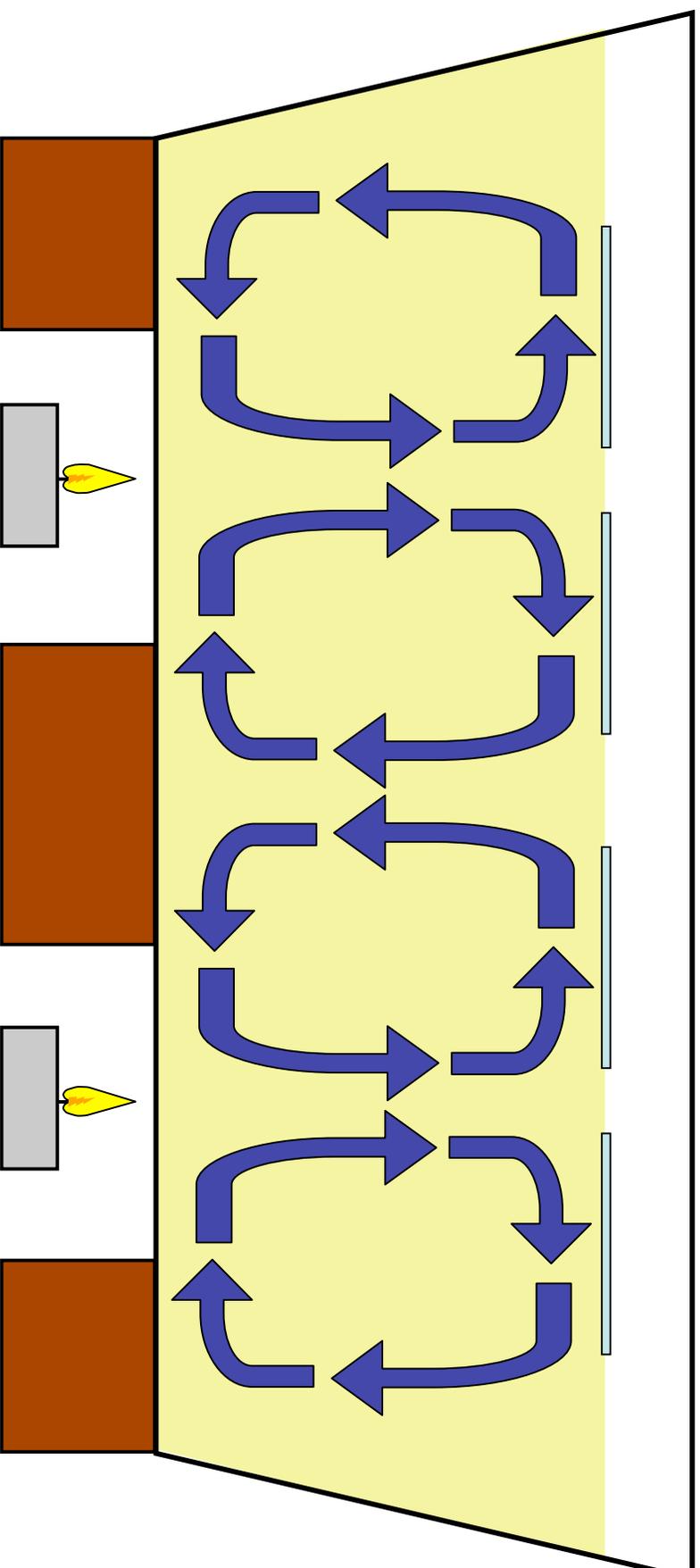


Vegetable Oil

Use drawings and/or words to show what happens to the fluid after the candle is lit.



Convection Diagram 1 – Extra-Wide Beaker



Convection Diagram 2 – Cut-Away Globe

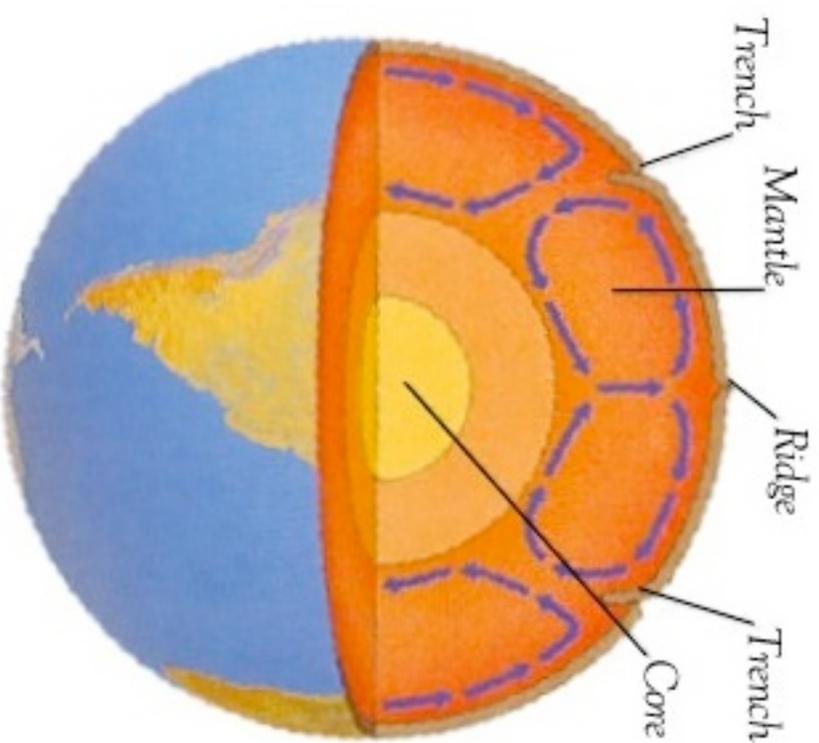


Plate Diagram 1 – Cut-Away Globe Section

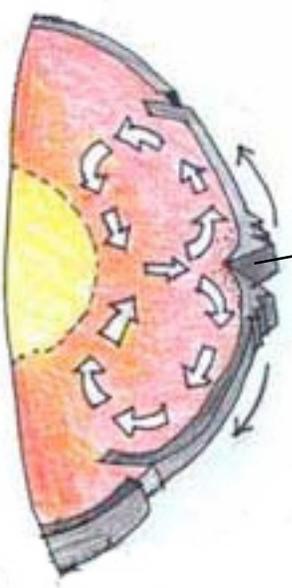
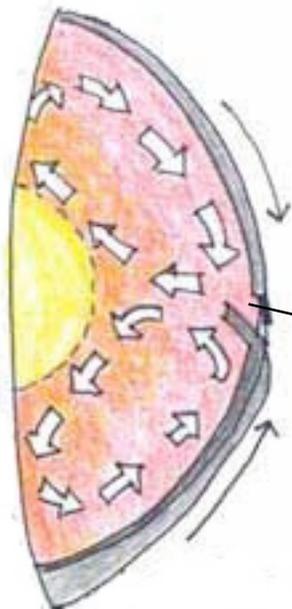
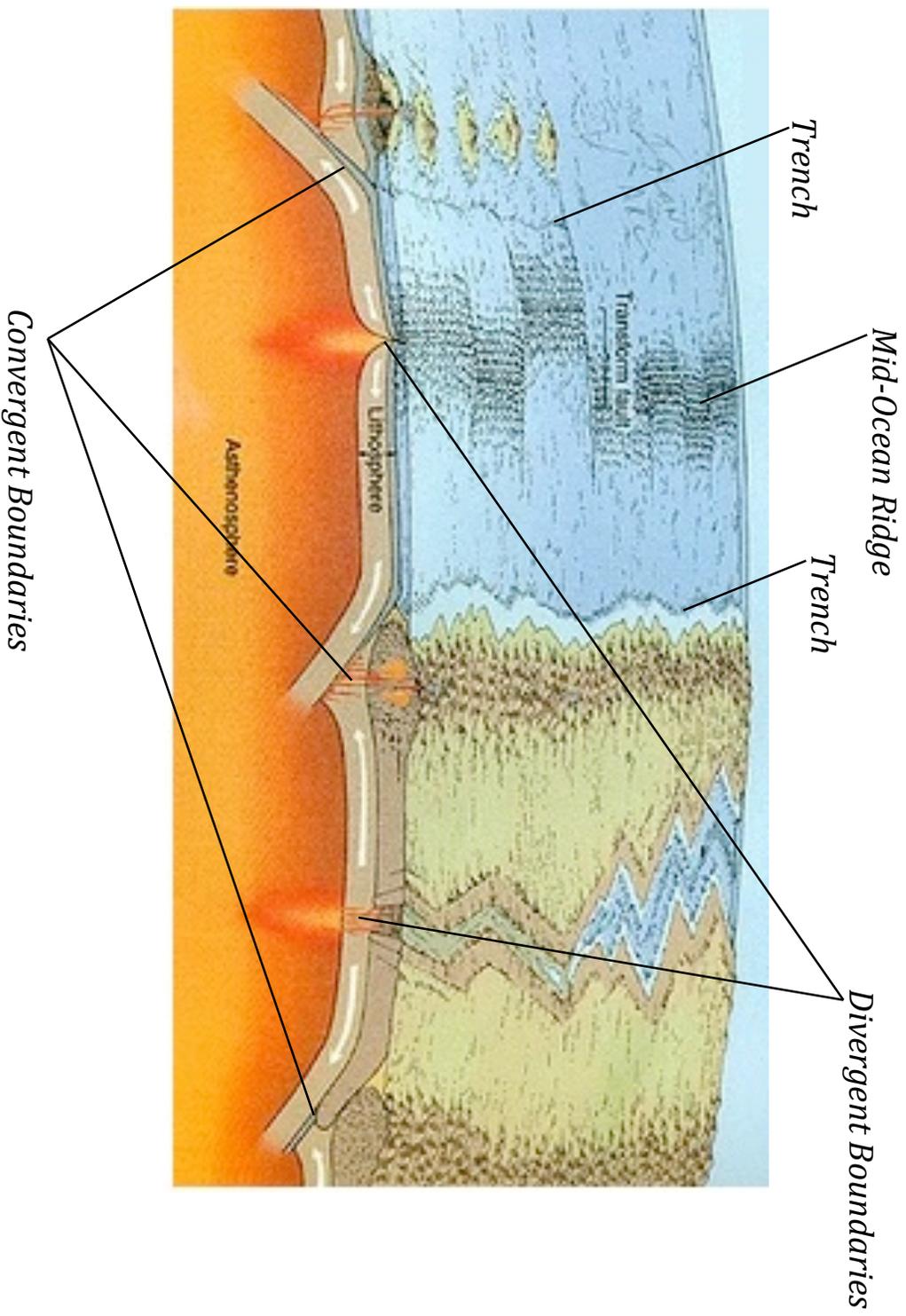
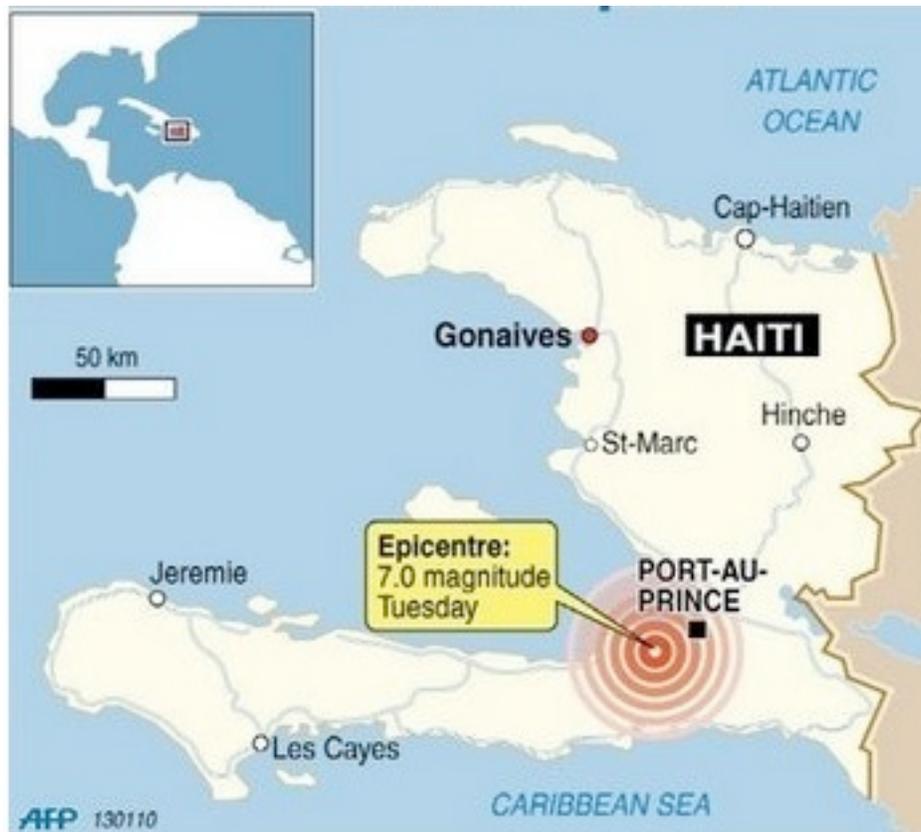
<p><i>Divergent Boundary</i></p> 	<p><i>Convergent Boundary</i></p> 
<p>When part of the mantle is warmer than its surroundings, it rises. When it reaches the plates, it spreads out. If there is a plate boundary above that area, the plates move apart, or diverge.</p>	<p>When part of the mantle is cooler than its surroundings, it sinks. If there is a plate boundary above that area, the plates move toward each other, or converge.</p>

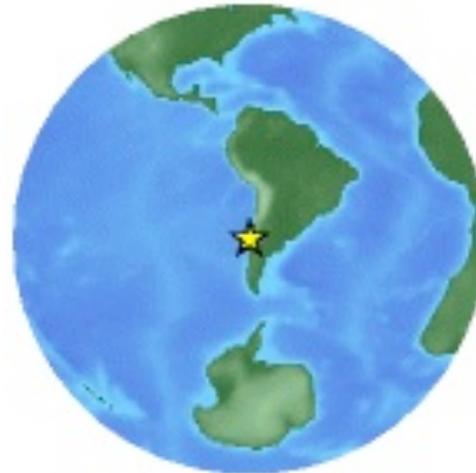
Plate Diagram 2 – Globe Surface





On Tuesday, January 12, 2010, a 7.0-magnitude earthquake struck Haiti. It only lasted for about 35 seconds, but more than 200,000 people were killed and at least 500,000 homes were damaged or destroyed. Government buildings, offices, hotels, schools, and stores collapsed during and after the earthquake, burying people beneath rubble. The earthquake also caused widespread power outages, destroyed roads and hospitals, and damaged communication systems, which hindered rescue and aid efforts. By January 24, at least 52 aftershocks measuring 4.5 or greater had been recorded.

The earthquake was caused by the movements of two tectonic plates: the North American and the Caribbean. Haiti is part of a large island that lies on the boundary between these two plates. At that boundary, both plates have mostly oceanic crust. These two plates are not moving toward or away from each other. Instead, the two plates are moving side-by-side, with the North American plate heading west and the Caribbean plate heading east.



On Saturday, February 27, 2010, an 8.8-magnitude earthquake occurred off the coast of Chile. It lasted 90 seconds and triggered a tsunami that devastated several towns along the coast and caused minor damage in San Diego, California. The earthquake generated a blackout that affected 93% of the country and lasted several days in some locations. Although it was much stronger than the earthquake that struck Haiti, fewer than 1000 people died, perhaps because of Chile's strict laws requiring earthquake-resistant buildings.

The earthquake was caused by the movements of two tectonic plates: the Nazca and the South American. The Nazca plate has oceanic crust and, at that boundary, the South American plate has continental crust. As these plates move toward each other, the Nazca plate is sinking and moving under the South American plate.



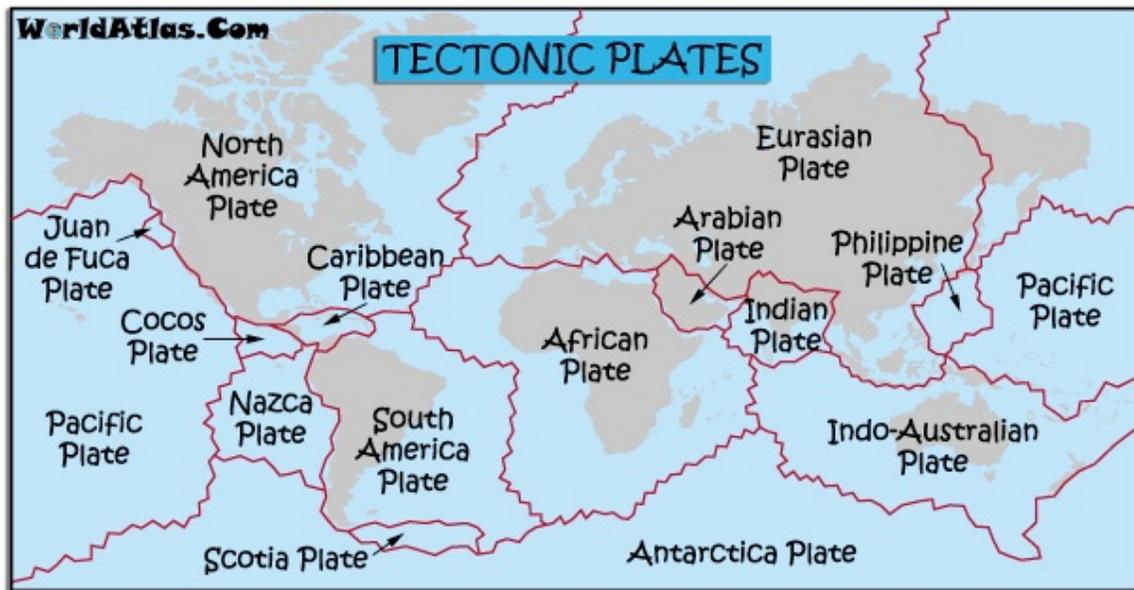
Mount St. Helens, in the state of Washington, is one of the most beautiful mountains of the Cascade Range. But on May 18, 1980, it erupted with a force that blew off the mountain's top and sent ash and debris more than 12 miles into the sky. Sixty two people were killed, and thousands of acres of prime forest were destroyed.

The formation of the Cascade Range and the eruption of Mount St. Helens were caused by the movements of three tectonic plates: the Pacific, the North American, and a tiny plate called Juan de Fuca, which lies between the other two. The Pacific and the Juan de Fuca plates have oceanic crust, and they are moving away from each other. The Juan de Fuca and North American plates are moving toward each other. At that border, the North American plate has continental crust, so the Juan de Fuca plate is sinking and moving under the North American plate. As the plate sinks, magma forms and then rises to the surface. Volcanoes that form this way typically erupt with explosive force, because trapped gases expand as the magma rises, creating tremendous pressure. This pent-up pressure is suddenly released in a violent eruption.



This is an aerial photograph of Amero, a town in Columbia that was destroyed when the Nevado del Ruiz volcano erupted on November 13, 1985. It ejected only about 3 percent of the magma that erupted at Mount St. Helens, yet this tiny eruption triggered mudflows that killed more than 23,000 people. The hot volcanic material melted the snow and ice that covered the mountain, creating floods of water that swept downward. As these floods descended, they picked up soil and loose debris forming hot mudflows. Two and a half hours after the start of the eruption, one of the mudflows reached Amero, 45 miles from the volcano. Within a few short minutes, most of the town was buried or swept away.

Nevado del Ruiz is in the Andes Volcanic Chain of western South America. The formation of the chain and the eruption of Nevado del Ruiz were caused by the movements of two plates: the Nazca, which has oceanic crust, and the South American, which has continental crust at that boundary. As these plates move toward each other, the Nazca plate is sinking and moving under the South American plate.



Haiti Earthquake

name of plate		
type of crust		
type of boundary		

Chile Earthquake

name of plate		
type of crust		
type of boundary		

Mount St. Helens Eruption

name of plate		Juan de Fuca	
type of crust			
type of boundary			

Nevado del Ruiz Eruption

name of plate		
type of crust		
type of boundary		