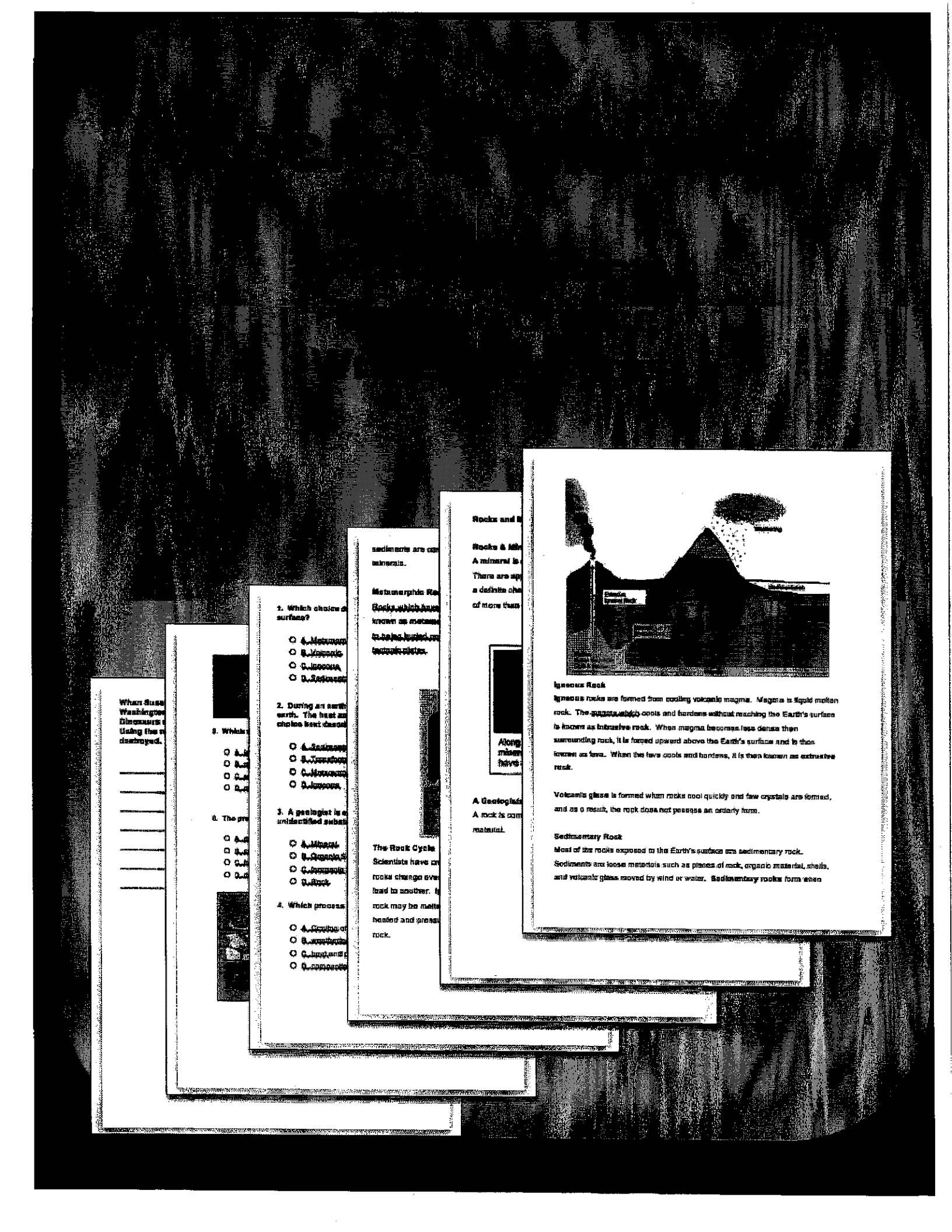
Earth and Space Science

YCHS

Instructional Packet

March 25th-April 6th

Coach Bourne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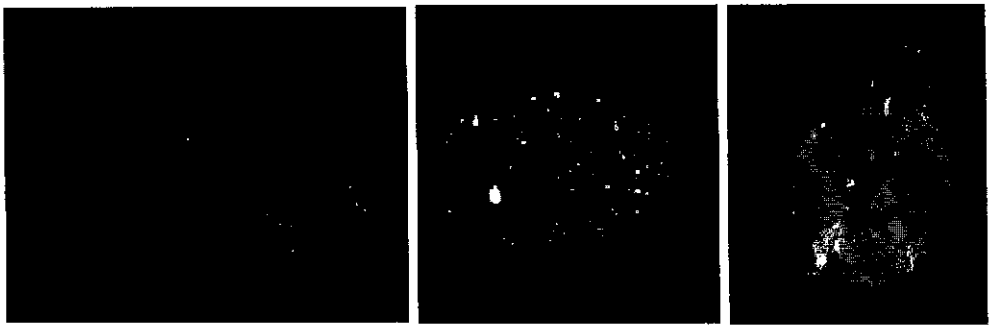
Igneous Rock
Igneous rocks are formed from cooling volcanic magma. Magma is liquid molten rock. The magma which cools and hardens without reaching the Earth's surface is known as intrusive rock. When magma becomes less dense than surrounding rock, it is forced upward above the Earth's surface and is then known as lava. When the lava cools and hardens, it is then known as extrusive rock.
Volcanic glass is formed when rocks cool quickly and few crystals are formed, and as a result, the rock does not possess an orderly form.
Sedimentary Rock
Most of the rocks exposed to the Earth's surface are sedimentary rock. Sediments are loose materials such as pieces of rock, organic material, shells, and volcanic glass moved by wind or water. Sedimentary rocks form when

Rocks and Minerals

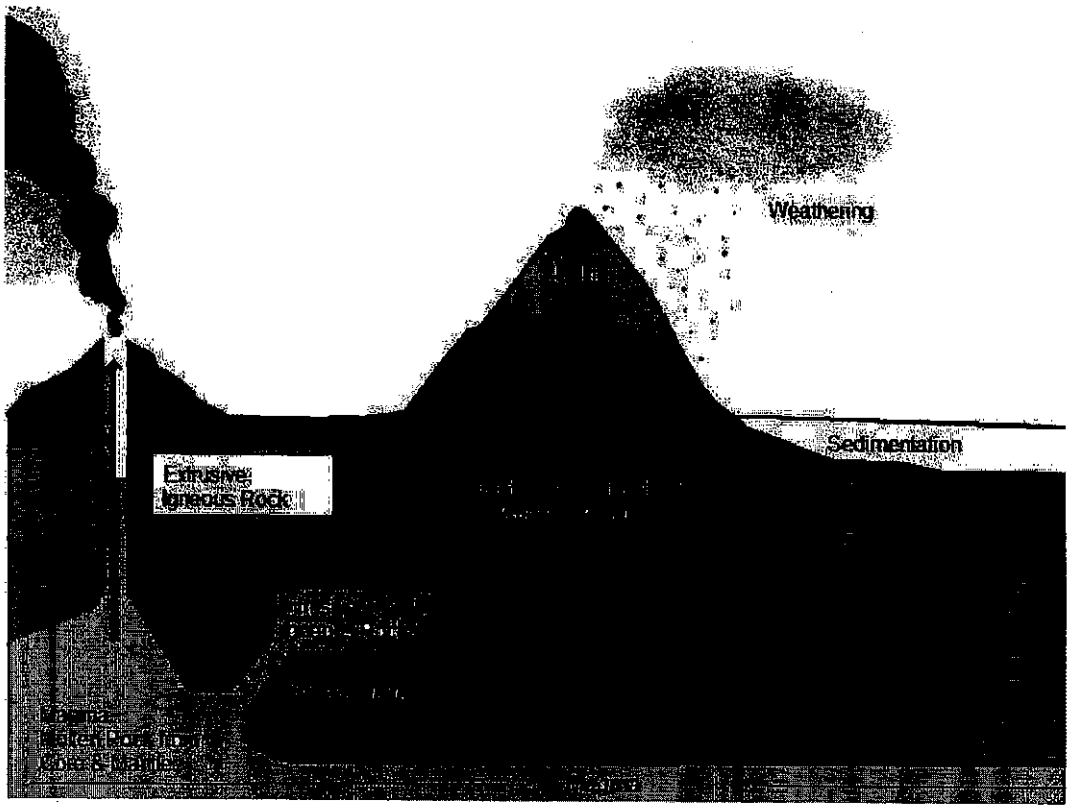
Rocks & Minerals

A **mineral** is an inorganic (made of non-living things), naturally occurring solid. There are approximately 4000 different minerals found on Earth. Minerals have a definite chemical composition and are found as crystals. **Rocks** are made out of more than one type of mineral.



Along with organic material, rocks are also made out of minerals. As you can see from the minerals above, minerals have a definite crystalline structure.

A Geologists, scientists who studies the Earth, are experts on identifying rocks. A rock is composed of a combination of minerals, volcanic material, and organic material.



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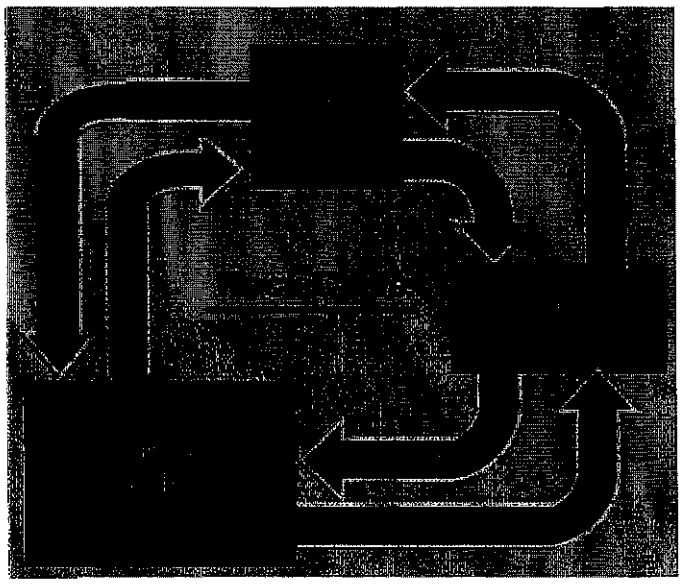
Sedimentary Rock

Most of the rocks exposed to the Earth's surface are sedimentary rock. Sediments are loose materials such as pieces of rock, organic material, shells, and volcanic glass moved by wind or water. **Sedimentary rocks** form when

sediments are compacted and stuck together or chemically react to form minerals.

Metamorphic Rock

Rocks which have chemically changed due to temperature and pressure are known as **metamorphic rocks**. The pressure a rock is exposed to may be due to being buried under layers of other rock or pressure supplied by colliding tectonic plates.



The Rock Cycle

Scientists have created a model known as the rock cycle to demonstrate how rocks change over time. As you examine the rock cycle, notice that phase can lead to another. Igneous rock may form into metamorphic rock. Metamorphic rock may be melted and cooled into igneous rock. Sedimentary rock may be heated and pressurized into metamorphic rock or melted and cooled into igneous rock.

1. Which choice describes most of the rocks exposed to the Earth's surface?

- ○ **A** Metamorphic
- ○ **B** Volcanic
- ○ **C** Igneous
- ○ **D** Sedimentary

2. During an earthquake, a sedimentary rock is buried deep within the earth. The heat and pressure chemically change the rock's identity. Which choice best describes the sample of rock after this change?

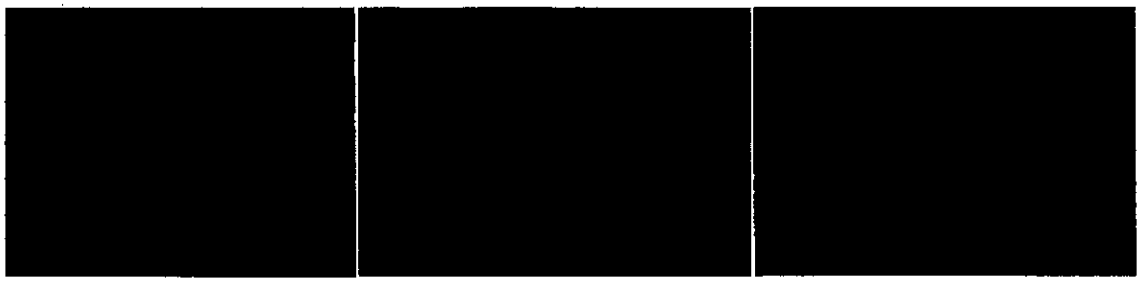
- ○ **A** Sedimentary
- ○ **B** Transformative
- ○ **C** Metamorphic
- ○ **D** Igneous

3. A geologist is examining a sample made up of pyrite, iron, and an unidentified substance. Which of the following <u>best</u> describes the sample?

- ○ **A** Mineral
- ○ **B** Organic Substance
- ○ **C** Inorganic Substance
- ○ **D** Rock

4. Which process forms igneous rock?

- ○ **A** Cooling of magma
- ○ **B** weathering
- ○ **C** heat and pressure
- ○ **D** compaction and cementation



5. Which types of rocks contains the best fossil records?

- ○ **A** igneous
- ○ **B** magma
- ○ **C** sedimentary
- ○ **D** metamorphic

6. The process of the Rock Cycle

- ○ **A** destroys matter during the process
- ○ **B** creates matter during the process
- ○ **C** both creates and destroys matter
- ○ **D** does not create or destroy any matter

7. Crystals which form very fast in igneous rocks are?

- ○ **A** very large
- ○ **B** large
- ○ **C** medium sized
- ○ **D** small

8. When magma cools below the earth surface what type of rock is formed?

- ○ **A** extrusive igneous
- ○ **B** intrusive metamorphic
- ○ **C** extrusive igneous
- ○ **D** intrusive metamorphic

9. Sedimentary rocks are classified as

- ○ **A** foliated or non-foliated
- ○ **B** intrusive or extrusive
- ○ **C** detrital, chemical, or organic
- ○ **D** basaltic, granitic, or andesitic

When Susan visited the Smithsonian Museum of Natural History in Washington D.C., the guide mentioned that many fossils and remains of Dinosaurs may have been lost due to natural changes within the earth. Using the rock cycle, explain how evidence of prehistoric life may be destroyed.

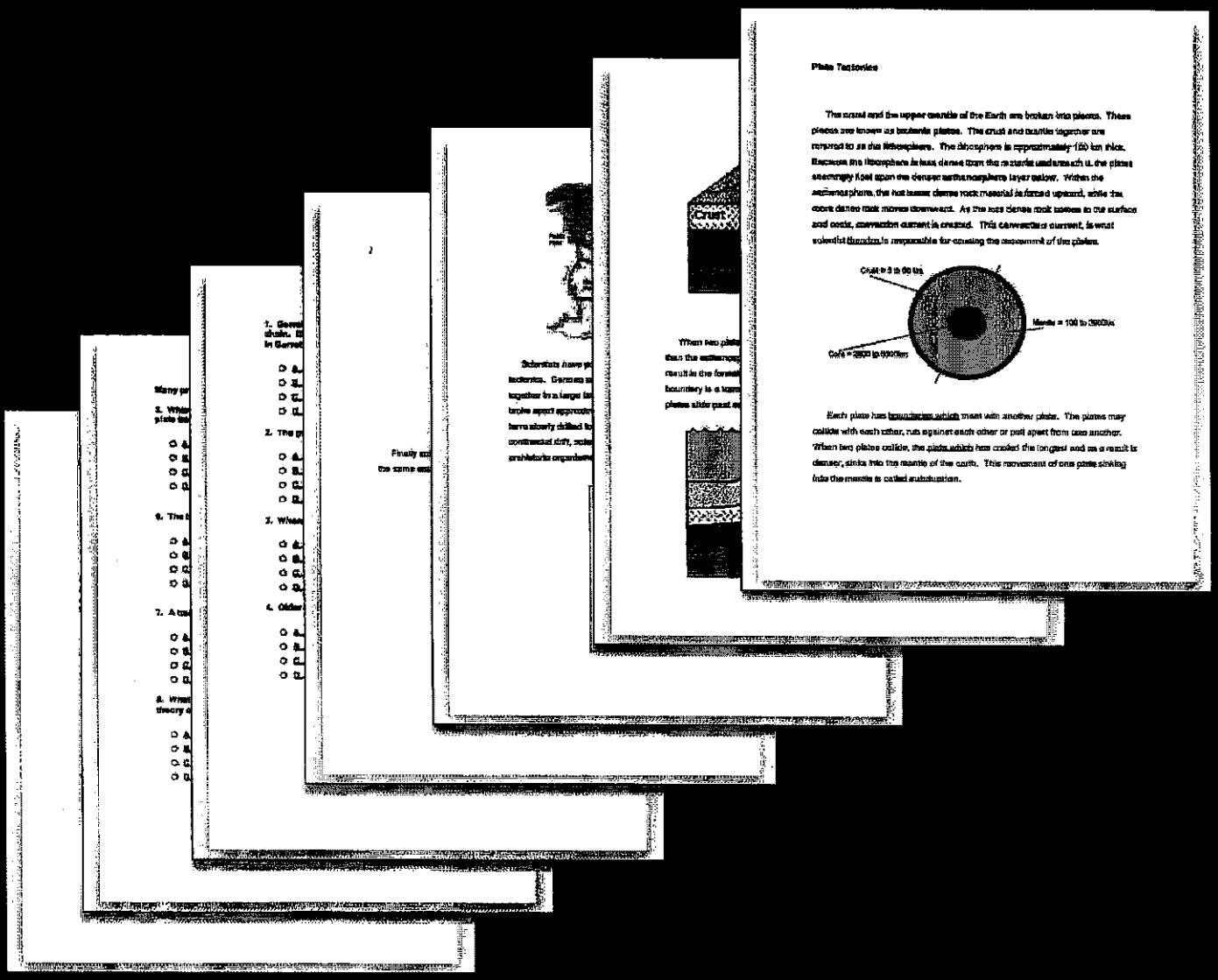


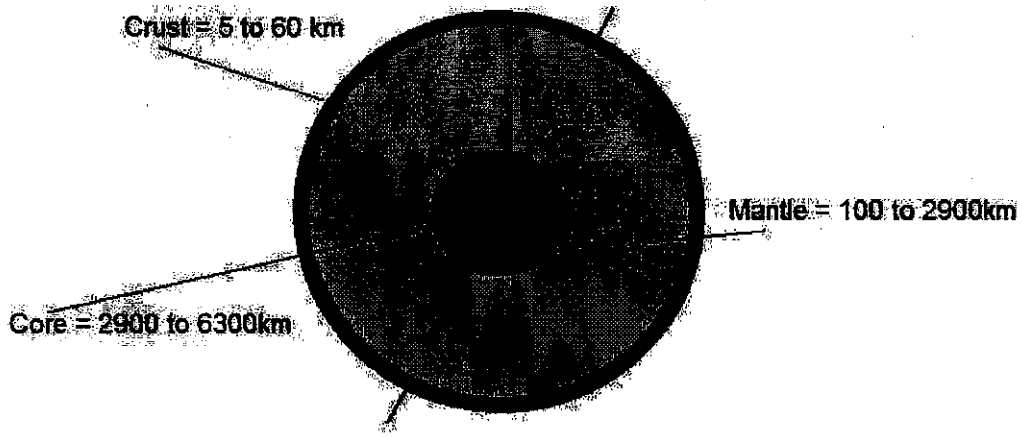
Plate Tectonics

The crust and the upper mantle of the Earth are broken into pieces. These pieces are known as tectonic plates. The crust and mantle together are referred to as the lithosphere. The lithosphere is approximately 100 km thick. Because the lithosphere is less dense than the mantle underneath it, the plates seemingly float upon the denser asthenosphere layer below. Within the asthenosphere, the hot lesser dense rock material is forced upward, while the cooler denser rock moves downward. As the less dense rock moves to the surface and cools, convection current is created. This convection current, is what scientist Hess, is responsible for causing the movement of the plates.

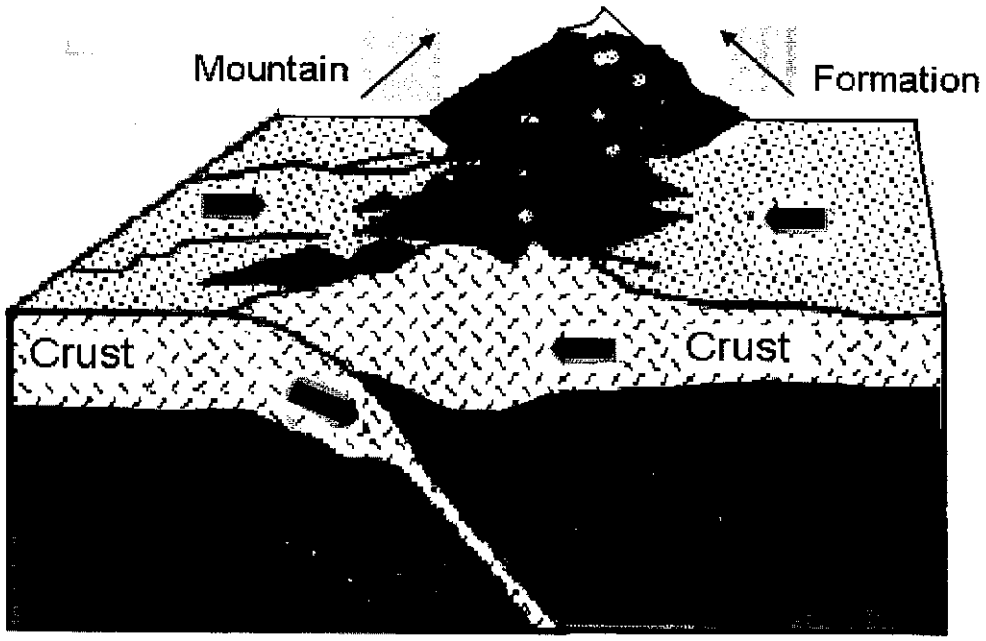
Each plate has boundaries which meet with another plate. The plates may collide with each other, run against each other or pull apart from one another. When two plates collide, the plate which has cooled the longest and as a result is denser, sinks into the mantle of the earth. This movement of one plate sinking into the mantle is called subduction.

Plate Tectonics

The **crust** and the **upper mantle** of the Earth are broken into pieces. These pieces are known as **tectonic plates**. The crust and mantle together are referred to as the **lithosphere**. The lithosphere is approximately 100 km thick. Because the lithosphere is less dense than the material underneath it, the plates seemingly float upon the denser **asthenosphere** layer below. Within the asthenosphere, the hot lesser dense rock material is forced upward, while the more dense rock moves downward. As the less dense rock comes to the surface and cools, convection current is created. This **convection current**, is what scientist theorize is responsible for causing the movement of the plates.

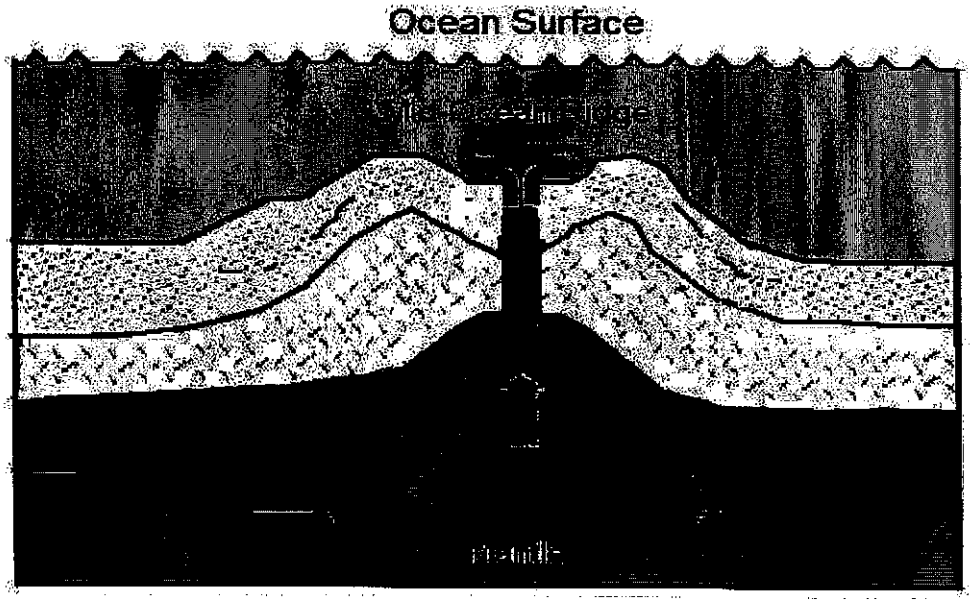


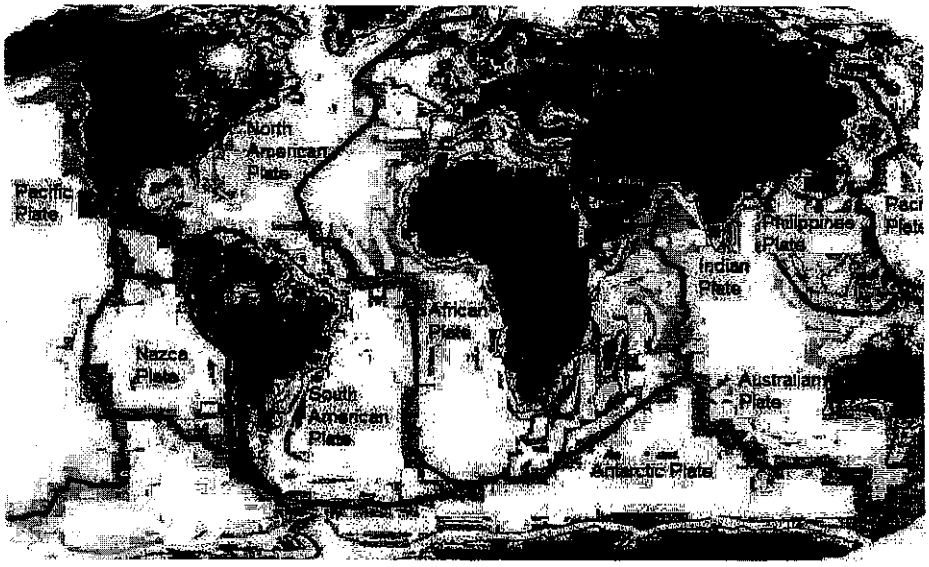
Each plate has boundaries which meet with another plate. The plates may collide with each other, rub against each other or pull apart from one another. When two plates collide, the plate which has cooled the longest and as a result is denser, sinks into the mantle of the earth. This movement of one plate sinking into the mantle is called **subduction**.



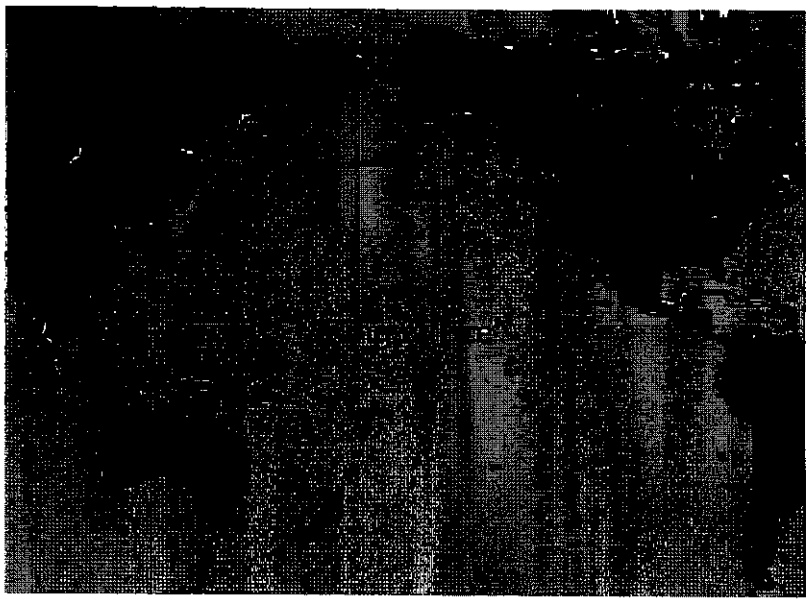
Convergent Boundary

When two plates collide and the rock from which they are made is less dense than the asthenosphere, there is not any subduction. **Convergent boundaries** result in the formation of mountain ranges and also earthquakes. The last type of boundary is a transform boundary. A **transform boundary** occurs when two plates slide past each other in opposite or the same direction.

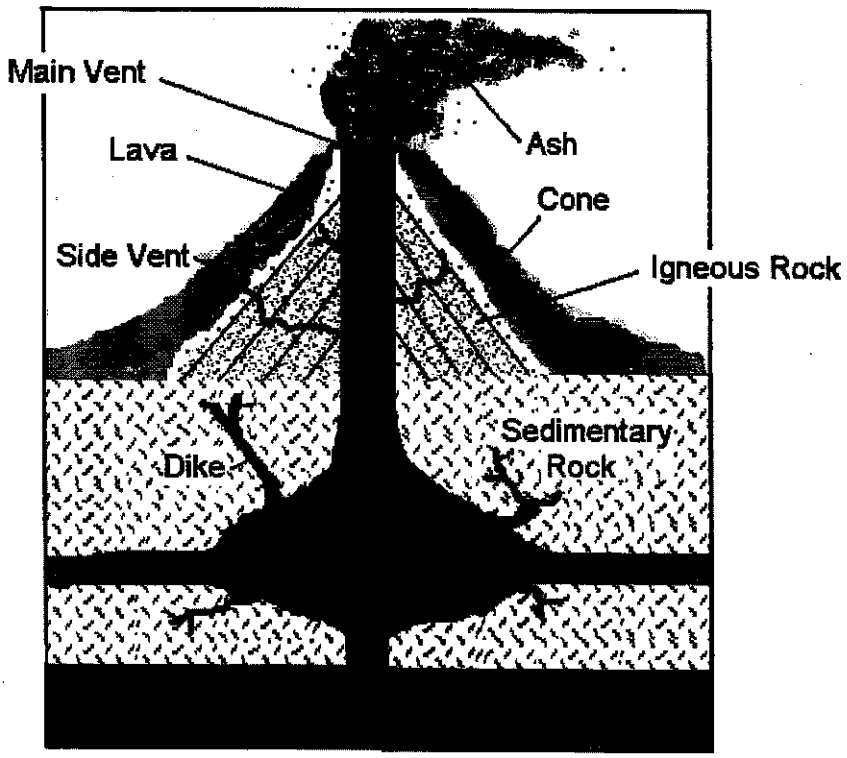




Scientists have pointed to several clues to support the concept of plate tectonics. German scientist Alfred Wegener proposed that the continents once fit together in a large landmass named Pangaea. Wegner theorized that Pangaea broke apart approximately 200 million years ago, and the subsequent continents have slowly drifted to their current position. Along with Wegener's theory of continental drift, scientist also point out the discoveries of fossils of the same type prehistoric organisms where the continents look as if they would fit together.



Finally scientists have observed that volcanic and seismic activity is always in the same area of a plate boundary.



1. Garrett County Maryland is found within the Appalachian Mountain chain. Choose the best answer below which describes how the mountains in Garrett County Maryland were formed.

- ○ **A** Two plates collided and forced the land mass upward
- ○ **B** Two plates pushed against each other in a sliding motion
- ○ **C** A plate experienced subduction
- ○ **D** A volcano formed

2. The person who proposed the theory continental drift was

- ○ **A** Alfred Wegner
- ○ **B** Harry Hess
- ○ **C** Albert Einstein
- ○ **D** John P. Drift

3. Where two plates collide what is formed?

- ○ **A** Mountains, Ocean basins, and volcanoes
- ○ **B** Strike-slip faults
- ○ **C** Conversion fault lines
- ○ **D** sink holes

4. Older rocks on the ocean floor are found

- ○ **A** closest to the mid-ocean ridge
- ○ **B** farthest from the mid-ocean ridge
- ○ **C** near ocean rift
- ○ **D** beyond the ocean rift

Many processes occur near tectonic plate boundaries.

5. Which of the following choices are most common along the tectonic plate boundaries?

- ○ **A** hurricanes and volcanoes
- ○ **B** sedimentation
- ○ **C** tidal waves
- ○ **D** earthquakes and volcanoes

6. The best description of subduction is

- ○ **A** when one plate moves under another colliding plate
- ○ **B** when two plates hit one another and form mountains
- ○ **C** when volcanic activity form ridges
- ○ **D** when volcanic material covers an existing plate

7. A transform fault is best described as

- ○ **A** a location where two plates collide
- ○ **B** a location where two plates slide past each other
- ○ **C** a location where two plates move away from each other
- ○ **D** a location where one plate moves over another

8. What was found on several continents in order to better support the theory of continental drift?

- ○ **A** similar living organisms
- ○ **B** the same types of rocks
- ○ **C** the same fossils
- ○ **D** none of the above

9. What is most likely to happen at a transform fault?

- ○ **A** Volcano
- ○ **B** Earthquake
- ○ **C** Mountains
- ○ **D** Flood

Southern California has experience several earthquakes centered on the San Andres fault. The plates experience tensions as they slide pass each other. Explain what type of fault the San Andres fault is and compare this fault to a divergent fault.