Chapter 3 Notes

Section 1

Objectives

- **Describe** the composition and structure of the Earth.
- **Describe** the Earth's tectonic plates.
- **Explain** the main cause of earthquakes and their effects.
- **Identify** the relationship between volcanic eruptions and climate change.
- **Describe** how wind and water alter the Earth's surface.

The Earth as a System

- The Earth is an _____ system that consists of rock, air, water, and living things that all interact with each other.
- Scientists divided this system into four parts:
    - The _____ (rock)
    - The Atmosphere (air)
    - The Hydrosphere (water)
    - The Biosphere (living things)

- The **geosphere** is the mostly _____, rocky part of the Earth that extends from the center of the core to the surface of the crust.

- The atmosphere is the mixture of _____ that makes up the air we breathe.

- Nearly all of these gases are found in the first _____ km above the Earth's surface.
- The hydrosphere makes up all of the water on or near the Earth's surface.

- Much of this water is in the oceans, which cover nearly _____ of the globe.
- However, water is also found in the atmosphere, on land, and in the soil.
- The biosphere is the part of the Earth where _____ exists.
- It is a thin layer at the Earth's surface that extends from about _____ km above the Earth's surface down to the bottom of the ocean.
- The _____ is therefore made up of parts of the geosphere, the atmosphere, and the hydrosphere.

Discovering Earth's Interior

- Scientists use _____ waves to learn about Earth's interior.
- Seismic waves are the same waves that travel through Earth's interior during an earthquake.
- A similar process would be you tapping on a melon to see if it is ripe.

- A seismic wave is _____ by the nature of the material through which it travels.

- Seismologists measure changes in the _____ and _____ of seismic waves that penetrate the interior of the planet.

- With this technique seismologists have learned that the Earth is made up of different _____ and have inferred what _____ make up each layer.

The Composition of the Earth

- Scientists divide the Earth into three layers:
- The crust

- The mantle
- The core
- These layers are made up of progressively _____ material toward the center of the Earth.
- The **crust** is the thin and solid outermost layer of the Earth above the mantle.

- It is the thinnest layer, and makes up less than _____ percent of the planet's mass.

- It is 5 km to 8 km thick beneath the _____ and is 20 km to 70 km thick beneath the

  _____.

- The **mantle** is the layer of rock between the Earth's crust and core.

- The mantle is made of rocks of medium density, and makes up __ percent of the mass of the Earth.
- The **core** is the central part of the Earth below the mantle, and is composed of the densest elements.

The Structure of the Earth

- The Earth can be divided into five layers based on the _____ properties of each layer.

- The _____ is the solid, outer layer of the Earth that consists of the crust and the rigid upper part of the mantle.
- It is a cool, rigid layer that is 15 km to 300 km thick and is divided into huge pieces called

  _____ plates.

- The **asthenosphere** is the semi-solid layer of the mantle beneath the lithosphere.

- It is made of mantle rock that _____ slowly, which allows tectonic plates to move on top of it.
- Beneath the asthenosphere is the mesosphere, the lower part of the mantle.

- The Earth's outer core is a dense _____ layer.
- At the center of the Earth is a dense, solid inner core, which is made up mostly of ____ and nickel.
- Although the temperature of the inner core is estimated to be between 4,000°C to 5,000°C, it is

  _____ because it is under enormous _____.

- The inner and outer core make up about _____ of Earth's mass.

Plate Tectonics

- **Tectonic plates** are blocks of lithosphere that consist of the crust and the rigid, outermost part of the mantle and glide across the underlying asthenosphere.

- The _____ are located on tectonic plates and move around with them.
- The major tectonic plates include the Pacific, North America, South America, Africa, Eurasian, and Antarctic plates.

Plate Boundaries

- Much of the _____ activity at the surface of the Earth takes place at the boundaries between tectonic plates.

- Tectonic plates may _____, collide, or slip past one another.

- Enormous forces are generated with these actions causing _____ to form, earthquakes to shake the crust, and volcanoes to erupt along the plate boundaries

Plate Tectonics and Mountain Building

- Tectonic Plates are continually moving around the Earth's surface.
- When tectonic plates collide, slip by one another, or pull apart, enormous forces cause rock to break and buckle.
- Where plates collide, the crust becomes _____ and eventually forms mountain ranges, such as the _____ Mountains.

Earthquakes

- A _____ is a break in the Earth's crust along which blocks of the crust slide relative to one another.
- When rocks that are under _____ suddenly break along a fault, a series of ground vibrations, known as earthquakes, is set off.
- Earthquakes are occurring all the time. Many are so small that we cannot feel them, but some are enormous movements of the Earth's crust that cause widespread damage.

- The measure of the energy released by an earthquake is called _____.

- The smallest magnitude that can be felt is _____, and the largest magnitude ever recorded is

  _____. Magnitudes greater than _____cause widespread damage.
- Each increase of magnitude by one whole number indicates the release of _____ times more energy than the whole number below it.

Where do Earthquakes Occur?

- The majority of earthquakes take place at or near _____ because of the enormous stresses that are generated when tectonic plates separate, collide or slip past each other.
- Over the past 15 million to 20 million years, large numbers of earthquakes have occurred along the San Andreas fault in California, where parts of the North America plate and the Pacific plate

  are _____ one another.

Earthquake Hazard

- Scientists cannot predict when earthquakes will take place. However, they can help provide information about where earthquakes are likely to occur helping people prepare.

- An area's earthquake-hazard level is determined by _____ and _____ seismic activity.

- Earthquake-resistant buildings, built in high risk areas, are slightly _____ so that they can sway with the ground motion preventing them from collapsing.

Volcanoes

- A volcano is a mountain built from _____, or melted rock, that rises from the Earth's interior to the surface, and can occur on land or in the sea.
- Volcanoes are often located near tectonic plate boundaries where plates are either _____ or _____ from one another.
- The majority of the world's active volcanoes on land are located along tectonic plate boundaries that surround the _____ Ocean.

Local Effect of Volcanic Eruptions

- Clouds of host ash, dust, and gases can flow down the slope of a volcano at speeds of up to _____ km/hr and sear everything in their path.
- During an eruption, volcanic ash can mix with water and produce _____ that runs downhill.
- In addition, ash that falls to the ground can cause buildings to collapse under its weight, bury crops, damage the engines of vehicles, and cause breathing difficulties.

Global Effects of Volcanic Eruptions

- Major volcanic eruptions can change Earth's _____ for several years.
- In large eruptions, clouds of volcanic ash and _____rich gases may reach the upper atmosphere, and spread across the planet reducing the amount of _____ that reaches the Earth's surface.
- The reduction in sunlight can cause a drop in the average global surface _____.

Erosion

- The Earth's surface is continually battered by _____ and scoured by running _____, which moves rocks around and changes their appearance.
- **Erosion** is the process in which the materials of the Earth's surface are loosened, dissolved, or worn away and _____ form one place to another by a natural agent, such as wind, water, ice or gravity.
- Erosion _____ _____ rocks and makes them smoother as times passes. Older mountains are therefore smoother than younger ones.

Water Erosion

- Erosion by both rivers and oceans can produce dramatic changes on Earth's surface.
- Waves from ocean storms can erode _____ to give rise to a variety of landforms,
- Over time, rivers can carve deep _____ into the landscape.

Wind Erosion

- Wind also changes the landscape of the planet.
- In places where few plants grow, such as and _____, wind can blow soil away very quickly.
- _____ rocks, such as sandstone, erode more easily than _____ rocks, such as granite do.