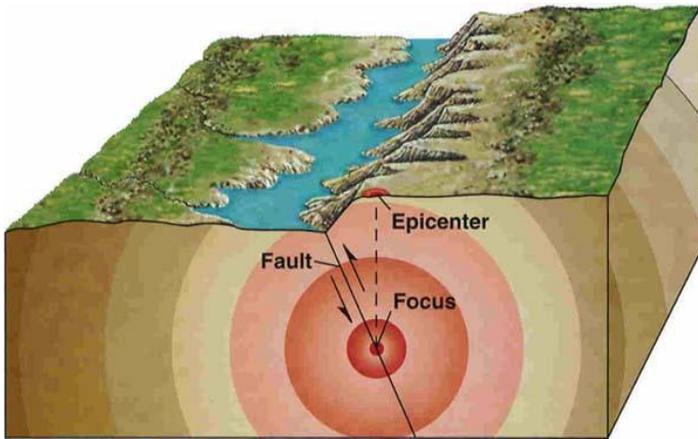


Chapter 6 Notes – Earthquakes

6.1 Earthquakes and Plate Tectonics

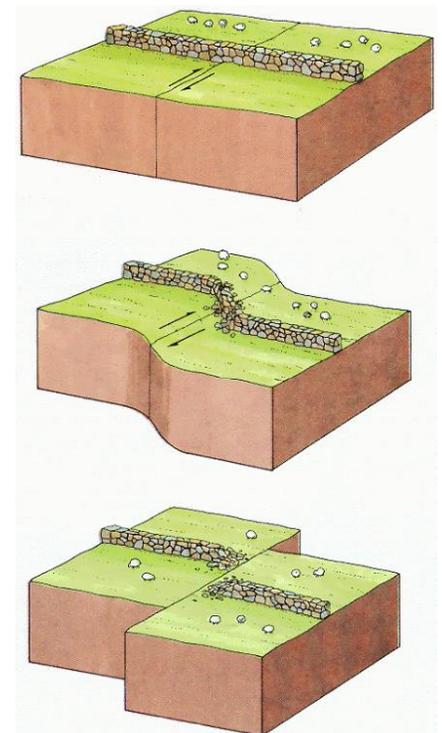
- **Earthquakes** – vibrations of the earth's crust usually caused by rocks under _____ that suddenly shift along a fault
 - o Movement along a fault line can be prevented by _____ between the rocks on both sides of the fault. When this happens, the fault is "locked."



- o **Focus** – area along a fault at which _____ first occurs, initiating an earthquake
- o **Epicenter** – the point on earth's surface directly above the _____
- o About 90% of continental earthquakes have a _____ focus (within 70km of earth's surface).

- o At subduction zones, the further inland you go, the _____ the focus of the earthquake. Shallow focus earthquakes cause the most _____.

- What is the most common cause of earthquakes?
 - o _____ **rebound theory** – theory that rocks that are strained past a certain point will fracture and spring back to their original shape
 - o As the rocks fault, energy is released in the form of _____ waves, which increases the stress in the surrounding rocks along the fault line. This added stress often results in **aftershocks**, small _____ that follow the main earthquake.



- Other Causes of Earthquakes:
 - _____ eruption
 - Explosion
 - Collapse of something _____

- Major Earthquake Zones
 - Most earthquakes occur along or near the _____ of the earth's lithospheric plates.
 - Pacific Ring of Fire
 - Mid-ocean ridges
 - Eurasian-Melanesian mountain belt

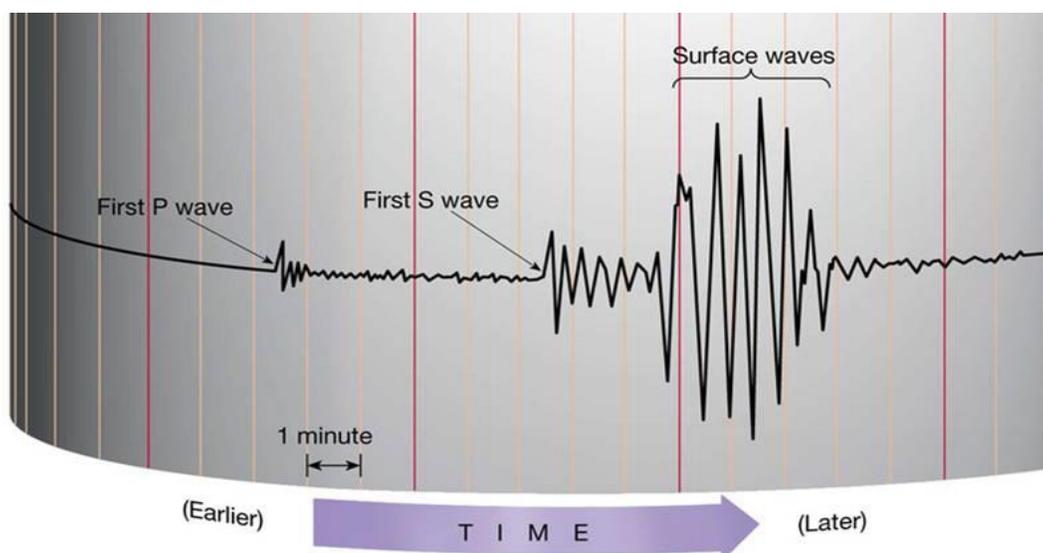
 - At some plate boundaries there are groups of interconnected faults called **fault** _____.
 - The San Andreas Fault Zone extends almost the entire length of _____

 - Earthquakes may also occur in the _____ of a plate.
 - _____ from both sides of a plate may cause movement along ancient faults or weak spots within a plate.
 - Example: New Madrid, Missouri earthquake of 1812.

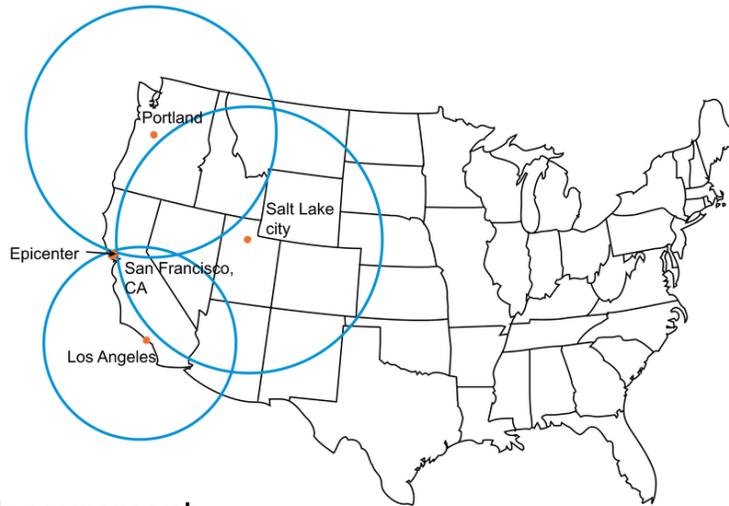
6.2

6.2 Recording Earthquakes

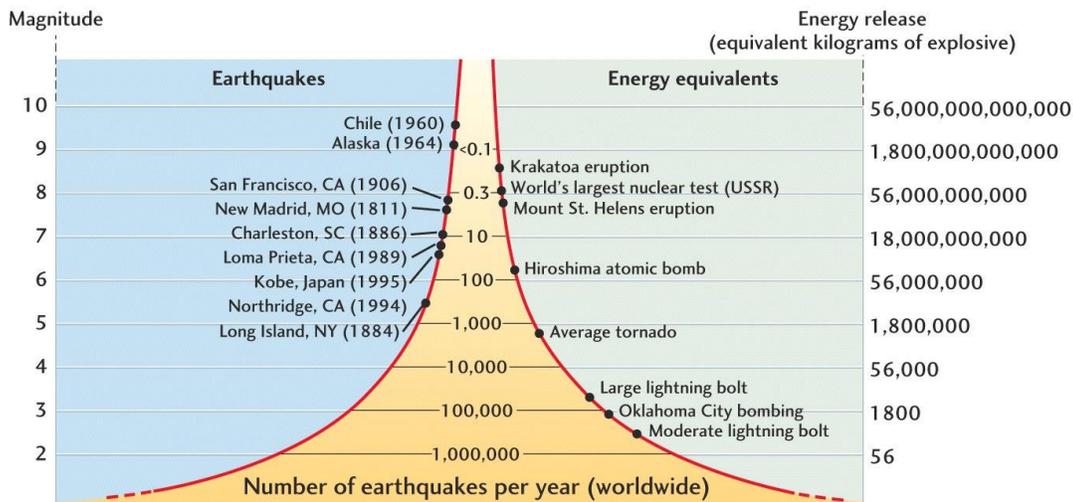
- **Seismograph** – instrument used to _____ and record seismic waves
- Three Types of Seismic Waves:
 1. **P waves** (_____ waves)
 - 6-7km/sec
 - Can travel through liquids and solids
 - The more rigid the material, the _____ the wave
 - They are _____ waves – they cause rock particles to move together and apart along the direction of the waves
 2. **S waves** (_____ waves)
 - 1-2 km/sec
 - Can only travel through _____
 - They are _____ waves – they cause rock particles to move at right angles to the direction in which the waves are traveling
 3. When P and S waves reach the earth's surface, their energy can be converted into a third type of seismic wave – **surface waves**.
 - Slowest-moving and the _____ to be recorded on a seismograph.
 - Travel slowly over earth's surface in a motion similar to _____ waves – causing the surface to rise and fall, which is very destructive through loose earth.
 - Two types:
 - L-Waves (_____ waves) – side to side shaking
 - Rayleigh Waves – _____ motion



- How do you locate where an earthquake has occurred?
 - o **Triangulation** – the use of seismograph readings from _____ different location to find the epicenter of an earthquake



- Earthquake Measurement
 - o **Magnitude** – a measure of the _____ released by an earthquake; the amount of ground motion experienced by an earthquake
 - o **Richter Magnitude** – magnitude scale where each number represents an earthquake strength of _____ times greater than the number before it.
 - Example: a 6 on the Richter scale is 32 X stronger than a 5
 - o **Moment Magnitude Scale** - an update scale that is more related to the _____ rather than the effect of the earthquake
 - It is the rigidity of the earth multiplied by the average amount of slip on the fault and the size of the area that slipped.



- A major earthquake (one that causes widespread damage) has a magnitude of _____ or above.
- Earthquakes with magnitudes less than _____ are called **microquakes** and usually are not felt by people.
- The largest earthquake so far recorded registered a magnitude of _____ - the 1960 Valdivia Earthquake in Chile
- **Mercalli Intensity** – measures damage caused by an earthquake using _____ I-XII

6.3

6.3 Earthquake Damage and Safety

- Most injuries and death result from the _____ of buildings and other structures or from falling objects and flying glass.
- Other dangers include _____, fires, explosions caused by broken electric and gas lines, and floodwaters released from collapsed dams.
- _____ of an earthquake can have a greater impact than _____ of the earthquake. Often a moderate earthquake that continues for a long time creates more damage than a shorter-lasting higher-magnitude earthquake.
- Earthquake Safety:
 - Before an earthquake occurs, be _____. Keep a supply of canned food, bottled water, flashlights, batteries and a portable radio on hand.
 - Move away from overhead _____
 - Find _____ to curl up in – like next to a desk, sofa, bed, or other large bulky object
 - In smaller buildings, a _____ can be a safer place, but not in a taller building. If the building collapses, the door frame will too.
 - In taller buildings, never go to the _____. They are likely to structurally fail. Get near the outer walls of buildings.
 - If outside, move to an open space away from buildings and _____ lines.

- Structural Damage Caused by Earthquakes

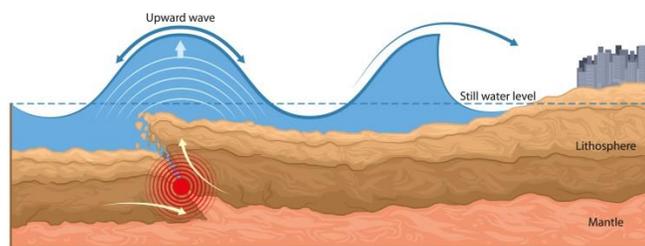
- **Liquefaction** – the liquefying of _____ soil during an earthquake can cause the foundations of some buildings to become unstable or sink. When the shaking stops, the soil resolidifies.

- **Resonance Frequency** – a natural frequency of _____ determined by the physical parameters of the vibrating object.
 - Buildings with ____-_____ floors are most at risk of earthquake damage as the resonance frequency of buildings this size is within the same range as the frequency of most earthquakes.

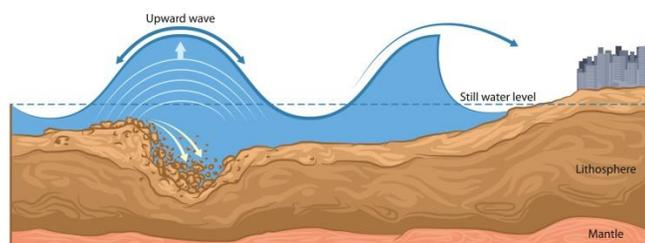
- Great Hanshin Earthquake in Kobe, Japan (1995)
 - 7.2 Magnitude
 - Lasted less than a minute
 - Killed 5,500 people

- A major earthquake with an epicenter on the ocean floor sometimes causes a giant ocean _____ called a **tsunami**.
 - Example: Tsunami that accompanied the 1964 Alaskan earthquake
 - Example: Fukushima, Japan

- Tsunamis are typically caused by one of two events:
_____ or underwater landslides



Tsunami caused by an earthquake



Tsunami caused by erosion