

PROPERTY OF:

EARTH SCIENCE – UNIT 4 – CHAPTER 11 NOTES

EARTHQUAKES

11.1 Earthquakes

Elastic limit = limit to the amount the Earth's crust can bend, stretch, or compress.
causes breaks, called faults, leads to earthquakes.

3 types of faults: normal fault, reverse fault, and strike-slip fault

SHOW DIAGRAMS OF EACH TYPE OF FAULT

Normal Fault

caused by tension force
vertical plate movement
divergent plate boundary
plates move apart

Reverse Fault

caused by compression force
vertical plate movement
convergent plate boundary
plates move closer together

Strike-Slip Fault

caused by shearing force
horizontal plate movement
transform-fault boundary
plates slip past each other

11.2 Earthquake Information

1. Seismic waves = energy generated by an earthquake

SHOW DIAGRAM OF A WAVE AND LABEL WAVELENGTH AND AMPLITUDE

- high frequency = shorter wavelengths (*SHOW DIAGRAM*)
- low frequency = longer wavelengths (*SHOW DIAGRAM*)
- high frequency = more energy! (EX: x-rays and ultraviolet rays)
- low frequency = less energy! (EX: radio waves)

2. Focus = point in the Earth's interior where the energy is released
P and S waves are produced and travel outward.

3. Epicenter = point on the Earth's surface that is directly above the focus
Surface waves are produced at the epicenter.

11.2 Seismic Waves

1. Primary (P) waves = waves of energy that travel through the Earth by causing particles to compress and stretch apart in the direction of the wave

2. Secondary (S) waves = waves of energy that travel through the Earth causing particles to move at right angles to the wave.

3. Surface waves = Waves of energy that radiate from the epicenter and travel along the surface of the Earth in a rippling motion. Causes a lot of damage by forcing parts of buildings up and other parts down.

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11.2 Speed of Waves

P wave – fastest – arrives first

S wave – medium – arrives second

surface wave – slowest – arrives last

****DRAW SEISMOGRAPH RESULTS & LABEL P / S / SURFACE WAVES****

11.2 How to Find the Epicenter Location

1. Convert time of arrival into distance.
2. Draw a circle around each station on a map (using the distance as the radius of the circle).
3. Repeat for a minimum of 3 stations.
4. The point of intersection is the epicenter. (*SHOW DIAGRAM OF 3 CIRCLES*)

11.2 Detecting Earthquakes

Seismograph = An instrument used to measure the magnitude of an earthquake.
A pen (attached to a pendulum) traces a record of Earth's vibrations onto a sheet of paper. It records all 3 types of waves.

****DRAW & LABEL A DIAGRAM OF A SEISMOGRAPH****

* if S + P waves are close together → EQ is nearby

* if S + P waves are far apart → EQ is far away

****DRAW SEISMOGRAPH RESULTS & LABEL AS “NEAR” OR “FAR”****

11.3 Measuring Earthquake Magnitude

Richter Scale = a measure of the energy released by an earthquake (from 1 to 10)
every difference of 1 unit = 10 times stronger

EX: A magnitude 5 EQ is ____ times stronger than a magnitude 4. (Answer: 10)

EX: A magnitude 5 EQ is ____ times stronger than a magnitude 3. (Answer: 100)

EX: A magnitude 8 EQ is ____ times stronger than a magnitude 4. (Answer: 10,000)

* Always multiply!

11.3 Tsunamis

Tsunami = an ocean wave that begins over an earthquake's focus
can reach over 30 meters high, forming a towering crest as the wave breaks on shore

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EARTH SCIENCE – UNIT 4 – CHAPTER 12 NOTES

VOLCANOES

12.1 Volcanoes

- volcano = an opening in Earth's surface that forms a mountain when layers of lava and ash erupt and build up
- vent = the opening at the surface of a volcano

12.1 Three Locations

1. Divergent Plate Boundary = plates moving away from each other (DPB)
EX: Mid-Atlantic Ridge
****DRAW DIAGRAM OF OCEANIC PLATE & CONTINENTAL PLATE SEPARATING****
2. Convergent Plate Boundary = plates moving toward each other (CPB)
EX: Pacific Ring of Fire (forms a trench or subduction)
****DRAW DIAGRAM OF OCEANIC PLATE & CONTINENTAL PLATE COLLIDING****
3. Hot Spots = areas in Earth's mantle (underground) that are hotter than usual, forming melted rock (magma) that rises towards the crust
EX: Hawaiian islands (chains of islands forms as the plate moves over the hot spot.
NOTE: THE HOT SPOT NEVER MOVES – THE PLATES MOVE!
****DEMONSTRATE HOT SPOTS USING A SHEET OF PAPER AND A COMPASS****

12.2 Eruptions

- Eruptions depend on 3 factors

1. trapped gases
 - low pressure = quiet eruption
 - high pressure = explosive eruption
2. magma composition
 - basaltic = less silica, more fluid, quiet eruption
lava runs down the side of the volcano
gases are easily released
usually occur at hot spots
 - granitic = more silica, less fluid, explosive/violent eruption
more thick – causes pressure of gases to build up
gases expand rapidly during explosion → violent explosion
usually occur in subduction zones (convergent plate boundaries)
 - andesitic = in-between basaltic and granitic
3. magma water content
 - high water content = granitic, violent eruptions
occurs at subduction zones (water from the oceanic plates)
water vapor is trapped in the thick magma
 - low water content = basaltic, quiet eruptions
occurs at hot spots

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12.2 Three Forms of Volcanoes

1. Shield Volcano = broad volcano with gently sloping side
quiet eruptions
basaltic magma
slowly flows out – cools to form layers of lava
found mainly at hot spots
2. Cinder-Cone Volcano = steep-sided volcano
violent eruptions
granitic magma
produces ash, cinders, and large rocks
cools to form layers of tephra
found mainly at CPB and DPB
3. Composite Volcano = steep-sided volcano
alternating quiet and violent eruptions
alternating layers of lava and tephra
found mainly at CPB and DPB

12.3 Top of a Volcano

- vent = the opening at the surface of a volcano
- crater = a steep-walled depression surrounding the vent
- caldera = very large opening that is caused by the top of a volcano collapsing after an eruption

EX: Crater Lake in Oregon

****SHOW DIAGRAMS OF VENT, CRATER, AND CALDERA****

5.2 Geothermal Energy

- Refer to pages 132-133 for a description and diagram of geothermal energy.