Unit 4: Earth \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_’s Study Guide

1. **Vocabulary:**

* Crust
* Mantle
* Convection
* Core
* Lithosphere
* Asthenosphere
* Mesosphere
* Pangaea
* Sea-floor spreading
* Plate tectonics
* Tectonic plates
* Convergent boundary
* Divergent boundary
* Transform boundary
* Deformation
* Folding
* Fault
* Shear stress
* Tension
* Compression
* Volcano
* Magma
* Lava
* Vent
* Hot spot
* Earthquake
* shield volcanoes
* cinder cones
* composite volcanoes
* lava plateaus
* craters
* calderas
* fissure
* magma chamber
* rift valley
* Focus
* Epicenter
* Tectonic plate boundary
* Elastic rebound
* Tsunami
* Seismic waves
* seismometer
* Seismogram
* Magnitude
* Intensity
* liquefaction

1. **Pictures to study**:

* Earth’s Physical and Compositional layers
* Types of plate boundaries
* Syncline and anticline folds
* Types of faults
* Kinds of seismic waves
* Types of stress that occurs at boundaries

1. Earth’s **Compositional Layers** from outside to center- crust, mantle, core… **Crust-** two types are continental and oceanic; oceanic is denser and thinner than continental… **Mantle**- hot slow flowing rock; Convection in the mantle causes cooler rock to sink and warmer rock to rise… **Core**- mostly of iron and some nickel, densest layer, one third of Earth’s mass
2. Earth’s **Physical layers** from outside to center- lithosphere, asthenosphere, mesosphere, outer core, inner core… **Lithosphere**- rigid, made up of crust and upper part of mantle, divided into tectonic plates… **Asthenosphere**- weak or soft mantle made of solid rock that moves very slowly, tectonic plates move on top of it… **Mesosphere**- strong, lower part of the mantle, rock flows more slowly than rock in the asthenosphere… **Outer core**- liquid layer of Earth’s core… **Inner core**- solid, dense center of earth
3. **Continental drift** hypothesis- continents once formed a single landmass, broke up, and drifted; evidence: Fossils of the same species, location of mountain ranges and rock formations, continents fit like a puzzle to make **Pangaea**
4. Discovery of **mid-ocean ridges** gave us theory of **plate tectonics**… Rock samples from the sea floor show youngest rock is closest to the ridge and oldest rock is farthest away, huge trenches on sea floor show where oceanic crust sinks into the asthenosphere
5. 3 types of boundaries: convergent, divergent, and transform… divergent- mid ocean ridges, transform- earthquakes
6. How tectonic plates move: mantle convection, ridge push, and slab pull… **Mantle convection** drags the overlying tectonic plates, **ridge push** moves plates away from mid-ocean ridges as rock cools and becomes more dense, **slab pull**- a plate moves because it is pulled along when its denser edge sinks beneath Earth’s surface
7. Tectonic plate movement cause **stress** (the amount of force per unit area that is placed on an object)
8. When rocks bend, **folds** form; when rocks break, **faults** form
9. A fold, or bend, in the rock layers means that **deformation** has happened
10. Two common types of folds are synclines and anticlines: **syncline-** the youngest layers of rock are at the core of the fold, The rock layers are usually arched upward, like a bowl… **anticline-** the oldest layers of rock are at the core of the fold. The rock layers are usually arched downward
11. Blocks of rock on either side of a fault are called **fault blocks**… movement of faults can create mountains and other landforms
12. **Strike Slip fault**- fault blocks move past each other horizontally, under **shear stress** (stress that pushes rocks in parallel but opposite directions, common along transform boundaries
13. **Normal fault**- the hanging wall moves down relative to the footwall, form when rock is under **tension** (stress that stretches or pulls rock apart), common along divergent boundaries
14. **Reverse fault**- the hanging wall moves up relative to the footwall, form when rocks undergo **compression** (stress that squeezes or pushes rock together), common along convergent boundaries
15. **Folded mountains** form when rock layers are squeezed together and pushed upward, convergent boundaries
16. **Volcanic mountains** form when melted rock erupts onto surface, at convergent boundaries, form on land or on the ocean floor
17. **Fault-block mountains** form when tension makes the lithosphere break into many normal faults, some pieces of the lithosphere drop down compared with other pieces and pieces left standing form fault-block mountains
18. Many **volcanoes** are **dormant**, meaning an eruption has not occurred in a long period of time
19. Volcanoes form as rock below Earth’s surface melts
20. Location of a volcano and composition of magma determine the type of volcanic landforms created including shield volcanoes, cinder cones, composite volcanoes, lava plateaus, craters, and calderas
21. **Volcanic mountains** are built from materials ejected from a volcano, Pyroclastic material, or hot ash and bits of rock, may also be ejected into the atmosphere
22. **Composite volcanoes** generally develop into large, steep mountains, produce most violent eruptions
23. **Fissure eruptions** happen when lava flows from giant cracks, or **fissures**, in Earth’s surface, no central opening, lava flows out the entire length of the fissure… at divergent plate boundaries, **fissure eruptions** are likely to occur and create **shield volcanoes**… at convergent plate boundaries, **composite volcanoes** can occur
24. **Ring of Fire-** name for numerous explosive volcanoes that form on convergent plate boundaries surrounding the Pacific Ocean
25. Undersea volcanoes helped lead to the creation of **mid ocean ridge**
26. Many people around the world live near a volcano because the surrounding soils are fertile for growing a variety of crops
27. Earthquake energy is released as **seismic waves** that cause the ground to move
28. **Seismic waves** flow outward from the focus in all directions
29. The release of energy that accompanies the movement of rock along a fault causes an earthquake
30. As the stress on rock increases, the energy stored in it increases. When the stress is released, the rock may return to its original shape. When rock returns to nearly the same shape after the stress is removed, the process is called **elastic deformation**.
31. Most earthquakes happen at or near **tectonic plate boundaries**
32. At divergent boundaries, **tension stress** causes **normal faults** to form. Earthquakes tend to be shallow because the crust is thin
33. At convergent boundaries, rock is squeezed, and the stress is called **compression**. **Reverse faults** are formed, and earthquakes can be strong and deep
34. At transform boundaries, **shear stress** pushes tectonic plates in opposite directions. Earthquakes tend to be relatively shallow
35. An earthquake under the ocean can cause a vertical movement of the sea floor, displacing an enormous amount of water and generating a **tsunami**… when waves reach the shoreline, the height of the waves increases and can cause major destruction
36. Some past earthquakes have been so massive geographers had to redraw the maps of some countries.
37. The **strength of an earthquake** is based on the energy that is released as rocks break and return to an undeformed shape
38. **Body waves** are seismic waves that travel through Earth’s interior. Types: P waves and S waves… **P waves**- primary waves, fastest body waves, travel through solids, liquids, and gases, and cause rock to move back and forth in direction the wave is traveling… **S waves**- shear waves/secondary waves, move rock side to side, can’t travel through completely liquid parts of Earth
39. **Surface waves**- Seismic waves that travel along Earth’s surface, slower than body waves, cause more damage than body waves, two ground motions (up-and-down and back-and-forth)
40. **Seismograms** are plotted on a graph, which is then used to pinpoint the earthquake’s epicenter
41. **Triangulation**- the epicenter can be located by drawing circles around at least three seismometer stations on a map, radius of each circle equals the distance from that station to the earthquake’s epicenter, point of intersection of circles is the epicenter
42. **S-P time method- lag time** between P and S waves used to determine how far the waves have traveled from the epicenter
43. The height of the waves on a **seismogram** indicates the amount of ground motion which calculates **magnitude**, the greater the magnitude the stronger the earthquake
44. **Richter scale** measures the ground motion from an earthquake to find the earthquake’s strength, increase in the magnitude by one unit corresponds to a ten-fold increase in ground motion
45. **Moment Magnitude scale**- more accurate for large earthquakes than the Richter scale, based on the size of the area of the moving fault, the average distance that the fault moves, and the rigidity of the rocks in the fault
46. **Magnitude** measures how much energy is released by earthquake. **Intensity** measures effects of earthquake at Earth’s surface
47. **Modified Mercalli scale** is used to describe an earthquake’s intensity. Intensity values are usually highest near the epicenter
48. **4 factors determine the effects of an earthquake**: magnitude, local geology, distance from epicenter, type of construction used
49. **Magnitude** is directly related to its **strength.** Stronger earthquakes cause more damage than weaker earthquakes
50. As an earthquake’s **magnitude** increases, the earthquake’s **intensity** is commonly higher
51. **Liquefaction** can intensify ground shaking or cause the ground to settle. Settling can cause structures to tilt or collapse
52. More energy a **surface wave** carries, the stronger the ground motion will be and the more damage the wave will cause
53. **Surface waves** decrease in size and energy the farther they travel from the epicenter (farther an area is located from the epicenter, the less damage it will suffer)
54. **Flexible structures and shorter buildings** are more likely to survive strong ground shaking… Special technologies control how much tall buildings sway during earthquakes