Physical Geology
South Sevier High School
Lecture Notes – Chapter 17

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Name _____
Due Date _____
Per _____

1. Earth's deep interior can be studied (directly/indirectly).

2. T or F Geologists have been able to drill deep enough into the Earth to reach the mantle.

3. _____ is the branch of Geology that studies the interior of the Earth.

4. _____ or vibrations from a large earthquake (or underground nuclear test) will pass through the entire Earth.

5. Seismic _____ is the return of some waves to the surface after bouncing off a rock layer boundary.

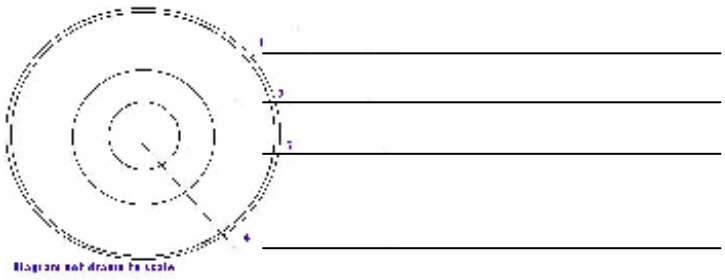
6. Sharp boundaries between two materials of different densities will _____ seismic waves.

7. Seismic _____ is the bending of seismic waves as they pass from one material to another having different seismic wave velocities.

8. Seismic waves have been used to determine the three main zones within the Earth. The three zones are the:

   a. _____ - the outer layer of rock that forms a thin skin on Earth's surface.
   b. _____ - a thick shell of dense rock that separates the crust from the core.
   c. _____ - a metallic central zone of the Earth.

9. Examine the image below, then label the correct layers of Earth's interior with the correct thickness of each layer in km (8pts).



10. Seismic wave studies indicate crust is _____ and _____ beneath the oceans than on the continents.

11. Oceanic crust is _____, composed primarily of basalt and gabbro, whereas continental crust is _____, with an average composition similar to granite.

12. Seismic wave studies indicate the mantle, like the crust, is made of _____ rock with only isolated pockets of magma.

13. Seismic wave studies of the mantle indicate that the rocks there are composed mainly of _____ material.

14. Crust and upper mantle together form the _____, the brittle outer shell of the Earth that makes up the tectonic plates.

15. Lithosphere thickness averages _____ km thick beneath oceans and _____ km thick beneath continents.

16. Beneath the lithosphere, seismic wave speeds abruptly decrease in a plastic low-velocity zone called the _____.

17. The _____ of the asthenosphere makes it easy for the brittle plates of the lithosphere to move or slide, acting as a lubricant for the constantly moving tectonic plates.

18. Specific areas on the opposite side of the Earth from large earthquakes do not receive seismic waves, resulting in seismic _____ zones.

19. A P-wave shadow zone (103°-142° from epicenter) is explained by the _____ of waves encountering the core-mantle boundary.

20. An S-wave shadow zone (≥103° from epicenter) suggests that the outer core is a _____.

21. Careful observations of P-wave refraction patterns indicate inner core is _____.

22. Core composition inferred from its calculated density, physical and electro-magnetic properties, and composition of meteorites, _____ is the most likely substance found in the Earth's inner and outer cores.

23. The Core-mantle boundary (D" layer) is marked by great changes in seismic velocity, density, and temperature. The hot core may melt lowermost mantle or react chemically to form iron silicates in this seismic wave _____ (ULVZ).

24. _____ is a balance or equilibrium of adjacent blocks of brittle crust "floating" on the asthenosphere.

25. Thicker blocks of lower density crust have deeper "roots" and float higher, such as in _____ ranges.

26. _____ adjustment is the rising or sinking of crustal blocks to achieve isostatic balance.

27. Crust will (rise/fall) when a large mass (like a glacier) is rapidly removed from the surface.

28. Rise of crust after ice sheet removal is called crustal _____.

29. Where on the Earth is crustal rebounding still occurring from the last ice age?

30. Gravitational force between two objects is determined by their _____ and the _____ between them.

31. Do the following gravitational attraction problem. Show all work (5pts):

    a. Determine the force of gravitational attraction between the Earth ($m = 5.98 \times 10^{23}$ kg) and a 70-kg geology student if the student is standing at sea level, a distance of 6.38×10^{6} from Earth's center.

32. A _____ field (region of magnetic force) surrounds the Earth, and has _____ and _____ magnetic poles. Earth's magnetic field is what a _____ detects.

33. Certain magnetic minerals (e.g., magnetite) in igneous rocks record Earth's magnetic field when they cool below their _____ point (580 ºC).

34. The examination of the metallic minerals inside ancient igneous rocks shows that the Earth's magnetic field has _____ many times throughout Earth's history. In fact, is seems to be very chaotic.

35. After next reversal, a compass needle will point toward the _____ magnetic pole.

36. _____ is the study of ancient magnetic fields in rocks, and it allows for the reconstruction of plate motions over time.

37. The Earth's magnetic pole is displaced about _____ degrees from the actual geographic pole.

38. The _____ gradient states that the temperature increases with depth into the Earth.

39. The gradient stated in number 38 is about _____ degrees Celsius per km, or _____ degrees Fahrenheit per mile.

40. _____ is the gradual loss of heat through Earth's surface.

41. Where does Earth's internal heat come from (5pts)?

42. How would a mountain belt respond isostatically if erosion rates increased significantly (5pts)?

43. Explain why geophysicists believe that there is a solid inner core to the Earth (5pts).

44. What is the difference between crust and lithosphere, and why is this distinction important for the Theory of Plate Tectonics (5pts)?