

9.10

EPS 200 (Stapleton)

Name: Answers

Plate Tectonics Questions, Part 1

\* a *subduction zone* is a region where one plate dives beneath another. The diving plate is *subducted*.

Identify each of the following characteristics as describing either mafic(m) or felsic(f) rock types.

- 1. Dense *M*
- 2. High viscosity when molten *F*
- 3. Found in ocean crust *M*
- 4. Found in the mantle *M*
- 5. Provides structure for steep volcanoes *F*
- 6. Contributes to gentle eruptions *M*
- 7. Forms low, rounded volcanoes *M*
- 8. Found in seafloor sediment *F*

Where in the world can each of the following plate boundaries be found?

- 9. Ocean/Ocean divergent *Mid atlantic Ridge*
- 10. Continent/Continent Convergent *Himalayas*
- 11. Ocean/Continent Convergent *Andes*
- 12. Ocean/Ocean Convergent *Japan*

13. Where ~~in the world~~ can the newest ~~rocks~~ be found?

*Ocean crust*  
*Mid ocean ridge. (Ocean/Ocean Divergent Boundary)*

14. At a convergent plate boundary, sometimes one of the plates dives and sometimes neither plate dives. How can we tell which option actually occurs?

*The more dense plate dives.*

15. When two different types of plates collide, and one plate dives beneath another, what determines which plate dives?

*Ocean plates will dive.*

16. Sometimes, when two plates of the same type of crust collide, one of the two plates dives. In that case, what determines which plate will dive? Why?

*When two ocean plates collide, the older one dives (because it is colder and denser).*

17. What type of material comprises most seafloor sediment? Where is seafloor sediment thinnest? Why?

*Felsic material. The sediment is thin at the mid-ocean ridge because that crust is young.*

18. The volcanoes that form near subduction zones can have explosive eruptions where a large portion of the volcano blows away, and they can also have relatively gentle eruptions with hot lava flows. What accounts for the variability of these eruptions?

*Those volcanoes have both mafic and felsic lava.*  
↑  
*From melting sediment*      ↑  
*from melting ocean crust*

19. Are the volcanoes that form near subduction zones relatively steep, or are they low and round? Why?

Steep. They have some felsic magma, which provides structure.

20. Provide some simple directions to help someone locate an ocean trench, what landmarks would he or she need to look for, and where would the trench be located in relation to those landmarks?

Find a chain of steep volcanoes (that are generally of equal size). The trench will parallel the volcano chain, in the nearby ocean.

21. When sea water is mixed with magma, what effect does its presence have on volcanic eruptions? Why?

Water increases explosiveness, because it expands as it boils.

22. At what types of plate boundaries do shallow-focus earthquakes occur?

All of them.

23. At what types of plate boundaries do deep-focus earthquakes occur?

Convergent boundaries with subduction, Ocean/Ocean and Ocean/continent.

24. Why does the mid ocean ridge form an elevated ridge, rather than just a level crack?

- The mantle below the ridge is hot, so the area expands and bulges upward.
- Rising currents below push the crust upward.

25. Which types of plate boundaries form over relatively warm parts of the mantle?

Divergent boundaries (also hotspots)

26. Which types of plate boundaries form over relatively cold parts of the mantle?

Convergent boundaries

27. If a plate of ocean crust is moving eastward, which part of the ocean crust is probably the oldest, the east end or the west end? Why?

The east end. The crust is coming from a mid-ocean ridge, where the rock is being "born."

Where in the world can each of the following tectonic features be found?

- 28. Ocean Hotspot *Hawaii*
- 29. Transform Boundary *San Andreas Fault, CA*
- 30. Continent/Continent divergent boundary *East African Rift Valley*

31. Suppose you find a chain of shield volcanoes (round, with little slope) in the ocean. The volcanoes decrease in height toward the East. Explain why the volcanoes decrease in height, and also explain why the easternmost volcanoes are smaller than the western volcanoes in this chain.

*The smaller volcanoes are older. They shrink due to erosion and cooling. The crust is moving eastward, carrying the old volcanoes with it.*

32. Would you classify the eruptions in Hawaii as being on the explosive end of the spectrum or the gentle end of the spectrum (compared to other volcanoes)?

*Gentle, because the magma is mafic material from the mantle*

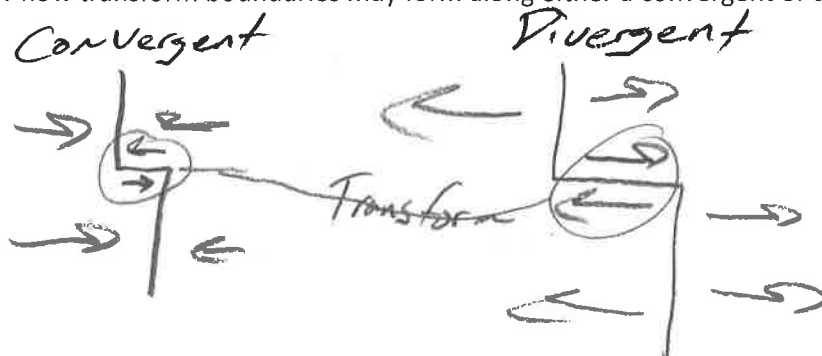
33. Eventually, a continent/continent divergent boundary turns into another type of plate boundary. What does it turn into?

*Ocean/Ocean Divergent*

34. What type(s) of tectonic activity can you expect at a transform boundary – volcanoes, earthquakes, lava, mountains???

*Shallow-focus earthquakes*

35. Transform boundaries may exist in conjunction with convergent or divergent boundaries. Use two drawings to show how transform boundaries may form along either a convergent or a divergent plate boundary.



Draw and label a cross-section diagram for each of the tectonic features described below. In your diagram, be sure to include all of the following components:

- A. Arrows indicating the direction of plate movement
- B. The asthenosphere of the mantle, including arrows representing its currents
- C. Seafloor sediment of appropriate thickness
- D. Volcanoes of the right shape and composition
- E. Labels indicating deep and/or shallow-focus seismic (earthquake) activity
- F. Labels indicating mafic and/or felsic magma
- G. Appropriate shading of all mafic and felsic materials
- H. Labels indicating relatively explosive or gentle eruptions
- I. The youngest rocks and the oldest rocks

**36. Ocean-Continent Convergent Plate Boundary**

**37. Ocean-Ocean Divergent Plate Boundary**