

2018 Dynamic Planet Answer Key

Proctor Notes: Answer on the answer packet, not the test. Write your team information/names on both the test and the answer packet (so you get the test back). No technology (recommend putting phones at front), no cheating.

Bring a stapler. 20% deduction for anyone going overtime.

Section I - Multiple Choice

1. A
2. B
3. D
4. A
5. C
6. A
7. C
8. B
9. A
10. A
11. B
12. C
13. C
14. A
15. C
16. C
17. D
18. C
19. D
20. D
21. C
22. B
23. B
24. D
25. A
26. A
27. D
28. A
29. C
30. D
31. D
32. A
33. B
34. A
35. A
36. B
37. D
38. D
39. B

Section II - Free Response

Unless otherwise noted, each bullet point is worth one point. Reasonable alternatives will always be accepted.

1. Answers given will vary, accept any correct answers. However, here are some ones that will likely be common (also shows how to grade this question in general)
 - Geologic fit between continents (1 pt). South American and African coastlines resemble each other (0.5 pt), suggesting that they were the same in the past (0.5 pt)
 - Geologic similarities (1 pt). Examples include: Karoo system of South America and Santa Catarina of Brazil, Appalachians Mountains and Scottish highlands, coalfields in North America and Europe and also Antarctica. (0.5 pt for any one of these examples). All of these imply that the respective continents were once at the same place (0.5 pt)
 - Fossil evidence (1 pt). Fossils that lay on both sides of the Atlantic such as the Glossopteris (fern victim of the P-T extinction which had bulky seeds which could not travel oceans), Lystrosaurus, Cynognathus (both freshwater reptiles that could not travel such long lengths of saltwater) (0.5 pt for any one of these examples) show that the continents must have once been connected by land. (0.5 pt)
 - Glacial evidence. (1 pt) Grooves carved by glaciers exist north of the equator. (0.5 pt) It is less likely that a glaciation would extend that far than it is that the continents were located nearer to the South pole at the time. (0.5 pt) An explanation of the directions of the grooves and their significance is also acceptable.
2.
 - Convergent = plates move together, divergent = plates move apart.
 - Divergent boundaries form in the embryonic stage
 - Divergent boundaries expand oceans
 - Convergent boundaries form in the declining stage
 - Convergent boundaries shrink oceans.
 - Possible divergent boundaries: Mid-Atlantic Ridge, Red Sea Rift, Baikal Rift Zone, East African Rift, East Pacific Rise, Gakkel Ridge, Galapagos Rise, Explorer Ridge, Juan de Fuca Ridge, Pacific-Antarctic Ridge, West Antarctic Rift, Great Rift Valley (list from Wikipedia, more examples may be acceptable)
 - Possible convergent boundaries: Himalayas, Southern Alps, Aleutian Islands, Andes, Pontic Mountains, Cascade Range (list from Wikipedia, more examples may be acceptable)
3.
 - Acts like a liquid on a geologic time scale in that it convects
 - Acts like a solid in that s-waves can travel through it
 - Is actually a solid that is weak
 - Physical property
 - While it has a constant chemical composition, this is not what defines it, as if it did it would include the lower lithosphere and the mesosphere. Its defining feature is its plasticity
4.
 - Any definition that conveys the idea that its tectonic history/background is different from the surrounding area is acceptable

For the remaining two points, answers will vary, but the following will likely be common.

- Fossils
 - Magnetism
 - Faults
 - Radiometric dating
 - Overlap formations and stitching plutons
- 5.
- Magnetism is symmetric across the mid-ocean ridge
 - Magnetism alternates
 - Occurs because of geomagnetic reversals every 50,000 years
 - Says that mid-ocean ridges gradually create new lithosphere

Section III - Applications

- 1.
- Convergent plate boundary
 - Northwest
 - North
 - It changed direction (1 pt) 43 million years ago (1 pt)
 - After each volcanic island is moved away from the hotspot, it no longer grows. (1 pt) Thus, it is subject to gradual erosion without any way to regenerating lost land (1 pt)
 - 38 million years ago (1 pt). Speed between 42.4 mya island and Midway island was higher than speed between Midway island and 20.6 mya island. (1 pt). The distance between the former pair is more than $(42.4 - 27.2)/(27.2 - 20.6) = 2.3$ times the distance between the latter pair. (1 pt)
- 2.
- Hypsometric curve
 - Accept answers between 36 and 38 percent
 - 150 m
 - $35.7\% - 0.7\%$ (1 pt) = 35% (1 pt). Accept values close to these
 - Both have mountains, both have both oceans and land, elevations vary a lot more on Earth, Earth has trenches, extraterrestrial planet lacks continental shelves. less land area on Earth
- 3.
- Serious attempt at problem
 - Writes out/uses weight equation (density * thickness)
 - Writes a correct equation for h_a
 - Solves for h_a
 - Final answer of 0.843 km
 - Recognizes subsidence occurs
 - Final units are km or m