



*Exploring the World of Science*

## Captain's Tryouts 2017

### Dynamic Planet – Key

Written by: Araneesh Pratap (Chattahoochee High School)

#### Instructions for grading

- **For 1-20:** A single letter is given as the correct answer. 1 point each
- **For 21-30:** Multiple possible answers for each question. 1/2 point each for a) every letter circled on both the team's answer sheet and the key, and b) every letter not circled on both the answer sheet and the key. Each question has four choices, so the max score per question is 2 points.
- **For 31-50:** Maximum 1 point. Can earn partial credit for some less-specific answers (see question)
- **For 51-57:** a sample answer is given, along with things that must be written to gain points.
- The section totals include locations to add up both earned and missed points, which can be checked to ensure that they add up to the total possible points as another measure to prevent grading mistakes.
- **Tiebreakers (in order):** 11, 24, 33, 41, 45, 52, 54, 57 (i.e. check question 11 for both teams, if that doesn't break the tie then move onto question 24, etc.)
- **Maximum Score: 83 points**

1.     D
2.     B
3.     D
4.     B
5.     C
6.     D
7.     D
8.     D
9.     A
10.    A
11.     D
12.     C
13.     B
14.     A
15.     D

**Total: 15**

16.     D
17.     C
18.     C
19.     D
20.     B
21. (A) (B) (C) D
22. A (B) (C) (D)
23. A (B) (C) D
24. (A) (B) (C) (D)
25. A B (C) (D)
26. (A) (B) (C) (D)
27. A B C D
28. (A) B C D
29. A B (C) (D)
30. A (B) (C) (D)

**Total: 25**

31. Intermontane Basin or Valley (1 point)
32. The oceanic plate (1 point)
33. None of them (1 point)
34. Lithosphere (1 point)
35. Asthenosphere (1 point) (1/2 point if just "mantle")
36. Oceanic Crust (1 point)
37. Continental Crust (1 point)

38. Stratovolcano or Felsic volcano (1 point) (1/2 point if just “volcano”)
39. Mélange or Accretionary wedge (1 point)
40. Serpentinization (1 point)
41. Eclogite metamorphism or Eclogite (1 point)
42. The Wilson Cycle (1 point)
43. B (1 point)
44. D and E (1 point if both, 1/2 point each)
45. Penplain (1 point) (1/2 point if just “plain.” No points for “coastal plain”)
46. Craton (1 point), (1/2 point for “continent”)
47. Clockwise (1 point)
48. West (1 point)
49. North (1 point)
50. South America (1 point)

**Total: 20**

---

51. Cordilleran subduction occurs when an oceanic plate subducts beneath a continental plate, while in Island Arc subduction the oceanic plate subducts beneath another oceanic plate. Modern-day examples include the Aleutian Islands, Kuril Islands, Japan/Japanese Archipelago, Ryukyu, the Philippines, Sunda Islands, Andaman and Nicobar, Izu Islands, Bonin Islands, Mariana Islands, Bismarck Archipelago, Solomon Islands/Archipelago, New Hebrides, Tonga Islands, Antilles, South Sandwich Islands, Aegean/Hellenic arc, South Aegean arc.

Point Breakdown:

Explains that Cordilleran=continental-oceanic while Island Arc=oceanic-oceanic (**2 points** for giving the difference, but only **1 point** if they just state what one of the two are). **1 point** for a correct example from the list above (**max 3 points**).

52. Higher silica content is associated with a higher viscosity, lower eruptive/melting temperatures, lower density, a higher water content, more explosive volcanoes such as composite volcanoes, more sodium/potassium, and more orthoclase feldspar/mica (either muscovite or biotite)/quartz/amphibole. Lower silica content is associated with a lower viscosity, higher eruptive/melting temperatures, higher density, lower water content, less explosive volcanoes such as shield volcanoes, more iron/magnesium/calcium, and more pyroxene/olivine.

Point Breakdown:

**1 point** for each of the following (**max 3 points**):

- High silica means higher viscosity (or the inverse)
- High silica means lower temp. magma/lava or lower eruptive temp. (or the inverse)
- High silica means lower density (or the inverse)
- High silica means more water or the inverse)
- High silica is associated with explosive/composite volcanoes (or the inverse, less explosive shield volcanoes)
- High silica has more sodium or potassium (or the inverse, low silica has more iron, magnesium, and calcium)
- High silica has more orthoclase feldspar (or just feldspar), mica, biotite, muscovite, quartz, and amphibole (or the inverse, low silica has more pyroxene and olivine)

Does not have to explain what happens at both high and low amounts of silica; either one is enough for points. For elements and minerals (the last two) they only need one of the elements/minerals to gain the point; giving more doesn't give any more points.

53. Ridge push is the force applied on a plate at a divergent boundary by gravity acted on the part of the plate that is raised up near the spreading site, causing the plate to slide "downhill" away from the boundary. Slab pull is the force caused by mantle convection acting on a subducting section of a plate, pulling it down into the mantle, which causes the part of the plate at divergent boundaries elsewhere to get pulled away from the spreading site. Slab pull is a lot stronger than ridge push.

Point Breakdown:

**Max 5 points**

**2 points** for a correct description of ridge push (must mention that it is powered by gravity)

**2 points** for a correct description of slab pull (must mention that the force from subducting sections affects diverging sections).

**1 point** for stating that slab pull is stronger.

54. Isostasy is the effect of the buoyant force of the mantle holding up Earth's crust. Because the continental crust is thicker and lighter than oceanic crust, it sinks deeper into the mantle and the top extends further up while the oceanic crust has a lower elevation surface. This is what causes ocean water to collect on oceanic crust.

Point Breakdown:

**Max 3 points**

**1 point** for identifying isostasy as being caused by buoyancy

**1/2 point** for mentioning the size differences between continental and oceanic crust

**1/2 point** for mentioning the density differences between continental and oceanic crust

**1 point** for mentioning that the oceanic crust surface is lower than continental crust surface as a result of isostasy

55. Stress is a measurement of the displacing force acting on a solid or viscous liquid. Strain is the measurement of the actual displacement of a solid or viscous liquid. Strain is caused by the application of stress.

Point Breakdown:

**Max 3 points**

**1 point** for mentioning that stress measures force/pressure

**1 point** for mentioning that strain measures displacement/motion

**1 point** for mentioning that stress causes strain

56. Elastic deformation is a type of strain/deformation in which the material is not permanently deformed, and will return to its original shape once the force that caused the deformation is

removed. In contrast, ductile deformation involves a permanent deformation of the material. Brittle materials are those with a variable elasticity and low ductility, i.e. they break soon after they start stretching. Ductile materials have a low elasticity and a high ductility, i.e. they start stretch with a small amount of force but will continue stretching for a while before breaking.

Point Breakdown

**1 point** for each of the following (max 6 points):

- Elastic deformation is temporary
- Ductile deformation is permanent
- Brittle materials have variable elasticity
- Brittle materials have low ductility
- Ductile materials have low elasticity
- Ductile materials have high ductility

**Total: 23**