

Dynamic Planet Answer Key

Science Olympiad North Regional Tournament at the
University of Florida



2018 UF Science Olympiad Regional Tournament

Dynamic Planet - KEY :

Matching- 1 point each, 12 points total

1. C
2. J
3. K
4. A
5. D
6. L
7. I
8. B
9. H
10. G
11. E
12. F

MC - 1 point each, 21 points total

- | | |
|---------|---------|
| 13. C | 24. D |
| 14. B | 25. A |
| 15. B | 26. B |
| 16. C | **27. B |
| 17. A | 28. D |
| 18. A | 29. E |
| 19. C | 30. C |
| 20. D | 31. D |
| 21. B | 32. A |
| **22. C | 33. C |
| 23. C | |

Labeling- 2 points each, 30 points total

34. Juan de Fuca Plate
35. Pacific Plate
36. Cocos Plate
37. North American Plate
38. Caribbean Plate
39. Nazca Plate
40. South American Plate
41. Scotia Plate
42. African Plate
43. Eurasian Plate
44. Arabian Plate
45. Indo-Australian Plate OR Australian Plate
46. Philippine Plate
47. Antarctic Plate
- **48. Okhotsk Plate

Labeling cont. - 2 points each, 18 points total

49. Continental Crust
50. Oceanic Crust
51. Upper mantle OR Asthenosphere
52. Lower mantle OR Mesosphere
53. Outer Core
54. Inner Core
55. Mohorovicic Discontinuity
56. Gutenberg Discontinuity OR Core-Mantle Boundary
57. Lehmann Discontinuity

58-62) Written Response - 14 points total

58. Name 3 reasons why rifting structures are good sites for mineralization. (1 point for each reason)

Rifting structures are good sites for mineralization because:

1. They can be the sites of thick clastic sedimentation.
2. Rift structures are also thermally anomalous hot zones.
3. Rift structures are sites of diverse rocks (particularly basaltic lavas, which can release their metals on hydrothermal alteration)

59. Describe the effects of an earthquake classified as VIII on the Modified Mercalli Scale. (2 points for correct description)

In a VIII intensity earthquake, a person would most likely experience damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

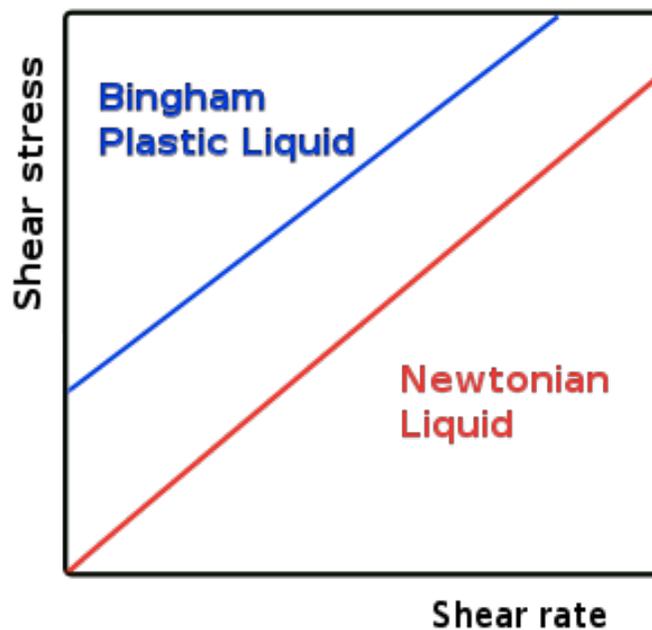
60. **Glacial Isostatic Adjustment refers to the rebound of the Earth from the several kilometer thick ice sheets that covered much of North America and Europe around 20,000 years ago. (1 point)

61. Name and explain 2 factors that determine how a material behaves under stress. (2 points for naming two of the factors, 2 points for the following explanation)

- **Temperature** - At high temperature molecules and their bonds can stretch and move, thus materials will behave in more ductile manner. At low Temperature, materials are brittle.
- **Confining Pressure** - At high confining pressure materials are less likely to fracture because the pressure of the surroundings tends to hinder the formation of fractures. At low confining stress, material will be brittle and tend to fracture sooner.
- **Strain rate** -- At high strain rates material tends to fracture. At low strain rates more time is available for individual atoms to move and therefore ductile behavior is favored.
- **Composition** -- Some minerals, like quartz, olivine, and feldspars are very brittle. Others, like clay minerals, micas, and calcite are more ductile This is due to the chemical bond types that hold them together. Thus, the mineralogical composition of

the rock will be a factor in determining the deformational behavior of the rock. Another aspect is presence or absence of water. Water appears to weaken the chemical bonds and forms films around mineral grains along which slippage can take place. Thus wet rock tends to behave in ductile manner, while dry rocks tend to behave in brittle manner.

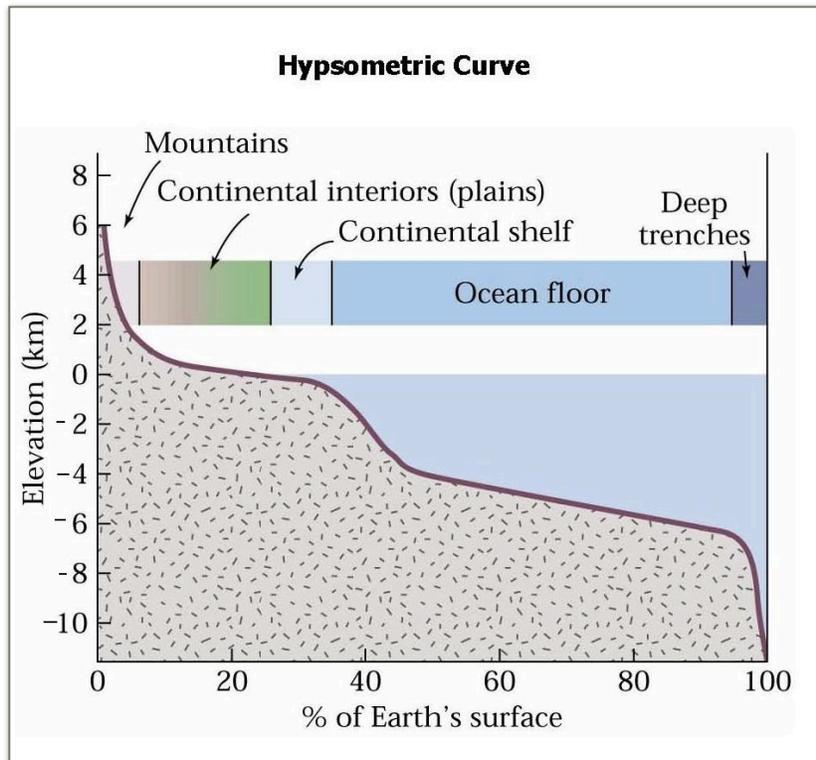
- **62. Illustrate and label a graph of a Bingham fluid and a Newtonian fluid. Give an example of a substance that is classified as a Bingham plastic. (1 point for correct Bingham fluid line and label, 1 point for correct Newtonian fluid line and label, 1 point for correct axes, 1 point for a valid example)



Examples: Clay suspensions and drilling mud. Cosmetics, toothpaste, soap solutions. Foods such as butter, cheese, jam, ketchup, chocolate, mayonnaise, taffy, and yogurt. Natural substances such as magma, lava, gums, honey, and extracts such as vanilla extract.

(The surface of a Bingham plastic can hold peaks when it is still.)

63-65) Math - 8 points total



63. Determine the minimum elevation of mountains that make up the highest 10% of the Earth's surface. (2 points)

0.5 km or higher

64. What percentage of the Earth's surface is above sea level? (2 points)

29% (accept percentages from 27%-30%)

65. What percentage of Earth's surface is between 4 km below sea level and 1 km above sea level? (4 points)

$49\% - 7\% = 42\%$ (accept percentages from 40%-44%)