Name: _____School Name: _____

Name: _____ Team Number: _____

SciOly Summer Study Session 2015

Dynamic Planet (Oceanography) – B and C Division Exam

Instructions (Example for official competitions)

1. To participate, you must have the appropriate tournament wristband.
2. Turn your cell phones off if you have one with you.
3. Per the event rules, you may have only the following materials: "four (4) 8.5"x11" sheets of paper with information on both sides in any form from any source. Each student may bring any kind of calculator." You may also have your own pencils. No other resources are permitted – having resources not listed will result in disqualification.
4. Turn in all exam materials at the end of this event. Missing exam materials will result in immediate disqualification of the team in question. You have been given an exam. Write your answers on the exam.
5. You may separate the exam pages and re-staple them in the correct order as you submit your materials to the supervisor.
6. Only answers provided on the exam will be considered. Write legibly.
7. Write your school name and team number in the appropriate locations on your. Once again, write legibly.
8. Tiebreaker questions are identified with an (*) indication on the exam. There are six (6) tiebreaker questions, and they do not appear in numerical order. Tiebreaker questions count toward the overall exam score, and are only used as tiebreakers in the event of a tie.
9. When time is up, the time is up. Continuing to write after the time is up risks immediate disqualification.
10. Mocking, inappropriate and/or nonsensical answers will result in disqualification.

Good luck!

Name: _____School Name: _____

Name: _____ Team Number: _____

1. What are the arrows pointing to in the picture?

2. Make a graph showing the three-layer water column in the midlatitudes, with temperature varying with depth. Label the middle part. Use graph paper provided and staple to you exam. (4 points)

3. What is the purpose of a secchi disk?

4. About how much of Earth's surface is covered by water?

5. How large is the Pacific Ocean?

a. large enough to fit Asia

b. Large enough to fit Eurasia

c. Large enough to fit Eurasia and Africa

d. Large enough to fit all of the continents with room to spare

6. The oceanic crust is mostly composed of _____ , while the continental crust is mostly composed of _____ . (2 points)

7. Evidence used by Alfred Wegener to support his hypothesis of Plate Tectonics included all of the following EXCEPT:

a. the composition of meteorites from outer space

b. the pattern of similar mountain belts on different continents

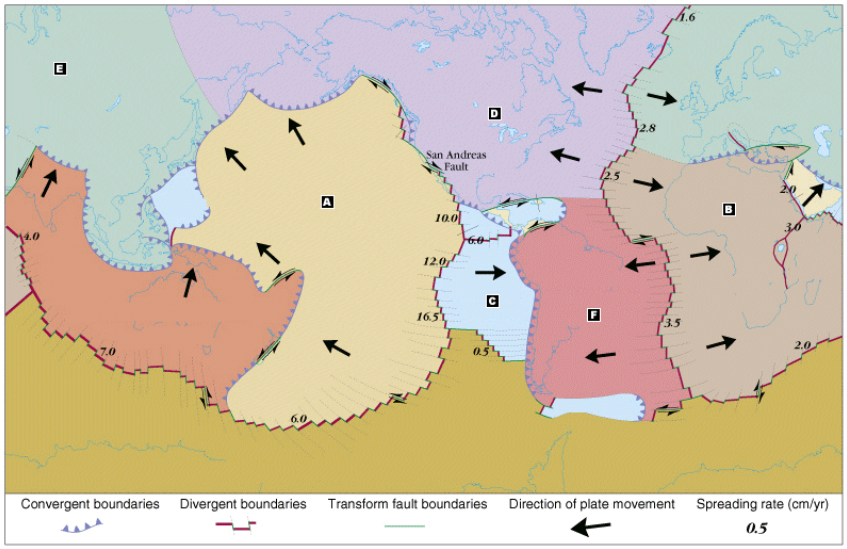
c. fossils of the same species found on different continents very far away

d. evidence of glaciers in areas that are now tropical

8. (6 points) Identify the correct tectonic plate with the correct letter.

Name: _____School Name: _____

Name: _____ Team Number: _____



A _____

B _____

C _____

D _____

E _____

F _____

9. Sediments derived from pre-existing rock are called _____ sediments.

10. Particles from space are referred to as _____ sediment.

11. Mid-ocean ridges are formed where one tectonic plate is forced under another. Circle your answer.

TRUE or FALSE

12. What is the depth where Ekman transport fails to affect water circulation?

13. Give an example of what can cause a tsunami.

14. The age of most oceanic rock is _____ million years old.

15. S waves can travel through solid and liquid media. Circle your answer. TRUE or FALSE

16. Halite, anhydrite, and gypsum are examples of _____ sediment.

17. What is the average depth of the carbonate compensation depth (CCD) in the ocean?

18. Compared to continental crust, oceanic crust tends to be:

a. Older, thinner, and more dense
b. Older, thicker, and more dense
c. Older, thinner, and less dense
d. Younger, thicker, and less dense
e. Younger, thicker, and more dense
f. Younger, thinner, and more dense

Name: _____School Name: _____

Name: _____ Team Number: _____

19. What kind of wave shown in the picture?

20. What are the three main ocean basins?

_____

_____

_____

21. A calcareous ooze contains abundant amounts of _____.

22. _____ are an example of a microscopic, photosynthetic, silica-secreting organism.

23. Manganese nodules are an example of _____ sediment.

24. Below the CCD, calcium carbonate _____.

25. What is the largest single feature of our planet?

26. The Tonga Trench and the Andes Mountains are associated with which kind of plate boundary?

27. What drives currents in the deep ocean?

Name: _____School Name: _____

Name: _____ Team Number: _____

28. What is shown in the picture below? _____

29. Areas of upwelling are characterized by

a. A: Nutrient rich, hot water
b. B: Nutrient rich, cold water
c. C: Nutrient poor, hot water
d. D: Nutrient poor, cold water

30. What does ENSO stands for

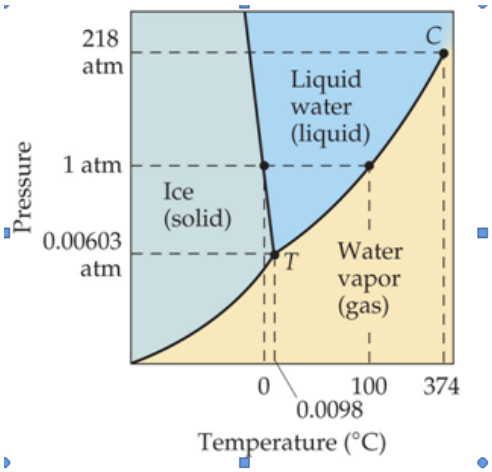
31. What is shown in the picture to the right? (General name, not scientific)

32. Are tsunamis deep- or shallow-water waves?

33. What compass direction does the North Equatorial Current flow in?

34. At what temperature (in degrees Celsius) is water the densest?

35. In the phase diagram for water to the right, what is the full name of the point labeled "T"?



36. What is a berm?

37. The majority of the world's earthquakes are found along _____ plate boundaries

a. Divergent
b. Convergent
c. Transform
d. All of the above
e. None of the above

38. On the pie chart shown below, identify each dissolved constituent in seawater with the letter indicating its abundance.

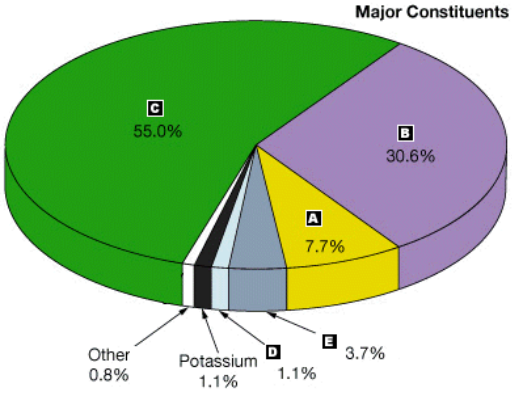
A _____

B _____

C _____

D _____

E _____



39. * Who was the first to publish a reasonably accurate chart of an ocean current?

40. Graph the following information. (9 points) Use graph paper provided and staple to exam before turning it in. What is it a graph of? (1point) _____

Depth (meters)	Temperature (°C)
100	22
200	21
300	18
400	12
500	10
800	7
1000	5
1500	4.5
2000	4.2
2500	4

Name: _____School Name: _____

Name: _____ Team Number: _____

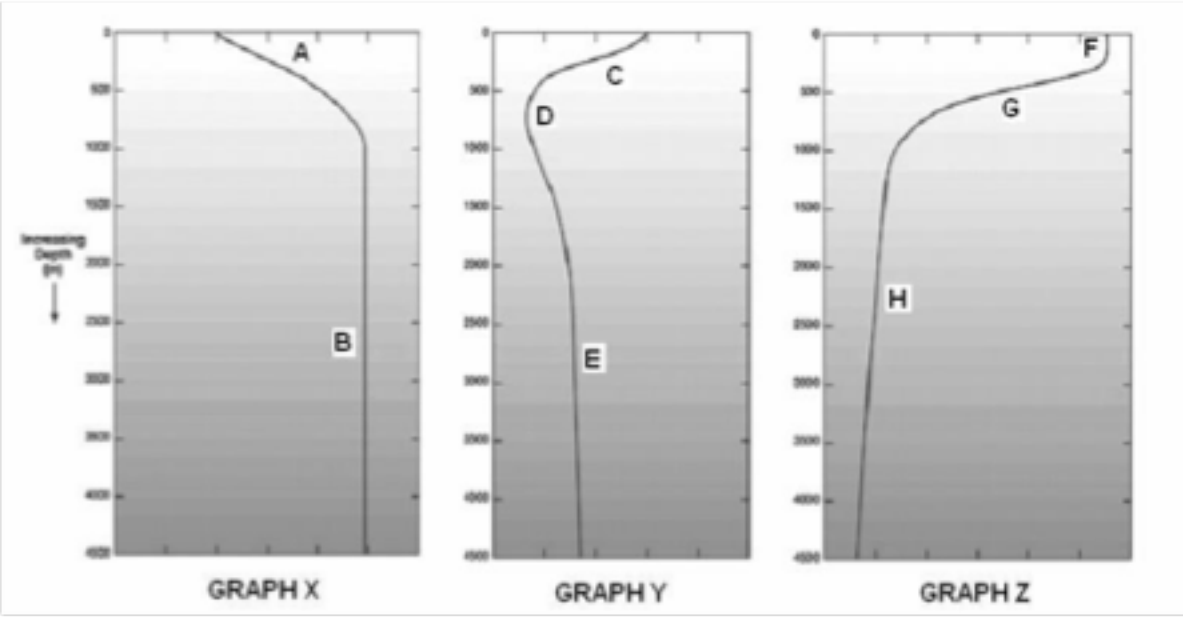
41. Explain the factors leading to the tidal range in the Bay of Fundy being the largest in the world. Provide at least 2 reasons.

42. * What is the tidal range in the Bay of Fundy, in meters? (Accuracy required: ±2 meters)

43. The Ferrel cells are found between what latitudes?

44. A sample of seawater is taken from 1000 meters below the surface in the North Atlantic ocean. It is tested, and the OH^- ion concentration is found to be $1*10^{-6}$. What is the pH of this sample?

For questions 45-49, use the three graphs shown below. All three graphs are associated with midlatitudes in the South Atlantic.



45. Which graph indicates temperature versus depth?

46. Which graph indicates salinity versus depth?

47. Which graph indicates density versus depth?

48. Which letter on the graphs indicates the pycnocline?

49. Which letter on the graphs indicates the thermocline?

50. Why was the marine chronometer such an important development in navigation?

51. List three sources of salt in the ocean.

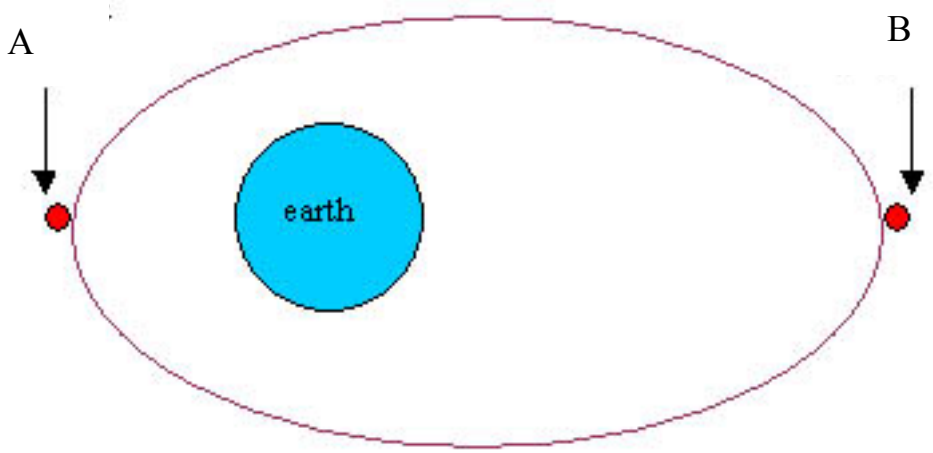
52. Submarine canyons are most commonly found on what underwater feature?

53. Define barycenter (in relation to the Earth-Moon system)

54. * Where is the barycenter found?

a. At the center of the Earth
b. At a point inside of the Earth (but not at the center)
c. At a point on the Earth's surface
d. At a point 1-2 miles off the surface of the Earth
e. At a point halfway between the Earth and Moon
f. At a point 1-2 miles off the surface of the Moon
g. At a point on the Moon's surface
h. At a point inside of the Moon (but not at the center)
i. At the center of the Moon
j. None of the above

55. In the diagram below, the red dot is the Moon. What are the terms for the Moon's locations at points A and B (2 points)



A _____

B _____

56. What rapidly moves large volumes of sediment from the continental shelf to the sea floor?

57. What is the general term for sediment eroded from a continent or volcanic island?

58. * What is the name for a coral structure separated from the mainland (or island) by a lagoon?

59. What is a zone of asthenospheric rock below a hot spot?

60. What is muddy, soft sediment composed of foraminifera, coccolithophore, or pteropod hard parts?

61. What is the density driven, deep water circulation of the oceans?

62. What is the process where cooler, nutrient rich water is brought to just below the surface layer by Ekman flow offshore?

63. What is a fissure in the earth's surface from which geothermally heated water issues?

64. * What is the underwater equivalent of topography?

65. What is wave action that causes the littoral drift of sand parallel to the coast?

66. What is unobstructed distance of sea over which wind blows?

67. What is an area of land adjacent to water on three sides?

68. * What is a coast that has experienced a rise in sea level due to subsidence?

69. What is a deposition landform that forms between an offshore island and the mainland?

70. What is a narrow, flat area at the base of a sea cliff?

71. What causes waves to change speed and direction as depth changes?

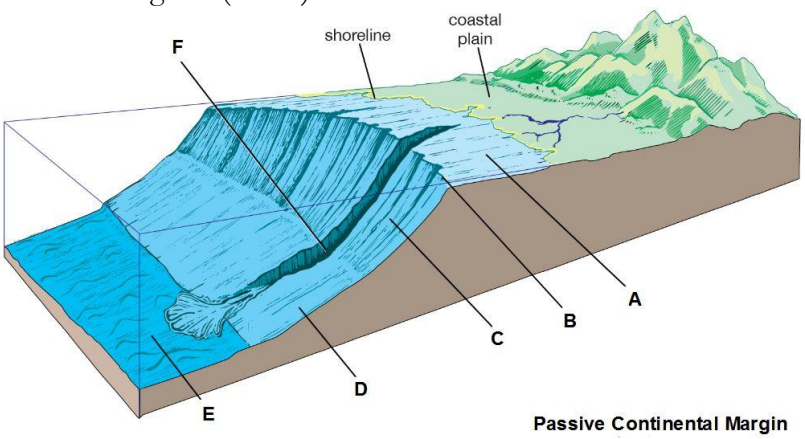
72. What is the seaward sloping portion of a beach between high and low tide water levels?

73. What is the time when the sun and moon are at right angles, causing minimal tidal ranges?

74. What are biogenous, pelagic sediments composed of diatoms and radiolaria?

75. What is the region between the continental rise and the continental shelf?

76. – 81. The diagram below shows the topographic features of a passive continental margin. Label the diagram (A – F)



A _____

B _____

C _____

D _____

E _____

F _____