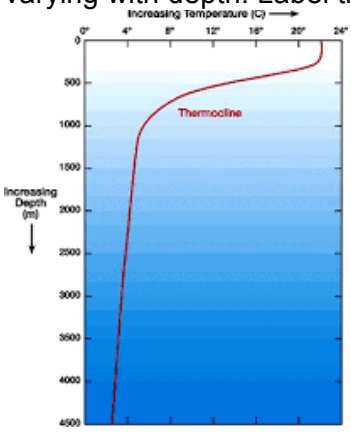
Scioly Summer Study Session 2015
Dynamic Planet (Oceanography) – B and C Division Exam
Answer Key

1. What are the arrows pointing to in the picture? Answer: a rip current

2. Make a graph showing the three-layer water column in the midlatitudes, with temperature varying with depth. Label the middle part. (4 points)



should look something like that (1 point for high temperatures at low depths, 1 point for sudden decrease in temperature with decreasing depth, 1 point for slowly decreasing temperatures at low depths, 1 point for a correct label)

3. What is the purpose of a secchi disk?

To measure water clarity.

The Secchi disk is a device used to measure water transparency in all kinds of open waters (ponds, lakes, reservoirs, bays, oceans).

4. About how much of Earth's surface is covered by water? Answer: anywhere from 70-75% is acceptable

5. How large is the Pacific Ocean? Answer: D

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)

Answer: basalt, granite (1 point per correct answer)

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
The correct answer is A

8. (6 points) Identify the tectonic plates shown in the diagram below. Select from the word bank below.

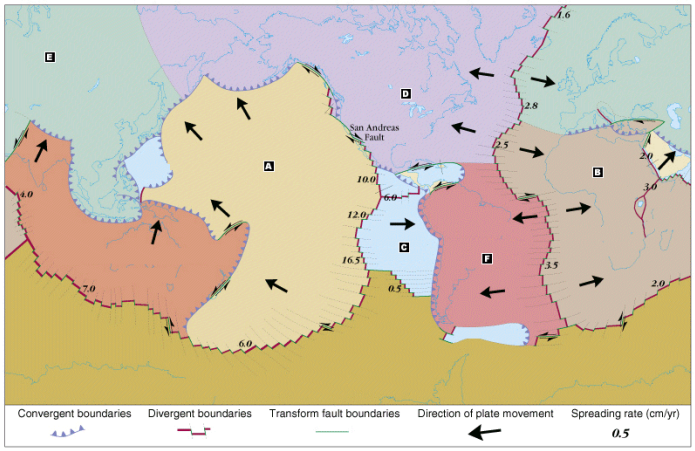


Plate bank: South American Plate African Plate Pacific Plate
North American Plate Nazca Plate Eurasian Plate

A: Pacific Plate
B: African Plate
C: Nazca Plate
D: North America Plate
E: Eurasian Plate
F: South American Plate

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

10. Particles from space are referred to as _____ sediment.
Answer: cosmogenous

11. Mid-ocean ridges are formed where one tectonic plate is forced under another.
Answer: false

12. What is the depth where Ekman transport fails to affect water circulation?
Answer: 100m

13. Give an example of what can cause a tsunami. Answer: underwater volcanoes, earthquakes, landslides

14. The age of most oceanic rock is _____ million years old.
Answer: less than 200

15. S waves can travel through solid and liquid media. TRUE or FALSE?
    Answer: false

16. Halite, anhydrite, and gypsum are examples of _____ sediment.
    Answer: evaporite (hydrogenous is also acceptable)

17. What is the average depth of the calcite compensation depth (CCD) in the ocean?
    Answer: 4500 meters

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

19. What kind of wave shown in the picture? Answer: a surging wave

20. What are the three main ocean basins? Answer: The Pacific, Atlantic, and Indian

21. A calcareous ooze contains abundant amounts of _____. Answer: Calcium Carbonate ($CaCO_3$)

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

23. Manganese nodules are an example of _____ sediment. Answer: Hydrogenous

24. Below the CCD, calcium carbonate _____.
    Answer: Dissolves or cannot form. Either answer is acceptable

25. What is the largest single feature of our planet? Answer: The Pacific Ocean

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

27. What drives currents in the deep ocean? Answer: Density differences

28. What is shown in the picture below? Answer: Hydrothermal vents/black smokers

29. Areas of upwelling are characterized by: Answer: B
    A: Nutrient rich, hot water
    B: Nutrient rich, cold water
    C: Nutrient poor, hot water
    D: Nutrient poor, cold water

30. ENSO stands for: Answer: El Niño-Southern Oscillation (Accent not necessary)

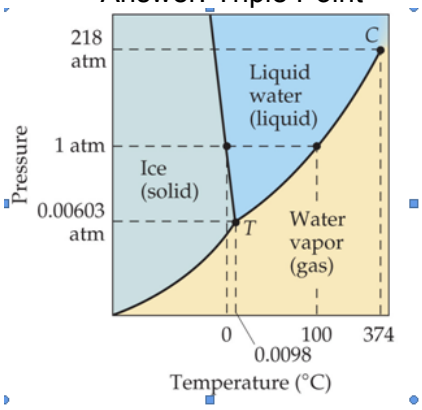
31. What is shown in the picture below (General name, not scientific) Answer: a Blobfish

32. Are tsunamis deep- or shallow-water waves? Answer: Shallow-water waves

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

34. At what temperature (in degrees Celsius) is water the most dense? Answer: 4 degrees

35. In the following phase diagram for water, what is the full name of the point labeled “T”?
    Answer: Triple Point



36. What is a berm? Answer: a dry, nearly-level or gently-sloping platform

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

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

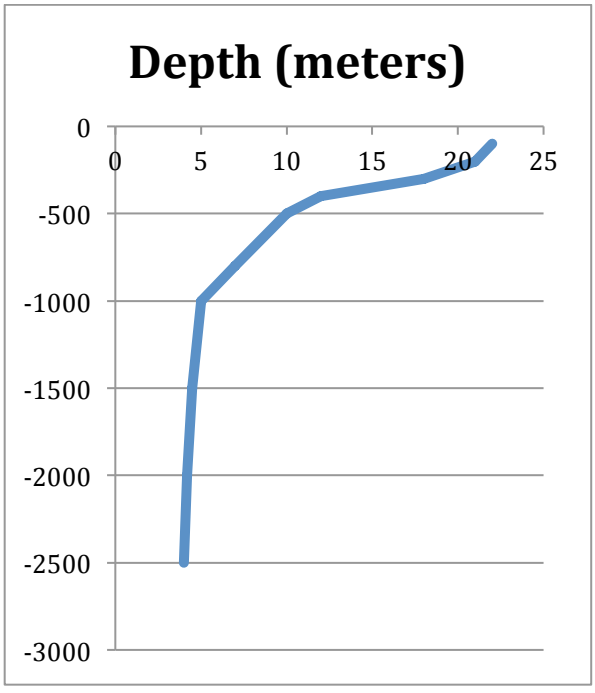
38. On the pie diagram shown below, identify each dissolved constituent in seawater with the letter indicating its abundance

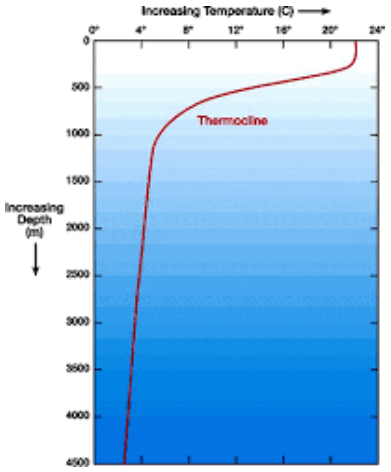
A: sulfate B: sodium C: chloride D: calcium E: magnesium

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

Answer: Benjamin Franklin

40. Graph the following information (9 points). What is it a graph of? (1 point) Answer: thermocline





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. (2 points)

Any 2 of the following (1 point per reason) (if all 3 are provided, then no worries! Ignore incorrect reasons):

- The bay tapers at the end

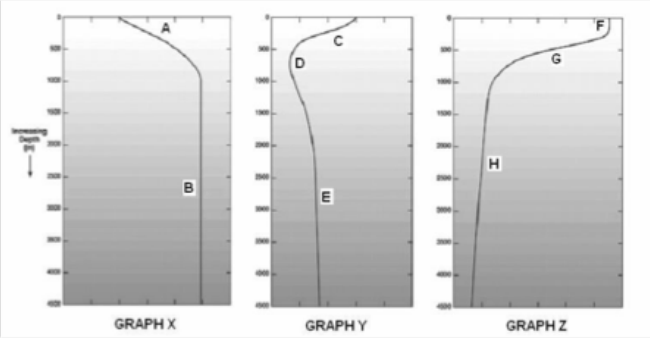
- The period of oscillation in the bay is very close to the tidal period
- The bay curves to the right, and is in the Northern Hemisphere (Coriolis Effect)

42. * What is the tidal range in the Bay of Fundy, in meters? (Accuracy required: ±2 meters)
17 meters (an answer between 15 and 19 meters, inclusive, is considered correct)

43. The Ferrel cells are found between what latitudes? Answer: 30 and 60 degrees (north and south)

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? Answer: 8

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? Answer: Graph Z

46. Which graph indicates salinity versus depth? Answer: Graph Y

47. Which graph indicates density versus depth? Answer: Graph X

48. Which letter on the graphs indicates the pycnocline? Answer: A

49. Which letter on the graphs indicates the thermocline? Answer: G

50. Why was the marine chronometer such an important development in navigation?
It allows for the calculation of longitude on a ship at sea

51. List three sources of salt in the ocean. (3 points)
- Gradual processes such as breaking up of cooled igneous rocks of Earth's crust by weathering and erosion/ Chemical weathering of rock from land
- Wearing down of mountains
- Dissolving action of rains and streams which transported mineral washings to the sea
- Salts dissolved from rocks and sediments below its floor
- Solid and gaseous materials that escaped from Earth's crust through volcanic vents or originated
- in the atmosphere

- Outgassing - due to volcanic eruptions large quantities of water and gas have been emitted during much of geologic time

52. Submarine canyons are most commonly found on what underwater feature?
Answer: Continental slope

53. Define barycenter (in relation to the Earth-Moon system)
The common center of gravity between the Earth and Moon. OR The point which the Earth/Moon system rotates around

54. * Where is the barycenter found? Answer: B
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)
Answer: (1 point per correct answer): A: perigee B: apogee

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

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

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

59. What is a zone of asthenospheric rock below a hot spot? Answer: mantle plume

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

61. What is the density driven, deepwater circulation of the oceans? Answer: thermohaline circulation

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

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

64. * What is the underwater equivalent of topography? Answer: bathymetry

65. What is wave action that causes the littoral drift of sand parallel to the coast? Answer: longshore drift/current

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

67. What is an area of land adjacent to water on three sides? Answer: headland or peninsula

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

69. What is a deposition landform which forms between an offshore island and the mainland?
Answer: tombolo

70. What is a narrow, flat area at the base of a sea cliff ? Answer: wave-cut platform

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

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

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

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

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

76. – 81. The diagram below shows the topographic features of a passive continental margin.

A continental shelf
B shelf break
C continental slope
D continental rise
E abyssal plain
F submarine canyon