**Dynamic Planet Tryout Test Mira Loma Science Olympiad 2014-2015**

For questions 1-4, classify the given sediment based on its type.

1. manganese nodules
2. tests
3. clay
4. evaporites

1. _____
2. _____
3. _____
4. _____

5-10. Order the following into the correct progression of coral reefs

A. barrier reef
B. fringing reef
C. subducting seamount
D. volcanic island
E. atoll
F. guyot

____ ____ ____ ____ ____ ____

**MULTIPLE CHOICE**

11. What is the type of deposition exhibited by turbidity deposits after they exit a submarine canyon?

A) graded bedding
B) structured bedding
C) random settling
D) crystal settling

12. Circle all of the following four locations where you would expect to find an active continental margin.

1) Eastern Americas
2) Western Americas
3) Eastern Asia
4) Western Europe

13. Rift valleys in oceanic ridges are connected by which of the following?

A) convergent boundaries
B) transform faults
C) divergent boundaries
D) tectonic plates

14. Order the following in order of lowest steepness to highest.
    1) continental shelf
    2) continental slope
    3) continental rise
    4) abyssal plain

____ ____ ____ ____

15. Circle all of the following four factors that affect seawater density.
    1) depth
    2) salinity
    3) sediment
    4) temperature

16. When is the best time to navigate a boat in a shallow, rock harbor?
    A) flood current
    B) ebb current
    C) high slack water
    D) low slack water

17. What is the average rate of efficiency for energy transfer between trophic levels?
    A) 5%
    B) 10%
    C) 15%
    D) 20%

18. Circle all of the following four bodies of water that you would expect to float in extremely easily.
    1) Dead Sea
    2) Great Salt Lake
    3) Don Juan Pond
    4) Lake Assal

19. In areas of high productivity on the west coast of continents, which of the following would you expect to be a prominent factor?
    A) coastal mixing
    B) coastal stratification
    C) coastal upwelling
    D) coastal circulation

20. Low energy waves would be most characteristic of
    A) high swash saturation, high backwash, sand gain
    B) high swash saturation, high backwash, sand loss
    C) high swash saturation, low backwash, sand gain
    D) high swash saturation, low backwash, sand loss

21. If there were to be another glacial age, which of the following would most likely appear with greater frequency?
    A) emergent coasts
    B) submergent coasts
    C) developing coasts
    D) declining coasts

22. Which current defines both the Antarctic Ocean and keeps Antarctica cold?
    A) North Wind Drift
    B) East Wind Drift
    C) South Wind Drift
    D) West Wind Drift

23. What is the name for the effect that is extremely influential in the exitance of Earth's ocean currents?
    A) Coriolis Effect
    B) Doppler Effect
    C) Bathymetric Effect
    D) Foram Effect

24. Why is the thermocline important?
    A) creates a barrier between marine life
    B) provides perfect conditions for different communities to thrive in
    C) is the area where nutrients are transferred
    D) was the starting point for all marine life

25. Which of the following four tide types is classified by having multiple high and low tides of the same height each day.
    A) diurnal
    B) semidiurnal
    C) mixed
    D) semimixed

**MATCHING**

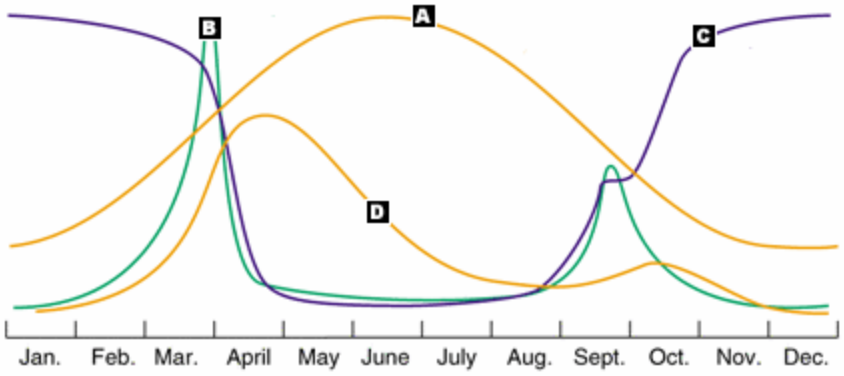
The ocean is split up into many different zones, and is classified in many different ways. The incline of the seafloor is classified in three different ways. The gently sloping submerged surface of sediments underlain by continental crust is called 26._____. This is then split up into two different zones. The first is the area between the high and low tide lines, called the 27._____. The second, called the 28._____ extends from the end of the low tide line to the edge of the 29._____, and even farther is the general 30._____. Past this area, on the ocean floor, is the relatively steep incline that connects the continental crust to the oceanic crust called the 31._____. After this a gradual incline with a thick accumulation of sediment is formed by the combining of deep-sea fans, giving way to the 32._____. Light penetration in the ocean is extremely important for the oceanic food web. The uppermost part of the 33._____ is called the 34._____ and is where sunlight is abundant enough for photosynthesis to occur. Underneath this is the 35._____, where no light shines.

**GRAPHS AND TABLES**

Fill in the table below. (4)

| | **North Pacific Gyre** | **North Atlantic Gyre** |
|---|---|---|
| **North Boundary Current** | | |
| **East Boundary Current** | | |
| **South Boundary Current** | | |
| **West Boundary Current** | | |

Analyze the following graph and answer the questions based on the information given. (6)




The graph above represents productivity in temperate oceans. Label A, B, C, and D.
Why are the spikes in graphs B and D larger in March/April than they are in September/October? Why is there little to no photosynthesis occurring during the summer? What kind of ocean does the summer month resemble? Use specific terminology to classify features of the graph.

**SHORT ANSWER**

Explain how we know when the continental slope ends and the continental rise begins. (2)

Why is there no thermocline present in high latitudes? What is the lack of thermocline called? (3)

Explain the defining characteristics of all three ocean layers and give examples of what kinds of organisms you would expect to find in each one. (4)

How are coral reefs built in deep waters? What are the ideal conditions? How did Charles Darwin hypothesize coral reefs were built? What later theory would corroborate his hypothesis? (4)

Why are abyssal plains more common on the floor of the Atlantic than on the floor of the Pacific? (5)

What is the driving force behind the biocommunity that is the deep sea hydrothermal event even though there isn't any sunlight? (5)

What will happen to the salinity of the oceans if the world were to go into another Ice Age and why? (5)

How does the relationship between evaporation and precipitation affect salinity? Why? Give real world examples of where this is present. (5)

How do cold ocean currents affect the climate of tropical deserts located on the West Coast of continents? Why doesn't this happen on the East Coast? (5)

Why is the surrounding topography around the Dead Sea developing more and more Karst features, like sinkholes? (7)

Explain the principles of paleomagnetism and magnetic reversals in the oceanic ridges and its role in proving the theory of plate tectonics and seafloor spreading. (10)

**ANSWER KEY**

1. hydrogenous
2. biogenous
3. terrigenous
4. hydrogenous
5. D
6. B
7. A
8. E
9. F
10. C
11. A
12. 2,3
13. B
14. 4,3,1,2
15. 2,4
16. C
17. B
18. 1,2,3,4
19. C
20. C
21. A
22. D
23. A
24. A
25. B
26. continental shelf
27. intertidal zone
28. neritic zone
29. continental shelf
30. oceanic zone
31. continental slope
32. continental rise
33. photic zone
34. euphotic zone
35. aphotic zone

36-39.

| | **North Pacific Gyre** | **North Atlantic Gyre** |
|---|---|---|
| **North Boundary Current** | North Pacific Current | North Atlantic Current |
| **East Boundary Current** | California Current | Canary Current |

| | | |
|---|---|---|
| **South Boundary Current** | North Equatorial Current | North Equatorial Current |
| **West Boundary Current** | Kuroshio Current | Gulf Stream |

40-45.
A-sunlight
B-phytoplankton
C-Nutrients
D-zooplankton
The spike in March/April is called the spring bloom while the spike in September/October is called the fall bloom. The spring bloom is more dramatic because nutrients are the limiting factor rather than sunlight, like in the fall bloom. During the summer, even though there is abundant sunlight, there is very little to no nutrients present in the photic zone because of the stratification induced by summer heating. The thermocline serves as a barrier between warm, nutrient depleted surface water and cold, nutrient rich deep water. Because of the lack of mixing, there aren't any nutrients available to perform photosynthesis. This is similar to a tropical ocean where the permanent thermocline prevents any sort of nutrient replacement and, thus, very little productivity occurs.

46-47.
When the deep-sea fans of turbidity currents in adjacent submarine canyons combine to form one large expanse of sediment. Furthermore, the continental rise is where oceanic crust is underneath instead of continental crust.

48-50.
Surface water temperatures are a lot cooler because the Sun doesn't strike the Earth as directly at those areas. Therefore, the temperature starts cool, and stays cool, creating and isothermal water column.

51-54.
The uppermost surface mixed zone makes up 2% of the entire ocean and has very uniform temperature. Here, solar energy is at its largest and most useful, allowing for lots of plankton to be present. The second, transition zone, makes up 18% of the ocean and is the location of the pycnocline and thermocline. Here, most fish and nekton are present. Finally, the deep zone, which consists of 80% of the total ocean is very deep and very cold. Here, benthic organisms such as crabs are present.

55-58.
Coral reefs require shallow, sunlit waters to grow. Darwin hypothesized that coral reefs continued to build the reef complex upwards in order to maintain the ideal conditions. Often times this was done around a volcano, creating the progression of fringing (along margins) to barrier (surrounding with volcano in middle) to an atoll (reef with central lagoon). The lagoon

maintains the ideal conditions under which a coral reef can thrive. This progression happened as the coral built upwards, but the island continued to sink. However the sinking hypothesis was only confirmed years later with the discovery of plate tectonics, and oceanic crust subsidence.

59-63.
The trenches apparent in active continental margins on the Pacific act as traps for the sediment that flows downslope. The Atlantic, on the other hand, has the least amount of trenches, allowing sediment to flow downslope uninterrupted.

64-68.
Though hydrothermal vents are located deep beneath the ocean, they are extremely hot and contain lots of hydrogen sulfide. This results in the existence of archaea, the first life on earth. These archaea are able to obtain energy in a process called chemosynthesis where the heat energy allows them to oxidize hydrogen sulfide into sugar and other forms of energy. Things like tube worms, mussels, clams, and urchins use these archaea bacteria to survive, and are then eaten by larger crabs or fishes.

69-73.
The overall salinity would increase because only fresh water would freeze into glaciers, leaving the remaining water highly concentrated with salt.

74-78.
When there is more evaporation than precipitation, the water becomes more saline because fresh water is evaporated and saltwater is left behind. (Ex. Middle East's Persian Gulf/Red Sea). Conversely, when freshwater is added the concentration of salt decreases. (Ex. Baltic Sea)

79-83.
Cold ocean currents chill the atmosphere, thickening it and prohibiting it from moving upward to create the clouds necessary for precipitation. As a result, these areas are extremely dense with fog and humidity in the area. Cold currents transform tropical deserts into cool, damp places shrouded in fog. The current on the east coast of continents is from the equator up or down the coast, bringing warm water instead of cold water.

84-90.
As the Jordan River becomes diverted, and less mineral rich water is flowing into the Dead Sea, the Sea begins to dry up. Soon after, freshwater begins to occupy the underground cavities, dissolving the salt deposits which creates empty cavities that collapse under its own weight.

91-100.
Paleomagnetism is the theory that rocks exhibit a certain type of magnetic polarity depending on when they were formed. Scientists found that rocks around the world had two different types of magnetic orientation based on the time of their formation. When examining the ocean floor around oceanic ridges, there exist alternating alignment of magnetic strips of basalt. This proves that new seafloor is constantly being created, otherwise, there would only be one orientation in which oceanic basaltic rocks could be found.