IB 82. Spring 2001. **FINAL EXAM** **T. Powell**

INSTRUCTIONS. PART I AND PART II EACH CONTAIN FOUR QUESTIONS. ANSWER TWO (2) QUESTIONS FROM PART I. ANSWER TWO (2) QUESTIONS FROM PART II. ANSWER A TOTAL OF FOUR (4) QUESTIONS. EACH QUESTION IS WORTH FIFTY (50) POINTS.

Me gusta

PART I.

1.a. What are the three major limiting nutrients in the ocean?

1.b. If nutrients are continuously lost from the surface waters by sinking dead organisms, how is the supply maintained?

1.c. Would you predict that the central areas of the gyres have high or low productivity? Why?

1.d. It is claimed by some that a COMPLETELY stratified ocean would eventually become devoid of life? Why?

2.a. What property of the magnetic record found in oceanic crustal rocks gave rise to the idea of sea-floor spreading?

2.b. Describe a possible mechanism responsible for moving the continents over the Earth's surface? In your discussion include the roles of the lithosphere and the asthenosphere.

2.c. Where are the youngest rocks in the ocean's crust? The oldest? Why? Me Gusta Mas

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3.a. If you put a note into a bottle and put the bottle into the Gulf Stream off of South Florida, in the hope of having it reach Great Britain in the minimum possible time, which would be the preferred release point -- the eastern or western side of the Gulf Stream? Why? West

3.b. Hot brines (60C) have been found in depressions at the bottom of the Red Sea. What can be said of their salinity relative to average seawater? lee Hee 2100

3.c. Dissolved materials mix throughout a water mass, but do not settle. This is in contrast to suspended solids which settle to the bottom. If you wanted to minimize the effect of a soluble poison that you were forced to add to the Mediterranean Sea at Gibraltar, where would you place it (the poison), and why?

maybe Boston

4.a Starting with the prevailing zonal wind belts (i.e., the easterly tradewinds, and the mid-latitude westerlies), diagram and discuss how Ekman transport produces "the hill" of water within major ocean gyres.

4.b How does this "hill" lead to geostrophic flow?

4.c What causes the apex of these "hills" to be offset to the west of center within the ocean gyre system? Briefly, explain.

4.d Does your mechanism in 4.c., above, lead to the same result in the Southern Hemisphere as in the Northern Hemisphere? Explain your answer.

yes

PART II.

5.a. In the open ocean away from coastal areas, rank the following regions in terms of phytoplankton productivity: 1) tropics; 2) polar regions; and 3) temperate and sub-polar zones [i.e., which has greater(lesser) productivity?]. Give reasons for your rankings.

5.b. Plot the seasonal progression (i.e., over a year) of phytoplankton biomass for the three regions in 5.a., above -- tropics, polar, and temperate/sub-polar.

5.c. What is the compensation depth? How does this interact with other parameters in phytoplankton bloom formation?

6.a. Name two important physical characteristics of the deep-sea environment. How are these physical characteristics important for organisms living in the deep sea?

6.b. What is the pattern of species diversity in the deep sea? Name and briefly describe two hypotheses which explain the patterm of deep-sea diversity we see today.

6.c. What is a hydrothermal vent and how is it formed? Draw a diagram. What is the source of primary productivity at hydrothermal vents?

7.a. Define what is meant by the term "rocky intertidal"? Name three organisms that live in the rocky intertidal.

7.b. What is meant by the phrase "zonation in the rocky intertidal"? Give an example.

7.c. What limits the success of organisms in the high intertidal? In the low intertidal? How are these limits related to zonation (see 7.b., above)?

8.a. Food webs (or food chains) consist of species acting at several trophic levels. Briefly, define what is meant by the term "trophic level". Give an example of a trophic level in a specific food web (or food chain).

8.b. Individuals at a given trophic level are inefficient. Only a small fraction of the energy at one level is made available to the next trophic level. What are the specific processes (or specific mechanisms) that make this transfer less than 100% efficient?

8.c. If a killer whale is a third level carnivore, how much phytoplankton biomass (in kilograms) is required to add each kilogram of new biomass of the whale? Include a diagram.