

Exam Example

1. Answer 1 of the following (10 points) (Indicate which you are answering):

- a) Why are ribosomal RNA molecules useful for determining phylogenetic relatedness in organisms?
- b) List some main features of archaebacteria and what they tell us about early evolution of life.

2. Answer 2 of the following (5 points each) (Indicate which you are answering):

- a) Why do soil depths decrease heading west in the central US (Great Plains)?
- b) Why do tropical soils have the mineral layers at, or near, the surface?
- c) What 2 elements (besides oxygen) make up the bulk of the mineral matter in most tropical soils? Why?

3. Answer 1 of the following (10 points) (Indicate which you are answering):

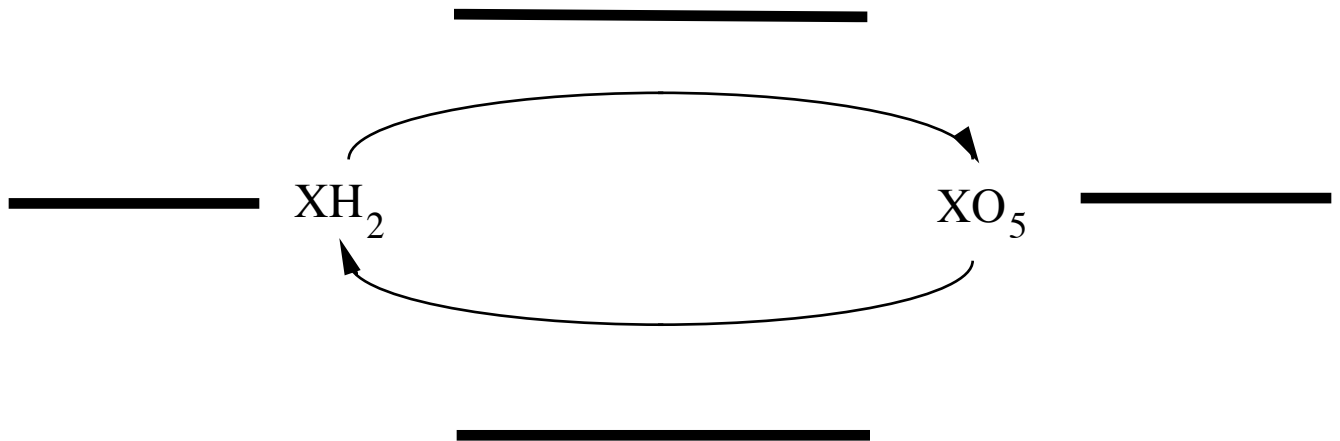
- a) What is the link between weathering processes and the energy output of the Sun?
- b) Describe Lovelock's idea about the relationship between solar output and atmospheric carbon dioxide concentrations and the eventual end of life on Earth as we know it.

4. Answer 2 of the following (5 points each) (Indicate which you are answering):

- a) How can one assess plant nutrient limitation?
- b) How can plant nutrient availability be assessed?
- c) What are the advantages/disadvantages of the buried bag method for determining nutrient mineralization?

5. For the hypothetical biogeochemical cycle below, list in the four (4) spaces provided (**bold lines**), the letter of the term(s) that corresponds best to that compound or process. **Beware** of the form of the words, directions of arrows and positions of compounds (for example, a compound is not aerobic, a process is). More than one letter may be entered on each of the four bold lines. (10 points)

- A. Aerobic
- B. Anaerobic
- C. Oxidation
- D. Reduction
- E. Oxidized
- F. Reduced
- G. Heterotrophic
- H. Autotrophic
- I. Electron donor
- J. Electron acceptor



6. Answer 1 of the following (10 points) (Indicate which you are answering):

- a) What is the relationship between the complexity of an ecological trophic structure and its yield of a marketable commodity?
- b) How does the flow of matter in an ecosystem differ from the flow of energy?

7. Answer 1 of the following (10 points) (Indicate which you are answering):

- a) How would you expect a change in the percent respiration of soil organic matter by a bacterial population to affect the relative ability of a soil to provide nutrients for plants?
- b) How would you expect a change in the C:N ratio of soil organic matter to affect the relative ability of a soil to provide nutrients for plants?

8. Water use efficiency varies greatly from moist environments to arid ones. How is stomatal conductance related to water use efficiency? Would you expect plants in the arid habitat to have lower or higher $\delta^{13}\text{C}$ values compared to the plants in the moist habitat? (10 Points)

9. Answer 2 of the following (5 points each) (Indicate which you are answering):

- a) How are stable isotope data used to determine the antiquity of life?
- b) How did the use of the fossil record as a tool for studying evolution influence thinking about early evolution?
- c) Describe how marine microscopic plankton might control planetary temperature by gas formation.

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