Høgskolen i Telemark

EXAMINATION

4327 Pollution and Microbiology

05.12.2013

Time :	5 hours (9-14)
Language :	English
Numer of pages :	4, including this one.
Aids :	None
Remarks :	Answers in English or Norwegian are acceptable Answer all the questions in section 1. Answer two questions from section 2 and two questions from section 3. Do not answer more than two questions from either of these sections.
Attachments :	None

Results will be published made available electronically via Studentweb

Section 1. Brief questions. Answer all questions in this section.

1a. What, briefly, is the Anammox reaction? Why does this reaction require a separate membrane-bound compartment, the anammoxosome, and why is the reaction only found in Planktomycetes?

1b. What feature of methane monooxygenase makes it important in the biodegradation of organic pollutants?

1c. Describe two adaptations that allow microorganisms to grow in extremely salty environments.

1d. Describe two adaptations that allow microorganisms to grow at extremely high temperatures.

1e. Define/explain the following terms:

i. Soil texture
ii. Soil structure
iii. 1:1 type layer silicate
iv. Cation Exchange Capacity
v. Isomorphous substitution
vi. Weathering by hydrolysis

Section 2. Answer <u>two</u> questions from this section.

Question 2.

(a) What are the main groups of toxins from Cyanobacteria and what effects do these toxins have on human health?

(b) How can toxins from cyanobacteria be detected and what advantages and disadvantages do the different methods of analysis have?

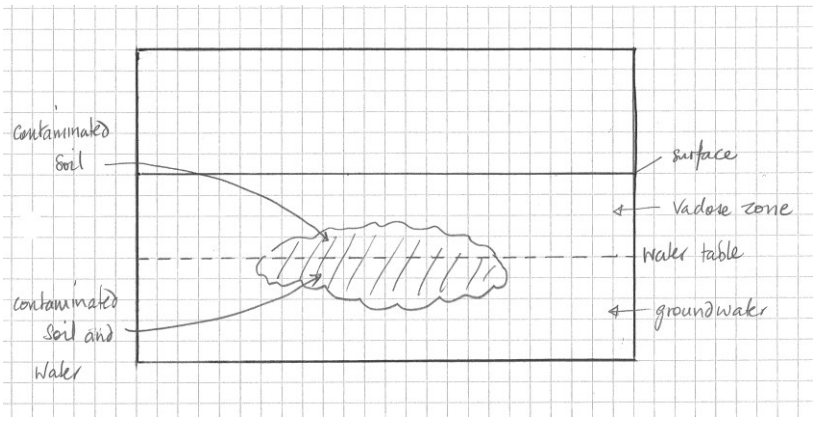
Question 3.

(a) What is acid mine drainage and what measures may be taken to prevent it?

(b) The same microbiological processes may be used to recover copper from low-grade ore. How?

Question 4.

Figure 1 shows a body of soil contaminated with chlorinated hydrocarbons. Suggest a system for bioremediation of this soil body. What, briefly, are the major biochemical processes that will occur during bioremediation?



Question 5.

(a) What factors control the occurrence and growth of cyanobacteria?

(b) What characteristics are used for taxonomic determination of cyanobacteria in the microscope?

Section 3. Answer <u>two</u> questions from this section.

Question 6.
Describe the three-phase soil system and explain briefly the importance of this system for the chemistry and microbiology of soil.

Question 7.

What factors are involved for the formation of high-As ground water? Use Bangladesh as an example. List up the important <u>main</u> factors and elaborate on each of them.

Question 8.
(a) In what way are contaminants transported in an aquifer?
(b) What parameters are involved in the transport?
(c) Discuss the effect of the different parameters when they vary in magnitude and scale.

Question 9.
Sequestration/sorption of trace elements in soil depends strongly on the soil composition.
(a) Which fractions are important for the sorption of trace elements in soil?
(b) Discuss the features of these soil fractions and important factors influencing the sorption.