

EXAMINATION

4327 Pollution and Microbiology

26.03.2014

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 made available electronically via Studentweb

TONTOK

Section 1. Brief questions. 50 marks. Answer all questions in this section.

Question1. (12 marks) Define the following terms:

- Nitrogen fixation
- Nitrification
- Denitrification
- Ammonification

Question 2. (4 marks) What are methanotrophs, and to which major group(s) of organisms do they belong.

Question 3. (6 marks) Describe two adaptations that allow microorganisms to grow in highly acidic environments.

Question 4. (8 marks) Describe four microscopic features of cyanobacteria that may be used for species identification.

Question 5. (12 marks) Define/explain the following terms:

- a. Soil texture
- b. Soil colloid
- c. 2:1 type layer silicates
- d. Base saturation
- e. Outer-sphere complexes
- f. Frost weathering

Question 6. (4 marks?) In microbiology, what is meant by a consortium?

Question 7. (4 marks) What characteristics of the following compounds makes them difficult to biodegrade?

- a. Chlorinated phenols
- b. Polychlorinated biphenyls (PCBs)



Section 2. 25 marks. Answer two questions from this section.

Question 8.

Describe the factors that control the occurrence and growth of cyanobacteria?

Question 9.

What is biofilm? What advantages does it give to its microbial inhabitants and what problems does it cause for humans?

Question 10. Describe the major processes of the microbial sulfur cycle. Under what conditions do the different processes occur?

Question 11.

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



Section 3. 25 marks. Answer two questions from this section.

Question 12.

Describe the three-phase soil system. Explain the differences between sand, clay and organic soils with respect to this system. How does the three-phase system affect the soil microbiology?

Question 13.

Creosote (DNAPL) was discharged into a sandy soil. How would you expect the creosote to spread in the ground? Assume that the water table is 1 m below the surface.

Question 14.

Describe how contaminants are transported by

- a. Advection
- b. Hydrodynamic dispersion; which consists of diffusion and mechanical dispersion (dispersivity)
- c. How does dispersivity change with scale?

Question 15.

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.