48

RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Special) Degree in Applied Biology

Third Year Semester I Examination– Nov./ Dec. 2016

MIB 3301 – ENVIRONMENTAL MICROBIOLOGY

Time: Three (03) hours

Answer ALL questions.

---

1. Answer the following (a-j) as briefly as possible.

a) Explain the two most important microbial reactions in biomining. **(10 marks)**

b) Name the most important group of microorganisms in methylation of mercury and identify an environment where there is a high rate of this phenomenon. **(06 marks)**

c) Identify the two major differences in *Deinococcus radiodurans* genome from the genomes of other bacteria. **(06 marks)**

d) Plastics are light weight and usually contain hydrophobic organic chemicals in their structure. Explain how these factors would impact the biodegradation of plastics in an aquatic system. **(10 marks)**

e) Mention two (02) factors in root exudates that may assist in acceleration of degradation of PCBs by rhizosphere microorganisms. **(10 marks)**

f) Name the most frequently engineered character for detection of pollution by GEMs. Give two examples of using genetically engineered microorganisms as indicators of environmental pollution. **(08 marks)**

g) Define "microbial fuel cell".
Mention how microbial fuel cell concept can be used as a biosensor for monitoring of environmental pollution with organic wastes in water. **(10 marks)**

h) Certain larger bacteria may form ulramicrobacteria under certain environmental conditions. Name **three** mechanisms that these bacteria use to survive under low nutrient conditions. **(12 marks)**

i) State how biosorption contributes in nuclear waste management. **(16 marks)**

j) Triclosan is an antimicrobial microbial substance used heavily in conjunction with detergents. How does this combination increase the persistence of triclosan in the environment? What is the consequence of transforming triclosan to methyl triclosan? Write the technical term used to denote this phenomenon. **(12 marks)**

2. a) Introduce the terms "growth-linked mineralization" and "cometabolic mineralization" and explain how these mechanisms result in bioremediation. **(55 marks)**

   b) Give a concise account on "higher plants in environmental cleanup". **(45 marks)**

3. a) Xenobiotic are synthetic compounds usually having complex chemical structure. Why are they recalcitrant to biodegradation? **(20 marks)**

   b) Explain how xenobiotics are degraded under anoxic conditions. **(80 marks)**

4. a) In biodegradation, particularly of synthetic chemicals in nature, acclimation may delay the process . Explain the term 'acclimation' in this connection. **(40 marks)**

   b) Evaluate the factors affecting acclimation in biodegradation of xenobiotics. **(60 marks)**

5. Bioindicators are extremely useful in environmental monitoring.

   a) Write down the general meaning of bioindicators. **(10 marks)**

   b) Discuss the criteria that should be considered in the selection of a bioindicator. **(55 marks)**

   c) State the desirable properties of diagnostic tests based on indicator organisms for a developing country. **(35 marks)**

6. Write short notes on;

   a) biofilms as a hope in microbial inoculations in natural habitats **(30 marks)**

   b) distribution of microorganisms in seas and oceans **(35 marks)**

   c) hydrothermal vent communities **(35 marks)**

END