RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Special) Degree in Applied Biology

Third Year Semester II Examination– February/ March 2019

MIB 3208 – ENVIRONMENTAL MICROBIOLOGY

Time: Two (02) hours

Answer **ALL** questions.

1. a) Write an account on primary, secondary and tertiary wastewater treatment technologies, with special emphasis on nitrogen and phosphorus removal. Use diagrams when required. **(60 marks)**

   b) Briefly discuss the aerobic bacterial biodegradation pathway of aromatic hydrocarbons. Use diagrams if required. **(40 marks)**

2. a) Write a brief account on extremophilic microorganisms. **(20 marks)**

   b) Discuss the molecular mechanisms behind survival of the following extremophiles;

      i. Thermophiles in extreme hot environments **(40 marks)**

      ii. Psychrophiles in extreme cold environments **(40 marks)**

3. a) Discuss the characteristics that make coliform bacteria a good indicator, but not an ideal indicator of recent fecal pollution of a water body. **(60 marks)**

   b) Explain methods available to render the use of indicator organisms progressively more specific to source track contamination by human feces. **(40 marks)**

4. a) You are requested to develop a derivation of the conventional microbial fuel cell (MFC) design, which is capable of fixing carbon dioxide and fulfilling its cathodic oxygen requirements by utilizing photosynthetic algae in the cathode compartment. Using an illustration, describe your MFC set-up. Describe the benefits of using a photosynthetic organism in the cathode. What benefit could it offer in terms of providing a steady supply of electron donor to the anode microorganisms? **(70 marks)**

   b) If the anode microorganisms in an MFC utilize acetic acid ($C_2H_4O_2$) as their electron donor and the abiotic cathode of the MFC utilizes atmospheric oxygen as the electron acceptor, write anodic and cathodic half reactions of the cell. **(30 marks)**

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