RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. Honours in Applied Biology

Third Year Semester II Examination – July 2020

MIB 3208 – ENVIRONMENTAL MICROBIOLOGY

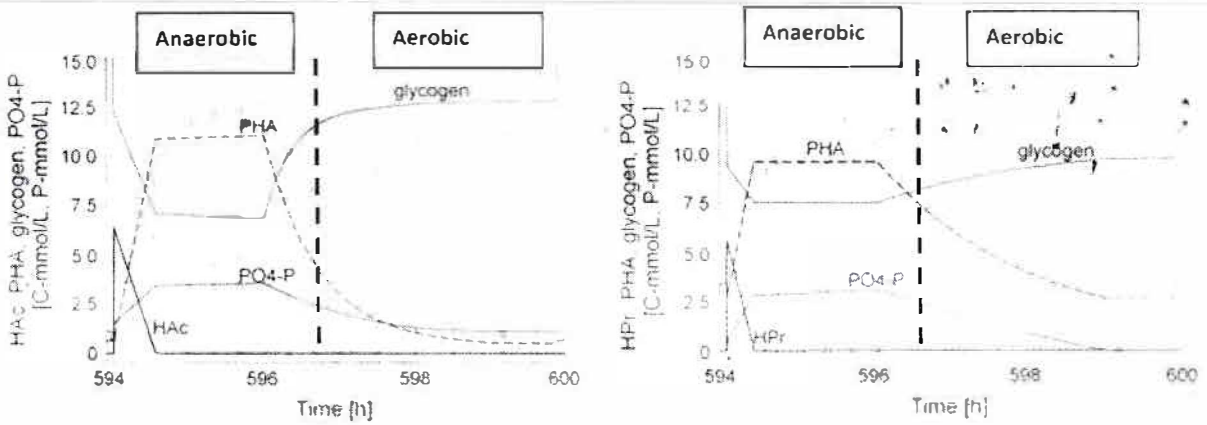
Time: Two (02) hours

Answer ALL questions.

1. Compare the molecular mechanisms of survival, in extreme psychrophilic and extreme thermophilic microorganisms in their natural habitats. Provide at least two known genera for each category of extremophile. **(100 marks)**

2. a). Using diagrams, write an account of the currently accepted metabolic model of Phosphorus removal by Polyphosphate accumulating organisms (PAOs) in modern enhanced biological Phosphate removal (EBPR) systems. **(50 marks)**

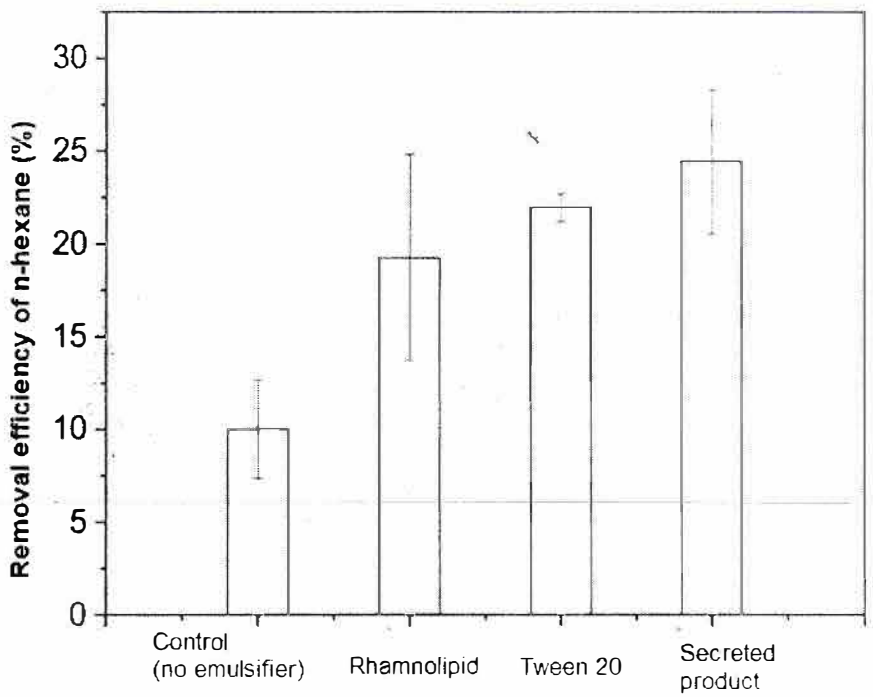
   b) Analyze the figures below from López-Vázquez et al., (2009) and write a brief account of intracellular dynamics of Glycogen, Polyphosphate and Polyhydroxyalkanoates (PHA) in PAO microorganism populations in a typical EBPR plant during anaerobic and aerobic phases (HAc and HPr respectively are Acetate and Propionate supplemented at the start as substrates; PO_4–P is Orthophosphate in bulk liquid). **(50 marks)**



3. Using appropriate diagrams, analyze how the following electron acceptors of microbial metabolism, contribute to bio-geochemical cycling of elements.
   a) NO_3^-
   b) SO_4^{2-}
   c) Fe^{3+} and
   d) Mn^{4+} **(100 marks)**

4. a) Using appropriate diagrams, discuss the current bacterial degradation model of aliphatic hydrocarbon compounds. Mention representative organisms that possess this this capability. **(55 marks)**

   b) The figure below, taken from He et al., (2019) relates to the production of emulsifying agents by a *Pseudomonas* spp. strain utilizing n-hexane as the sole source of carbon and energy. Discuss why the production of emulsifying agents is important during hydrocarbon degradation and comment on the possible chemical nature of the secreted product indicated in the figure. **(45 marks)**



--END--