



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES**

Bachelor of Science Honors in Microbiology

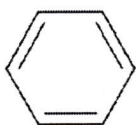
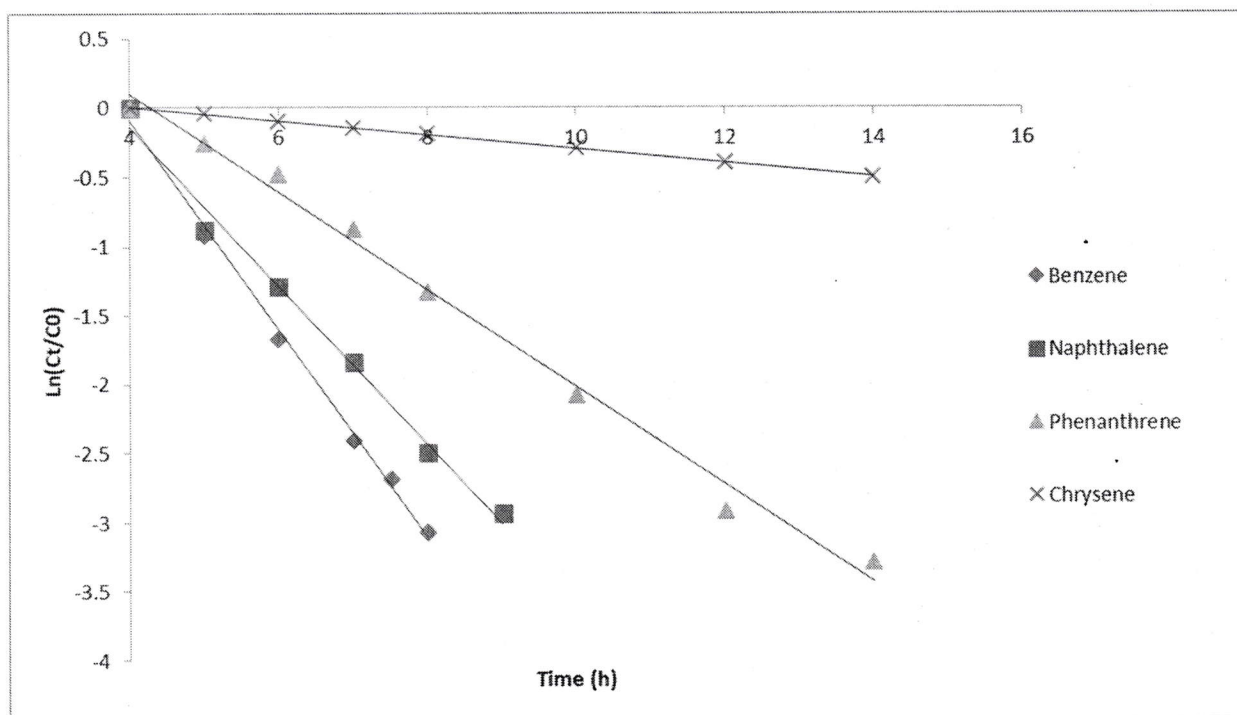
Third Year- Semester II Examination– January/February 2023

MIB 3208 – ENVIRONMENTAL MICROBIOLOGY

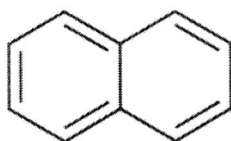
Time: Two (02) hours

Answer **ALL** questions.

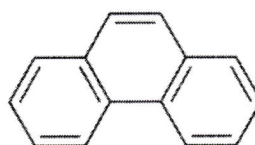
1. The following data was obtained after a microbial biodegradation experiment of the four aromatic hydrocarbon compounds benzene, naphthalene, phenanthrene and chrysene (their molecular structures are also given). The biodegradation kinetic constants (k) of the plots for the four compounds respectively were **0.75, 0.57, 0.35 and 0.05**.



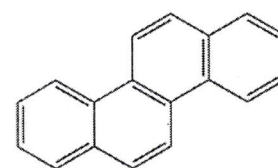
Benzene



Naphthalene



Phenanthrene



Chrysene

- a) Describe briefly the differences observed in the degradation rates of each compound, based on their kinetic constants (k). **(30 marks)**

- b) Using your knowledge on molecular size, molecular mechanisms and the rates of biodegradation of various hydrocarbon compounds, rationalize the observed phenomenon shown in the graph. (40 marks)
- c) If the above hydrocarbon compounds had several chemical substituent groups such as halogen groups or sulfonic acid groups on them, would you expect the degradation kinetic constants to be different? Explain your answer. (30 marks)
2. Discuss the molecular, physiological and genetic adaptations of:
- a) Psychrophilic microorganisms (50 marks)
- b) Thermophilic microorganisms (50 marks)
3. a) Write an account on primary and secondary wastewater treatment technologies. In your description, include expected key changes occurring to the characteristics of the raw wastewater at each stage. (60 marks)
- b) Describe briefly, the biochemical basis behind nitrogen (including Anammox metabolism) and phosphorus removal in activated sludge systems. (40 marks)
4. Discuss the role of electron acceptors in natural microbial biogeochemical cycling of elements, especially in the absence of oxygen. (100 marks)

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