UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2002/2003

February/March 2003

# KEN 300 – Environmental Chemistry

Time : 3 hours

Answer any **FIVE** questions.

All questions are of equal value (20 marks for each question).

This paper contains SIX questions (3 pages).

1. Global warming has been attributed to the accelerated melting of glaciers resulting in the formation icebergs. Discuss the probable causes of global warming and the adverse effects on the environment.

(20 marks)

2. The anthrosphere may be described as that part of the environment made up of technological, engineering and industrial activities attributed to mankind. Discuss the generation of the various types of hazardous wastes from the anthropogenic activities and their safe storage, treatment and disposal.

(20 marks)

3. Describe the effects of ozone in the troposphere as well as the stratosphere. Chlorofluorocarbons (CFC's) have been identified as ozone depleting substances. Discuss the principle involved in ozone depletion and how ozone-safe are their hydrogen-containing chlorofluorocarbon (HCFC) and hydrogen-containing fluorocarbon (HFC) replacements.

(20 marks)

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4. (a) Give a specific example of each of the following general classes of water pollutants:

(i) trace elements,
(ii) metal-organic combinations, and
(iii) pesticides.

(6 marks)

(b) Discuss some of the advantages of physical-chemical treatment of sewage as opposed to biological wastewater treatment. What are some of the disadvantages?

(14 marks)

5. (a) What are the two reasons that soap is environmentally less harmful that ABS surfactant used in detergents?

(8 marks)

(b) Consider municipal drinking water from two different kinds of sources, one a flowing, well-aerated stream with a heavy load of particulate matter, and the other an anaerobic groundwater. Describe possible differences in the water treatment strategies for these two sources of water.

(12 marks)

6. (a) Match each water contaminant in the left column with its preferred method of removal in the right column.

| | |
|---|---|
| (i) $Mn^{2+}$ | (1) Activated carbon |
| (ii) $Ca^{2+}$ and $HCO_3^-$ | (2) Raise pH by addition of $Na_2CO_3$ |
| (iii) Trichloromethane compounds | (3) Addition of lime |
| (iv) $Mg^{2+}$ | (4) Oxidation |

(4 marks)

(b) Analysis of a lead-containing sample by graphite-furnace atomic absorption analysis gave a peak of 0.035 absorbance units when 25 microliters of pure sample was injected. Lead was added to the sample such that the added concentration of lead was 5.0 micrograms per liter. Injection of 25 microliters of "spiked" sample gave an absorbance of 0.75 absorbance units. What was the concentration of lead in the original sample

(6 marks)

(c) Active biomass is used in the secondary treatment of municipal wastewater. Describe three ways of supporting a growth of the biomass, contacting it with wastewater, and exposing it to air.

(10 marks)

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