UNIVERSITI SAINS MALAYSIA

Supplementary Semester Examination
Academic Session 2010/2011

June 2011

IEK 306 – TREATMENT AND MANAGEMENT OF SCHEDULED WASTE
[PENGOLAHAN DAN PENGURUSAN SISA TERJADUAL]

Duration: 3 hours
Masa: [3 jam]

Please check that this examination paper consists of FIVE pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi LIMA muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions: Answer FIVE questions. You may answer the questions either in Bahasa Malaysia or in English.

[Arahan: *Jawab LIMA soalan. Anda dibenarkan menjawab soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]*

In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai.]

1. Fill up the steps in the Pollution Prevention Hierarchy shown in Figure 1 and give a detailed description on the steps and the diagram (why is it in the form of inverted triangle?). Please re-draw the figure in your answer script.

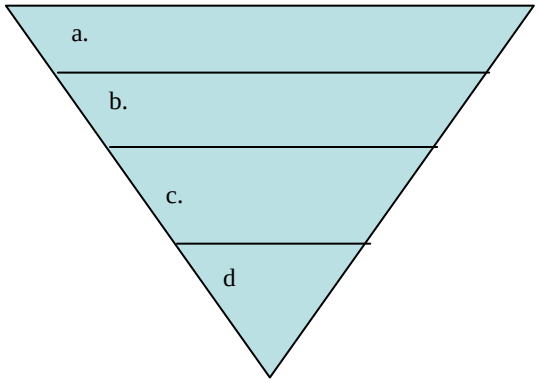


Figure 1

(20 marks)

2. Assume that you are a Facilities Manager handling wastewater in a food industry. Your company produces a wastewater stream that contains high organic content, acidic and with some oil and grease content. Describe the sequence and types of treatment processes that this wastewater should undergo, detailing on the reason as to why this sequence as well as the treatment methods are chosen.

(20 marks)

3. (a) Define bioremediation?

(2 marks)

(b) Discuss the differences between in-situ and ex-situ treatment methods. Describe the advantages and disadvantages of both methods.

(8 marks)

(c) Briefly explain **one** ex-situ and **one** in-situ methods of bioremediation that can be used to treat contaminated soil, sediment or sludge.

(10 marks)

4. (a) Explain the major routes toxic chemicals enter the human body.

(10 marks)

(b) Explain the flammable and toxicity characteristics in the classification and characterization of scheduled waste.

(10 marks)

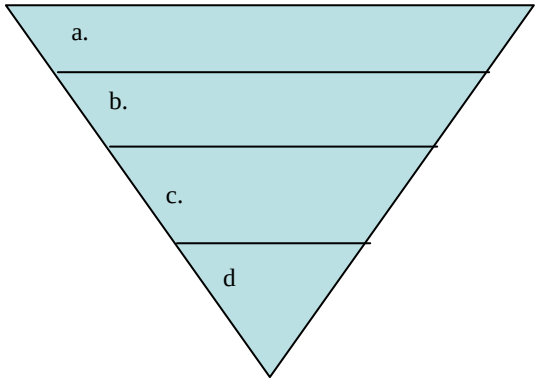
5. Explain the processes involved in a 'cradle-to-grave' scheduled waste management system.

(20 marks)

6. Explain the responsibilities of a hazardous waste generator.

(20 marks)

1. *Isi langkah-langkah di dalam Hierarki Pencegahan Pencemaran seperti yang ditunjukkan di Rajah 1, dan beri penjelasan terperinci bagi setiap langkah serta bentuk gambarajah tersebut (mengapakah ianya berbentuk segitiga terbalik?). Sila lukis semula gambarajah ini dalam skrip jawapan anda.*



Rajah 1

(20 markah)

2. *Andaikan anda seorang Pengurus Fasiliti yang mengendalikan air kumbahan industri makanan. Syarikat anda menghasilkan aliran air kumbahan yang mengandungi kandungan organik yang tinggi, berasid serta mengandungi minyak dan gris. Huraikan urutan dan jenis proses rawatan yang perlu dilalui oleh air kumbahan ini, dengan memberi perincian mengapa urutan dan kaedah-kaedah rawatan ini dipilih.*

(20 markah)

3. *(a) Takrif biopemulihan?*

(2 markah)

(b) Bincang perbezaan kaedah rawatan in-situ dan rawatan ex-situ. Huraikan kebaikan-kebaikan dan keburukan-keburukan kedua-dua kaedah ini.

(8 markah)

(c) Jelaskan secara ringkas ***satu*** *kaedah biopemulihan.in situ dan* ***satu*** *kaedah biopemulihan ex-situ yang boleh digunakan untuk merawat tanah tercemar, enapan atau enapcemar.*

(10 markah)

4. (a) *Terangkan cara-cara utama bahan kimia toksik dapat memasuki tubuh badan manusia.*

(10 markah)

(b) *Jelaskan ciri mudah terbakar dan ciri ketoksikan dalam pencirian sisa terjadual.*

(10 markah)

5. *Huraikan proses-proses yang terlibat dalam sistem pengurusan sisa terjadual berkonsepkan 'cradle-to-grave'.*

(20 markah)

6. *Jelaskan tanggungjawab seorang pengeluar sisa terjadual.*

(20 markah)

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