

---

# UNIVERSITI SAINS MALAYSIA

Second Semester Examination  
2013/2014 Academic Session

June 2014

## **EAP 412/4 – Environmental Studies** **[Pengajian Alam Sekitar]**

Duration : 3 hours  
[Masa : 3 jam]

---

Please check that this examination paper consists of **NINE (9)** pages of printed material including **ONE (1)** appendix before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi **SEMBILAN (9)** muka surat yang bercetak termasuk **SATU (1)** lampiran sebelum anda memulakan peperiksaan ini.]

**Instructions** : This paper contains **SIX (6)** questions. Answer **FIVE (5)** questions.

**Arahan** : Kertas ini mengandungi **ENAM (6)** soalan. Jawab **LIMA (5)** soalan.]

All questions **MUST BE** answered on a new page.

[Semua soalan **MESTILAH** dijawab pada muka surat baru.]

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

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

1. (a) The Department of Environment of Malaysia in 2004 has issued the following Noise Guidelines with specific objectives and scopes (i): “The Planning Guidelines For Environmental Noise Limits And Control” and (ii): “The Guidelines For Noise Labelling And Emission Limits Of Outdoor Sources”.

*Pada tahun 2004, Jabatan Alam Sekitar Malaysia telah mengeluarkan Garis Panduan Bunyi berikut dengan objektif dan skop yang spesifik (i): “Garis Panduan Perancangan untuk Had Bunyi Sekeliling dan Kawalan, dan (ii): “Garis Panduan Untuk Pelabelan Bunyi dan Had Pelepasan Sumber Luar Bangunan”.*

- (i) In brief, state the purpose of each Guideline.

*Secara ringkas, nyatakan tujuan kedua-dua Garis Panduan ini.*

[4 marks/markah]

- (ii) State **ONE (1)** Scope of application for each Guideline

*Nyatakan **SATU (1)** daripada skop aplikasi setiap Garis Panduan.*

[4 marks/markah]

- (b) There are many noise analyses methods done for specific purpose. With the help of a sketch diagram, define Noise Level (Phon) and give **ONE (1)** of its application.

*Terdapat banyak kaedah analisis bunyi yang boleh dibuat berdasarkan tujuan tertentu. Dengan bantuan lakaran kasar, definisikan Paras Hingar (Phon) dan berikan **SATU (1)** daripada aplikasinya.*

[6 marks/markah]

- (c) A vertical wall is one of the common methods in the noise control. With the help of a sketch diagram, briefly discuss effectiveness of this method in reducing:

*Dinding pugak merupakan salah satu kaedah biasa dalam kawalan bunyi. Dengan bantuan lakaran kasar, terangkan secara ringkas keberkesanan kaedah ini dalam mengurangkan:*

- (i) High frequency noise

*Bunyi frekuensi tinggi*

[3 marks/markah]

- (ii) Low frequency noise

*Bunyi frekuensi rendah*

[3 marks/markah]

2. (a) Measurement of noise must be undertaken in accordance to the standard procedures. Propose **FOUR (4)** factors that you will consider in sampling traffic noise at kerbside adjacent to a tall building.

*Pengukuran bunyi mesti dilakukan mengikut prosedur standard. Cadangkan **EMPAT (4)** faktor yang perlu anda timbangkan dalam membuat pensampelan bunyi trafik di tepi jalan yang bersebelahan dengan bangunan tinggi.*

[4 marks/markah]

- (b) A day-time noise monitoring has produced the following data:

*Suatu pemantauan bunyi waktu siang telah menghasilkan data seperti berikut:*

Time (minutes) <i>Masa (minit)</i>	Noise Level dB (A) <i>Paras Bunyi dB (A)</i>
0	84
20	76
30	74
40	75
50	74
60	75
70	77
80	68
90	75
100	80
110	84
120	73

- (i) Calculate the  $L_{dn}$  (1 hr)

*Kirakan nilai  $L_{dn}$  (1 jam)*

[6 marks/markah]

- (ii) With the help of a sketch, evaluate the  $L_{10}$  and the background noise level for the whole monitoring period.

*Dengan bantuan lakaran, tentukan nilai  $L_{10}$  dan paras bunyi latar belakang untuk keseluruhan masa pengukuran*

[10 marks/markah]

3. (a) Distinguish the main classes of clinical waste and explain appropriate management methods for each class.

*Bezakan kelas-kelas utama sisa klinikal dan terangkan kaedah pengurusan yang sesuai untuk setiap kelas tersebut.*

[10 marks/markah]

- (b) A mineral processing industry pioneered by Australian company has been producing waste products that must be sent for disposal in Australia. Propose the procedure to be implemented for shipping the materials to Australia through the port of Kuantan.

*Sebuah industri memproses mineral dipelopori oleh syarikat Australia telah menghasilkan sisa sampingan yang perlu dihantar untuk dilupuskan di Australia. Cadangkan langkah yang perlu dilaksanakan untuk penghantaran bahan berkenaan ke Australia melalui pelabuhan Kuantan.*

[10 marks/markah]

4. (a) The ABC Palm Oil Mill currently treats effluent from the milling process using a series of open aerobic and anaerobic treatment ponds. Criticize the weaknesses of the open pond treatment system and propose a more sustainable treatment option for treating the high strength wastewater (COD > 3000 mg/l).

*Kilang Minyak Sawit ABC merawat efluen dari proses pengilangan menggunakan satu siri kolam rawatan aerobik dan anaerobik terbuka. Kritik kelemahan system kolam rawatan terbuka tersebut dan cadangkan suatu rawatan yang lebih mampan bagi merawat air sisa berkekuatan tinggi (COD > 3000 mg/l).*

[10 marks/markah]

- (b) The DEF clinic disposes all of its clinical wastes in the rubbish bin at the back of doctor's room. Evaluate whether this clinical waste management practice is acceptable and propose new improvements to the current practice.

*Klinik DEF melupuskan semua sisa klinikal dalam tong sampah di belakang bilik doktor. Nilai kan samada pengurusan sisa klinikal tersebut adalah suatu amalan yang boleh diterima dan cadangan penambahbaikan baru terhadap amalan sedia ada.*

[10 marks/markah]

5. Discuss the appropriateness of using air pollution index in the context of relationship between the index and air pollutants.

*Bincangkan kesesuaian penggunaan indeks pencemaran udara dalam konteks hubungkait indeks dan pencemar udara.*

[20 marks/markah]

6. (a) **Figure 1** shows a tunnel with wind blowing into the tunnel with a speed of 2.8m/s. It is estimated that 3500 vehicles per hour, with a 6% heavy duty vehicles mix, running at an average speed of 60km/h, travel through the tunnel during the highest vehicle rate period. Calculate the CO concentration in ppm within the tunnel during maximum use.

Given that:

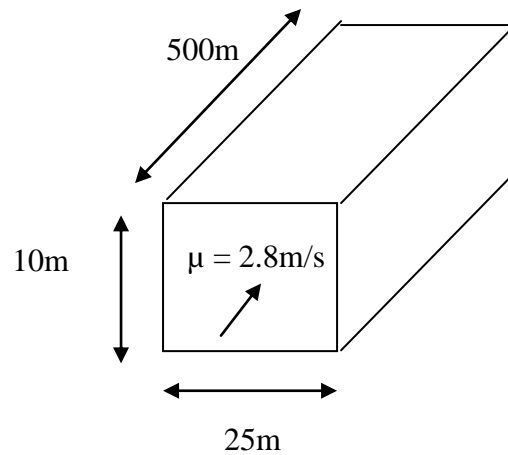
$$E = \text{emission factor} \\ = 0.015\text{gm}^{-1}\text{veh}^{-1}$$

***Rajah 1** menunjukkan sebuah terowong dengan angin yang bertiup ke arahnya pada kelajuan 2.8m/s. Dianggarkan 3500 kenderaan sejam, dengan 6% daripadanya adalah kenderaan berat, bergerak pada kelajuan purata 60km/j melalui terowong ketika kadar kenderaan paling tinggi. Tentukan kepekatan CO di dalam terowong dalam ppm ketika penggunaan maksimum tersebut.*

*Diberikan bahawa:*

$$E = \text{faktor emisi} \\ = 0.015\text{gm}^{-1}\text{veh}^{-1}$$

[5 marks/markah]

Figure 1/ *Rajah 1*

- (b) Control of NO<sub>x</sub> emission from industrial chimney is important as it can cause air pollution effect. One of the technologies to control this pollutant is through post-treatment where NO<sub>x</sub> is removed from the exhaust gases after the NO<sub>x</sub> has already been formed in the combustion chamber.

*Kawalan pelepasan NO<sub>x</sub> dari cerobong industri adalah penting kerana ia boleh menyebabkan kesan pencemaran udara. Salah satu teknologi untuk mengawal pencemar ini adalah melalui pos-rawatan di mana NO<sub>x</sub> disingkirkan daripada gas ekzos selepas NO<sub>x</sub> terbentuk di dalam kebuk pembakaran.*

- i) Propose and explain suitable control technique required to reduce more than 90% NO<sub>x</sub> emission from industrial combustion processes.

*Cadang dan terangkan teknik kawalan sesuai yang diperlukan untuk menyingkirkan lebih 90% pelepasan NO<sub>x</sub> daripada proses pembakaran industri.*

[9 marks/markah]

- ii) Evaluate the potential problems and challenges of control technique that you suggest in b. i).

*Bincangkan masalah dan cabaran yang berpotensi bagi teknik kawalan yang anda cadangkan dalam b. i).*

[6 marks/markah]

AppendixLampiran

Useful formulae:

- 1)  $C = 20.05 T^{0.5}$
- 2)  $I = w/s$
- 3)  $L_I = 10 \log_{10} I/10^{-12}$
- 4)  $L_p = 20 \log_{10} (P/P_0)$ ,  $P_0 = 20 \mu\text{Pa}$
- 5)  $L_w = 10 \log_{10} (w/10^{-12})$
- 6)  $L_{eq} = 10 \log_{10} \sum t_i 10^{L_i/10}$
- 7)  $L_{wp} = 10 \log_{10} 1/N \sum 10^{(L_j/10)}$
- 8)  $L_{pp} = 20 \log_{10} 1/N \sum 10^{(L_j/20)}$
- 9)  $T_L = 10 \log_{10} \left\{ \frac{s}{\tau_1 s_1 + \dots + \tau_2 s_2} \right\}$
- 10)  $T_L = 10 \log_{10} 1/\tau$
- 11)  $NNI = \text{Average Peak Noise Level} + 15 \log_{10} N - 80$   
 $\text{Average Peak Noise Level} = 10 \log_{10} 1/N \sum 10^{\text{Peak noise level}/10} \text{ dB (A)}$
- 12)  $\text{Traffic } L_{eq} = 42.3 + 10.2 \log (V_c + 6 V_t) - 13.9 \log D + 0.13 S$
- 13)  $\text{Traffic } L_{dn} = 31.0 + 10.2 \log [AADT + T\% AADT/20] - 13.9 \log D + 0.13 S$