
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
2010/2011 Academic Session

April/May 2011

IEG 102 – INTRODUCTION TO ENVIRONMENTAL TECHNOLOGY
[PENGANTAR TEKNOLOGI PERSEKITARAN]

Duration: 3 hours
Masa: [3 jam]

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

[Sila pastikan bahawa kertas peperiksaan ini mengandungi TUJUH 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.]

PART A: ANSWER ALL QUESTIONS

1. (a) Sketch and describe briefly the functions of any **TWO** of the following equipment.
 - i) Cyclone separator
 - ii) Fabric filter
 - iii) Electrostatic precipitator

(12 marks)
- (b) Describe the degradation process of an organic pollutant in soils through biological mechanism.

(8 marks)
2. (a) Define renewable energy and its importance toward achieving environmental sustainability.

(8 marks)
- (b) List **FOUR** renewable energy sources.

(4 marks)
- (c) Briefly explain the role of decomposers in an ecosystem.

(8 marks)
3. (a) Explain the different stages of waste water treatment and their goals.

(12 marks)
- (b) What chemicals are often used for disinfection?

(4 marks)
- (c) What is the mechanism of disinfection?

(4 marks)
4. (a) Estimate the energy content of the hydrocarbons in Figure 1 in unit kJ/g.

(8 marks)
- (b) How many moles of CO₂ will be formed in this process for every 1000 kJ of liberated energy?

(12 marks)

The formulae of the two hydrocarbons and bond energies are as follows:

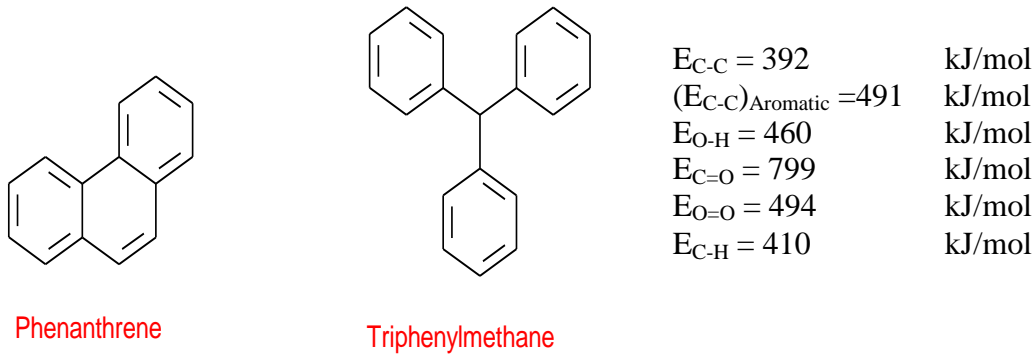


Figure 1

PART B: ANSWER ONE QUESTION ONLY

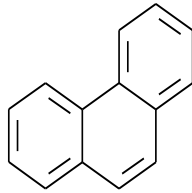
5. (a) Calculate the BOD concentration of water in which 10 mg of sugar ($C_6H_{12}O_6$) is dissolved in one liter of water. How does this compare with the O_2 solubility at $20^\circ C$ which is 9 mg/L? (10 marks)
- (b) Explain briefly **TWO** suitable methods in the remediation of soil contamination. (10 marks)
6. Describe any **THREE** of the following: (20 marks)
- i) Acid Rains
 - ii) Limiting Nutrient
 - iii) Photochemical Smog
 - iv) Chemical formation of particulate matters

7. (a) What is meant by NO_x? (4 marks)
- (b) What are the sources and sinks of NO_x? (6 marks)
- (c) How particulate matters are formed in the atmosphere? Describe with the help of chemical equations. (10 marks)

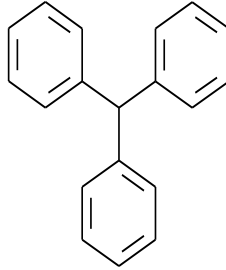
BAHAGIAN A: JAWAB SEMUA SOALAN

1. (a) *Lakarkan dan jelaskan dengan ringkas **DUA** alatan berikut*
- i) Pengasing siklon*
 - ii) Penuras fabrik*
 - iii) Pemendap elektrostatik*
- (12 markah)*
- (b) *Huraikan proses penguraian satu bahan pencemar organik di dalam tanah menerusi mekanisme biologi.*
- (8 markah)*
2. (a) *Takrifkan Tenaga diperbaharui dan kepentingannya dalam mencapai kelestarian persekitaran.*
- (8 markah)*
- (b) *Senaraikan **EMPAT** sumber tenaga diperbaharui.*
- (4 markah)*
- (c) *Secara ringkas terangkan peranan pengurai dalam ekosistem.*
- (8 markah)*
3. (a) *Jelaskan perbezaan tahap pemprosesan air kumbahan dan tujuan mereka.*
- (12 markah)*
- (b) *Apakah bahan kimia yang sering digunakan untuk pembasmian kuman?*
- (4 markah)*
- (c) *Apakah mekanisme pembasmian kuman?*
- (4 markah)*
4. (a) *Anggarkan kandungan tenaga hidrokarbon dalam Rajah 1 di bawah dalam unit kJ/g.*
- (8 markah)*
- (b) *Berapa mol CO₂ akan terbentuk dalam proses ini untuk setiap 1000 kJ tenaga yang dibebaskan?*
- (12 markah)*

Diberi rumus dua hidrokarbon dan tenaga ikatan seperti berikut:



Phenanthrene



Triphenylmethane

$E_{C-C} = 392$	kJ/mol
$(E_{C-C})_{Aromatic} = 491$	kJ/mol
$E_{O-H} = 460$	kJ/mol
$E_{C=O} = 799$	kJ/mol
$E_{O=O} = 494$	kJ/mol
$E_{C-H} = 410$	kJ/mol

Rajah 1

BAHAGIAN B: JAWAB SATU SOALAN SAHAJA

5. (a) Hitung kepekatan BOD air yang mana 10 mg gula ($C_6H_{12}O_6$) dilarutkan dalam satu liter air. Bagaimana kepekatan BOD yang diperolehi dibandingkan dengan ketelaruhan O_2 pada $20^\circ C$ yang berkepekatan 9 mg/L? (10 markah)
- (b) Terangkan secara ringkas **DUA** kaedah yang sesuai dalam pemulihan tanah yang tercemar. (10 markah)
6. Huraikan sebarang **TIGA** yang berikut:
- Hujan Asid
 - Gizi Penghad
 - Kabut fotokimia
 - Kimia pembentukan partikulat
- (20 markah)

7. (a) *Apakah yang dimaksudkan dengan NO_x?* (4 markah)
- (b) *Apakah sumber dan takungan NO_x?* (6 markah)
- (c) *Bagaimana partikulat terbentuk di atmosfera? Jelaskan dengan bantuan persamaan kimia.* (10 markah)