SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN TEKNOLOGI KIMIA DAN MAKANAN

PEPERIKSAAN AKHIR

SESI II : 2023/2024

DMT40133 : INSTRUMENTAL ANALYSIS OF FOOD

TARIKH : 11 JUN 2024
MASA : 2.30 PETANG - 4.30 PETANG (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan subjektif. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO 1

(a) Define Chromatography analysis and Spectral method analysis with **ONE (1)** example of an instrument used for each analysis.

*Definisikan analisis kromatografi dan kaedah spektra beserta **SATU (1)** contoh alat yang digunakan untuk setiap analisis tersebut.*

[5 marks]

[*5 markah*]

CLO 2

(b) Explain **THREE (3)** factors that influence the preparation of standard solution to form the best calibration curve.

*Terangkan **TIGA (3)** faktor yang mempengaruhi kepada penyediaan larutan piawaian bagi menghasilkan graf lengkuk yang baik.*

[6 marks]

[*6 markah*]

(c) A Quality Assistant in Company A is conducting an experiment to determine the amount of vitamin C in orange syrup. She needs to measure 0.80 gram standard of Vitamin C using different types of balance. The resulting weight of the standard of vitamin C is shown in Table 1(c).

Seorang pembantu kualti di Syarikat A sedang menjalankan satu eksperimen bagi menentukan jumlah vitamin C dalam sirap oren. Dia perlu mengukur 0.80 gram piawai Vitamin C dengan menggunakan jenis penimbang yang berbeza. Keputusan berat piawai Vitamin C adalah seperti di Jadual 1 (c)

Table 1(c) / *Jadual 1(c)*

Reading of Balance 1 *Bacaan penimbang 1*	Reading of Balance 2 *Bacaan penimbang 2*	Reading of Balance 3 *Bacaan penimbang 3*	Reading of Balance 4 *Bacaan penimbang 4*
0.801	0.811	0.811	0.801
0.802	0.831	0.812	0.803
0.801	0.853	0.812	0.808

CLO 3

i. Based on Table 1 (c), predict the level of precision and accuracy for weighing balance 1, 2, 3 and 4.

Berdasarkan Jadual 1 (c), jangkakan tahap kejituan dan ketepatan untuk penimbang 1, 2, 3 dan 4.

[8 marks]

[*8 markah*]

CLO 3

ii. Write **THREE (3)** ways that can be used to reduce error of reading for weighing balance 2 and 3.

*Terangkan **TIGA (3)** cara mengurangkan ralat bacaan bagi penimbang 2 dan 3.*

[6 marks]

[*6 markah*]

QUESTION 2
SOALAN 2

CLO 1 (a) List **THREE (3)** types of electromagnetic spectrum.
*Senaraikan **TIGA (3)** jenis spektrum elektromagnetik*

[3 marks]
[*3 markah*]

CLO 2 (b) Figure 2(b) shows the schematic diagram of single beam UV-Visible Spectrophotometer. Explain the functions of components A, B and C.
Rajah 2(b) menunjukkan rajah skematik Rasuk Tunggal Spektrofotometer UV-Nampak. Terangkan fungsi komponen A, B dan C.

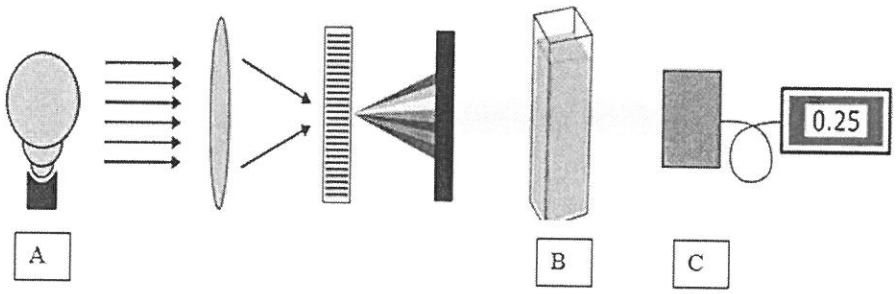

Figure 2(b) / *Rajah 2(b)*

[6 marks]
[*6 markah*]

(c) Carbon dioxide (CO_2) compound is irradiated with infrared light and the absorption spectrum range of stretching vibration at wavenumber is at 4220 cm^{-1}.

(Given: Planck's constant = 6.626 x10^{-34} J.s, The speed of light = 3.0 x 10^8 m/s)
Sebatian Karbon dioksida disinari dengan cahaya inframerah dan julat spektrum penyerapan regangan pada getaran nombor gelombang pada 4220 cm^{-1}.
(Diberi: pemalar Planck's = 6.626 x10^{-34} J.s, Kelajuan cahaya = 3.0 x 10^8 m/s)

CLO 3

i. Sketch Carbon dioxide compound in the situation of Symmetric and Asymmetric Stretching vibration when irradiated with infrared light.
Lakarkan sebatian Karbon dioksida dalam keadaan Simetrik dan Asimetrik getaran regangan apabila disinari dengan cahaya inframerah.

[6 marks]
[*6 markah*]

CLO 3

ii. Calculate the wavelength and frequency of the infrared radiation in a meter unit.
Kirakan panjang gelombang dan frekuensi bagi radiasi inframerah tersebut dalam unit meter.

[6 marks]
[*6 markah*]

CLO 3

iii. Calculate the energy of the infrared radiation
Kirakan tenaga bagi radiasi inframerah tersebut.

[4 marks]
[*4 markah*]

QUESTION 3

SOALAN 3

CLO 1 (a) Name **THREE (3)** types of detectors used in High-Performance Liquid Chromatography (HPLC).

*Namakan **TIGA (3)** jenis pengesan yang digunakan dalam Kromatografi Cecair Bertekanan Tinggi (HPLC).*

[3 marks]

[*3 markah*]

CLO 2 (b) Explain the relationship between the polarity of the stationary phase and elution times for Reverse Phase Chromatography of components A, B and C with the aid of a diagram. Given the polarity of the component A>B>C.

Terangkan hubungan antara tahap kepolaran komponen dan masa elusi bagi Kromatografi Fasa Berbalik dengan bantuan gambarajah. Diberi polariti komponen adalah A>B>C.

[6 marks]

[*6 markah*]

(c) A group of students needed to prepare a stock solution of 6% v/v acetic acid in 2L solution using Gas Chromatography. Table 3 (c) shows the reading of the result of a standard solution of acetic acid.

Satu kumpulan pelajar perlu menyediakan larutan stok asid asetik 6% v/v sebanyak 2L dengan menggunakan Kromatografi Gas. Jadual 3(c) menunjukkan bacaan keputusan larutan piawai asid asetik.

Table 3 (c) / *Jadual 3(c)*

Standard solution concentration (%) *Kepekatan larutan piawai*	Peak area *Luas puncak*
0.2	8548
0.4	13026
0.6	19680
0.8	26252
1.0	30548

CLO 3

i. Calculate the volume needed from stock solution to prepare a dilution series of standard 0.4% and 0.8% with 5 ml solution volume.
Kirakan jumlah isipadu yang diperlukan dari larutan stok untuk menyediakan siri pencairan piawai 0.4% dan 0.8% dengan isipadu larutan 5 ml.

[6 marks]
[*6 markah*]

CLO 3

ii Plot the calibration curve graph using the data in Table 3(c) on graph paper.
Plotkan graf lengkung kalibrasi berdasarkan data di Jadual 3(c) di atas kertas graf.

[8 marks]
[*8 markah*]

CLO 3

iii. From the graph plotted at 3(c) ii, show the value of concentration reading of acetic acid in the sample if the peak area is 24000 mAU.s
Daripada graf yang diplot di 3(c)ii, dapatkan nilai kepekatan bacaan asid asetik dalam sampel jika luas puncak 24000 mAU.s

[2 marks]
[*2 markah*]

QUESTION 4

SOALAN 4

CLO 1 (a) List **FIVE** types of contaminants that may present in untreated water.
*Senaraikan **LIMA** jenis bahan pencemar yang mungkin ada di dalam air yang tidak dirawat.*

[5 marks]
[*5 markah*]

CLO 2 (b) Compare **THREE (3)** characteristics of water quality parameters of Biological Oxygen Demand and Chemical Oxygen Demand.
*Bandingkan **TIGA (3)** sifat ukuran kualiti air bagi Keperluan Oksigen Biokimia dan Keperluan Oksigen Kimia.*

[6 marks]
[*6 markah*]

(c) The locations of Lake A and B are located near a food court. It is found that, the waste from the food court is thrown into the lake.
Tasik A dan B terletak berhampiran kawasan medan selera dan didapati banyak sisa makanan ditemui di dalam tasik tersebut.

CLO 3 i. From the situation given, predict **ONE (1)** impact of the dissolved oxygen level to the aquatic life in the lake.
*Daripada situasi yang diberi, jangkakan **SATU (1)** kesan kepada tahap oksigen terlarut kepada hidupan di dalam air tasik.*

[2 marks]
[*2 markah*]

CLO 3

ii. Table 4(c)i shows the results of the water analysis test for Dissolved Oxygen on the 1st day and the 5th day for the lake water. Calculate the value of Biochemical Oxygen Demand (BOD) for all the samples.
Jadual 4(c)i *menunjukkan keputusan ujian analisis air untuk Oksigen Terlarut pada hari pertama dan hari ke lima untuk kedua-dua air tasik tersebut. Kirakan nilai keperluan oksigen biokimia (BOD) untuk ke semua sampel.*

Table 4(c)i / *Jadual 4(c)i*

Sources of water *Sumber air*	Dissolved Oxygen (mg/L) Day 1	Dissolved Oxygen (mg/L) Day 5
Lake water A *Air tasik A*	11.3	9.5
Lake Water B *Air Tasik B*	35.6	30.6

[6 marks]
[*6 markah*]

CLO 3

iii. From the BOD results calculated in question 4(c)ii, predict **TWO (2)** activities that can be carried out by referring to Table 4(c)ii and Table 4(c)iii.
Berdasarkan keputusan ujian BOD di 4(c)ii, jangkakan ***DUA (2)*** *aktiviti yang boleh dijalankan berpandukan Jadual 4(c)ii dan Jadual 4(c)iii.*

Table 4(c)ii / *Jadual 4(c)ii*

parameter	Class				
	Class I	Class II	Class III	Class IV	Class V
BOD	<0.1	1-3	3-6	6-12	>12

Table 4(c)iii / *Jadual 4(c)iii*

Quality class	Description and treatment process
Class I	Conservation of natural environment. Water supply I – Practically no treatment necessary (except by disinfection or boiling only). Fishery I- Very sensitive aquatic species.
Class II	Water supply II – Conventional treatment required. Fishery II – Sensitive aquatic species
Class III	Water supply III – Extensive treatment required. Fishery III – Common of economic value and tolerant species; livestock drinking
Class IV	Irrigation
Class V	None of the above

[6 marks]

[*6 markah*]

SOALAN TAMAT