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UNIVERSITI SAINS MALAYSIA

First Semester Examination  
2009/2010 Academic Session

November 2009

**IMG 203 – Chemical Analysis of Food**  
*[Analisis Kimia Makanan]*

Duration: 3 hours  
*[Masa: 3 jam]*

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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** (5) questions. **Section A** is **COMPULSORY** to answer. You may answer the questions either in Bahasa Malaysia or in English.

**Arahan:** Jawab **LIMA** (5) soalan. **Bahagian A** adalah **WAJIB** dijawab. 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.]*

**SECTION A: This question is COMPULSORY to answer**

1. Answer both parts of this question

- (a) In determination of moisture content in a yogurt sample, the following triplicate data was obtained and given (Table 1):

Table 1: Analysis data of moisture content determination in yogurt

	Sample 1	Sample 2	Sample 3
Weight of crucible + cover (g)	50.3951	61.3608	52.3608
Weight of crucible + cover + sample (g)	52.4897	63.4493	54.3973
Weight of crucible + cover + dry sample (g)	50.8130	61.7701	52.7505

- (i) Calculate the moisture content  
(ii) Calculate the standard deviation of analysis

(note: marks are given for calculation steps)

(4 marks)

- (b) Five grams pineapple peel waste was blended with an amount of water. The final volume of this extract was 50 mL. Diluted extract sample was subjected to reducing sugar determination using DNS method. Based on the data given (Table 2 and 3), answer the following questions.

Table 2: Absorbance readings of standard glucose solution

Concentration of glucose standard (mg/mL)	Absorbance (540nm)
0.0 (Blank)	0.000
0.2	0.145
0.4	0.295
0.6	0.440
0.8	0.585
1.0	0.730

Table 3: Absorbance readings of pineapple waste extracts

Sample replicate	Absorbance (540 nm)
1	0.392
2	0.392
3	0.400

- (i) Plot a graph of absorbance readings against standard glucose concentrations
- (ii) Calculate the slope value of the standard curve
- (iii) Calculate the concentration of reducing sugar in pineapple waste sample
- (iv) Calculate the standard deviation of analysis

(note: marks are given for calculations steps)

(16 marks)

**SECTION B: Answer four (4) questions.**

2. Answer both parts of this question

- (a) Describe the factors that can affect sample preparation for moisture determination.

(10 marks)

- (b) What are the practical considerations to obtain accurate and precise determination of moisture content in food samples by any method?

(10 marks)

3. State the differences between the following items.

- (a) Karl Fisher titration vs. distillation moisture method
- (b) Total soluble fibre vs total insoluble fibre
- (c) Wiley melting point vs iodine value
- (d) Smoke point vs fire point
- (e) Soxhlet extraction vs Bligh and Dyer extraction

(20 marks)

4. Answer all parts of this question

(a) What are the factors affecting Kjeldahl results?

(4 marks)

(b) State three (3) types of sample degradation that can occur during moisture analysis that can effect the outcome of the results for the moisture content in sample. Briefly describe how or what method can be used to inhibit these degradation reactions.

(6 marks)

(c) What is the purpose of 2,6-dichloroindophenol in ascorbic acid analysis?

(2 marks)

(d) Explain the chemical basis of the Lowry method and Bradford method that can be used to quantitate proteins.

(8 marks)

5. Describe a method for the analysis of total sugar content in fruit samples. Include the sample preparation and extraction procedures to remove the impurities in order to obtain an aqueous sugar extract. State any possible interferences in this analysis and how they can be overcome.

(20 marks)

6. Discuss the difference between Majonnier and Babcock fat extraction method. These methods are suitable for what types of samples? Discuss.

(20 marks)

7. Answer all parts of this question

(a) Name one test method to obtain the following information.

- (i) Degree of unsaturation
- (ii) Predicted susceptibility to oxidative rancidity
- (iii) Average fatty acid molecular weight
- (iv) Present status with regard to oxidative rancidity
- (v) Hydrolytic Rancidity

(5 marks)

- (b) Define solid fat content and explain the usefulness of solid fat content determinations.

(8 marks)

- (c) You need to analyze a lime flavored sports drink for total carbohydrate using the phenol sulfuric acid method. What precautions would you take to ensure the analysis is performed correctly?

(7 marks)

8. Answer both parts of this question

- (a) What is the difference between the AOAC Munsen-Walker method and the AOAC Lane-Eynon method in determination of reducing sugars?

(10 marks)

- (b) What are the three major methods to determine the fiber content of foods? Compare these three methods for what they each can measure and what they cannot.

(10 marks)

**BAHAGIAN A: Soalan ini WAJIB dijawab**

1. Jawab kedua-dua bahagian soalan ini

- (a) Dalam penentuan kandungan lembapan di dalam satu sampel yogurt, data tripliket berikut diperolehi (Jadual 1):

*Jadual 1: Data analisis penentuan kandungan lembapan di dalam yogurt*

	<i>Sampel 1</i>	<i>Sampel 2</i>	<i>Sampel 3</i>
<i>Berat krusibel + penutup (g)</i>	<i>50.3951</i>	<i>61.3608</i>	<i>52.3608</i>
<i>Berat krusibel + penutup + sampel (g)</i>	<i>52.4897</i>	<i>63.4493</i>	<i>54.3973</i>
<i>Berat krusibel + penutup + sampel kering (g)</i>	<i>50.8130</i>	<i>61.7701</i>	<i>52.7505</i>

- (i) Kira kandungan lembapan  
(ii) Kira sisihan piawai analisis

(nota: markah diberi untuk langkah-langkah pengiraan)

(4 markah)

- (b) Lima gram sisa kulit nanas dikisar bersama sejumlah isipadu air. Isipadu akhir ekstrak ini ialah 50 mL. Sampel ekstrak yang dicair dilakukan penentuan gula penurun menurut kaedah DNS. Berdasarkan data yang diberi (Jadual 2 dan 3), jawab soalan berikut.

*Jadual 2: Bacaan absorbans larutan piawai glukosa*

<i>Kepekatan larutan glukosa (mg/mL)</i>	<i>Absorbans (540nm)</i>
<i>0.0 (Blank)</i>	<i>0.000</i>
<i>0.2</i>	<i>0.145</i>
<i>0.4</i>	<i>0.295</i>
<i>0.6</i>	<i>0.440</i>
<i>0.8</i>	<i>0.585</i>
<i>1.0</i>	<i>0.730</i>

*Jadual 3: Bacaan absorbans ekstrak sisa nanas*

<b>Replikat sampel</b>	<b>Absorbans (540 nm)</b>
1	0.392
2	0.392
3	0.400

- (i) *Plot graf bacaan absorbans melawat kepekatan piawai glukosa*
  - (ii) *Kira kecerunan graf piawai tersebut*
  - (iii) *Kira kepekatan gula penurun di dalam sampel sisa nanas*
  - (iv) *Kira sisihan piawai analisis*
- (nota: markah diberi untuk langkah-langkah pengiraan)*

*(16 markah)*

**BAHAGIAN B: Jawab empat (4) soalan.**

2. *Jawab kedua-dua bahagian soalan ini.*

- (a) *Bincangkan faktor-faktor yang boleh memberi kesan kepada penyediaan sampel untuk penentuan kelembapan.*

*(10 markah)*

- (b) *Apakah pertimbangan praktikal untuk mendapatkan penentuan yang tepat dan jitu kandungan lembapan dalam sampel makanan dengan mana-mana kaedah?*

*(10 markah)*

3. *Nyatakan perbezaan diantara kenyataan berikut.*

- (a) *Pentitratan Karl Fischer dan kaedah penyulingan lembapan*
- (b) *Gentian larut total dan gentian tak larut total*
- (c) *Titik pencairan 'Wiley' dan nilai iodine*
- (d) *Titik asap dan titik api*
- (e) *Pengekstrakan 'Soxhlet' dan pengestrakan 'Bligh and Dyer'*

*(20 markah)*

4. *Jawab semua bahagian soalan ini.*

(a) *Apakah faktor-faktor yang mempengaruhi keputusan Kjeldahl?*

*(4 markah)*

(b) *Nyatakan tiga(3) degradasi sampel yang boleh berlaku semasa analisis lembapan yang mungkin memberi kesan kepada keputusan kandungan lembapan dalam sampel. Terangkan secara ringkas bagaimana atau kaedah apa yang boleh diguna bagi menghalang tindakbalas degradasi tersebut.*

*(6 markah)*

(c) *Apakah kegunaan 2,6-dichloroindophenol dalam analisis asid askorbik?*

*(2 markah)*

(d) *Terangkan asas kimia bagi kaedah Lowry dan kaedah Bradford yang boleh diguna untuk menentukan protein.*

*(8 markah)*

5. *Bincangkan satu kaedah analisis kandungan gula di dalam sampel buah. Berikan juga prosedur penyediaan dan pengestrakan sampel untuk menyingkirkan bendaasing bagi mendapatkan suatu ekstrak gula. Nyatakan gangguan yang mungkin terdapat dalam analisis ini dan bagaimana untuk mengatasinya.*

*(20 markah)*

6. *Bincangkan perbezaan di antara kaedah pengestrakan lemak Majonnier dan Babcock. Kaedah-kaedah ini adalah sesuai untuk apa jenis sampel? Bincangkan.*

*(20 markah)*

7. *Jawab semua bahagian soalan ini.*

(a) *Namakan satu keadah ujikaji untuk mendapatkan maklumat berikut.*

*(i) Tahap ketaktepuan*

*(ii) Kecenderungan yang dijangka terhadap ketengikan oksidatif*

*(iii) Purata berat molekul asid lemak*

*(iv) Status kini berkaitan dengan ketengikan oksidatif*

*(v) Ketengikan hidrolitik*

*(5 markah)*



(b) *Beri definisi kandungan lemak pepejal dan terangkan kegunaan dan kepentingan penentuan kandungan lemak pepejal.*

*(8 markah)*

(c) *Anda perlu analisa minuman sukan berperisa limau purut untuk kandungan karbohidrat total dengan kaedah fenol-asid sulfurik. Apakah langkah berjaga-jaga yang anda patut ambil untuk memastikan analisis dilakukan dengan betul.*

*(7 markah)*

8. *Jawab kedua-dua bahagian soalan ini.*

(a) *Apakah perbezaan di antara kaedah AOAC Munsen-Walker dan kaedah AOAC Lane-Eynon dalam penentuan gula penurunan?*

*(10 markah)*

(b) *Apakah tiga (3) kaedah utama untuk penentuan kandungan gentian dalam makanan? Bandingkan ketiga-tiga kaedah ini dari segi apa yang boleh diukur dan yang tidak boleh diukur.*

*(10 markah)*