
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2009/2010

April/May 2010

IMG 103 – Food Chemistry
[Kimia Makanan]

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 any **FOUR (4)** out of five questions. You may answer the question either in Bahasa Malaysia or in English.

Arahan: *Jawab mana-mana **EMPAT (4)** daripada lima soalan. Anda dibenarkan menjawab soalan sama ada [untuk KBI] 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].

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1. Answer all parts of this question.

- (a) What is solid fat index? With a suitable example, explain how it is useful in food industry. (5 marks)
- (b) Explain polymorphism in fats. (5 marks)
- (c) Explain the formation and properties of β' crystals. (6 marks)
- (d) Explain the differences between hydrolytic rancidity and oxidative rancidity of fat. (4 marks)
- (e) What are the factors affecting the melting point of fatty acids? (5 marks)

2. Answer all parts of this question.

- (a) Describe three (3) ways to minimize Maillard reaction and their effectiveness in foods. (8 marks)
- (b) List the biological source of
 - (i) Gelatin
 - (ii) Xanthan gum
 - (iii) Carrageenan
 - (iv) Pectin(4 marks)
- (c) Define anomer and explain why glucose exists as two anomers. (4 marks)
- (d) Describe the two stages of starch gelatinization, and explain retrogradation and syneresis then occur. (9 marks)

3. Answer all parts of this question.
- (a) Explain the biochemical basis for the colour of meat changing from purplish red to bright red to brownish-red during preparation and storage. (10 marks)
 - (b) List the various plant pigments and describe any TWO. (10 marks)
 - (c) Briefly describe the properties of biotin. (5 marks)
4. Answer all parts of this question.
- (a) Comment on the following statement:
“Water molecule shows unusual properties as compared to other hydrogen containing compounds that present in the same group in Periodic Table, such as H₂S, H₂Se and H₂Te.” (5 marks)
 - (b) Define water activity and explain how water activity is related to the water vapour pressure. (10 marks)
 - (c) Briefly describe factors influencing water activity of food. (10 marks)
5. Answer all parts of this question.
- (a) Explain how tertiary and quaternary structure of protein are stabilized. (10 marks)
 - (b) Briefly describe functional properties of protein in the following foods:
 - (i) Sausage
 - (ii) Baked goods
 - (iii) Soup and Gravies
 - (iv) Beverages(10 marks)
 - (c) Classified amino acids based on their polarity with suitable examples. (5 marks)

1. Jawab semua bahagian soalan ini.

- (a) Apakah yang dimaksud dengan indeks lemak pepejal? Dengan contoh yang sesuai, terangkan bagaimana ianya berguna dalam industri makanan. (5 markah)
- (b) Terangkan polimorfisma dalam lemak. (5 markah)
- (c) Terangkan pembentukan dan sifat-sifat hablur β' . (6 markah)
- (d) Terangkan perbezaan antara ketengikan hidrolitik dan ketengikan oksidatif. (4 markah)
- (e) Apakah faktor-faktor yang mempengaruhi takat lebur asid lemak? (5 markah)

2. Jawab semua bahagian soalan ini.

- (a) Terangkan tiga (3) cara untuk mengurangkan tindakbalas Maillard dan keberkesanannya dalam makanan. (8 markah)
- (b) Senaraikan sumber biologi bagi berikut:
 - (i) Gelatin
 - (ii) Gam Xanthan
 - (iii) Karagenan
 - (iv) Pektin(4 markah)
- (c) Berikan definisi anomer dan terangkan kenapa glukosa wujud sebagai dua anomer. (4 markah)
- (d) Terangkan dua peringkat gelatinisasi kanji, dan terangkan kenapa retrogradasi dan sineresis berlaku. (9 markah)

3. *Jawab semua bahagian soalan ini.*

(a) *Jelaskan asas biokimia perubahan warna dari merah ungu ke merah terang dan seterusnya merah perang semasa penyediaan dan penyimpanan daging.*
(10 markah)

(b) *Senaraikan pelbagai pigmen tumbuhan dan huraikan mana-mana DUA.*
(10 markah)

(c) *Secara ringkas huraikan ciri-ciri biotin.*
(5 markah)

4. *Jawab semua bahagian soalan ini.*

(a) *Komen kenyataan berikut.*

“Molekul air adalah luar biasa apabila dibanding dengan sebatian lain yang mengandungi hidrogen yang hadir dalam kumpulan yang sama dalam Jadual Berkala, seperti H_2S , H_2Se dan H_2Te .”

(5 markah)

(b) *Takrifkan aktiviti air dan jelaskan bagaimana aktiviti air dihubungkait dengan tekanan wap air.*

(10 markah)

(c) *Huraikan secara ringkas faktor-faktor yang mempengaruhi aktiviti air makanan.*

(10 markah)

5. *Jawab semua bahagian soalan ini.*

(a) *Jelaskan bagaimana struktur ketiga dan keempat protein boleh distabilkan.*
(10 markah)

(b) *Secara ringkas huraikan sifat berfungsi protein yang berperanan dalam makanan berikut:*

(i) *Sausage*

(ii) *Baked good*

(iii) *Soup and Gravies*

(iv) *Beverages*

(10 markah)

(c) *Kelaskan asid-asid amino berasaskan kepolaran dengan memberi contoh yang sesuai.*

(5 markah)

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