UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2006/2007

April 2007

KIE 356E – Food and Palm Oil Chemistry
[Kimia Makanan dan Minyak Sawit]

Duration : 3 hours
[Masa : 3 jam]

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

Answer **FIVE** questions. Only the first five questions answered by the candidate will be marked. You may answer a question either in Bahasa Malaysia or in English.

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1. Refer to the following parameters of the three different oils below:

Parameter	Oil-A	Oil-B	Oil-C
Saturation (%)	80	20	50
Moisture (%)	0.25	0.02	0.10
P.V.	10.0	2.0	0.5
A.V.	5.0	2.0	20.0

a) Arrange the oils in ascending order of Iodine Value.

(3 marks)

b) Discuss the effect of different levels of moisture content on the quality of the oils.

(7 marks)

c) Discuss the state of oxidation of the above oils.

(10 marks)

2. a) Explain the formation of ALL the primary oxidation products (including their geometric isomers) of methyl linoleate ($C_{18:2}$) when it undergoes autoxidation.

(12 marks)

b) Discuss the cause of rancidity in oils.

(8 marks)

3. a) Phenolic antioxidants and citric acid are synergistic antioxidants. Discuss.

(10 marks)

a) β-Carotene is used as food colour, pro-vitamin A, and antioxidant. Discuss.

(10 marks)

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4. a) Discuss the advantages and disadvantages of physical and chemical refining of crude palm oil.

(10 marks)

b) Discuss how chemical modifications of starch and cellulose have enhanced their usage.

(10 marks)

5. a) Give three different types of food additives and explain how they improve food quality.

(12 marks)

b) Explain what is protein denaturation.

(8 marks)

6. Discuss the chemical changes of a polyunsaturated oil during the following processes:

a) Catalytic hydrogenation.
b) Deep frying.
c) Interesterification.

(20 marks)

7. a) Transition metal ions are detrimental to quality of food containing oil. Explain.

(8 marks)

b) Discuss the precautions you need to observe in the determination of the following quality parameters:

(i) Iodine Value
(ii) Free fatty acid content
(iii) Fatty acid composition
(iv) Cloud point

(12 marks)

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1. Merujuk kepada parameter yang berikut bagi tiga minyak di bawah:

Parameter	Minyak-A	Minyak-B	Minyak-C
Ketepuan (%)	80	20	50
Kelembapan (%)	0.25	0.02	0.10
P.V.	10.0	2.0	0.5
A.V.	5.0	2.0	20.0

a) Susunkan mengikut Nilai Iodin yang meningkat bagi minyak-minyak di atas.

(3 markah)

b) Bincangkan kesan perbezaan paras kandungan kelembapan terhadap mutu minyak di atas.

(7 markah)

c) Bincangkan keadaan pengoksidaan bagi minyak-minyak tersebut di atas.

(10 markah)

2. a) Terangkan pembentukan SEMUA hasil pengoksidaan primer (termasuk isomer geometriknya) bagi metil linoleat ($C_{18:2}$) apabila ia mengalami pengautoksidaan.

(12 markah)

b) Bincangkan punca ketengitan dalam minyak.

(8 markah)

3. a) Pengantioksida jenis fenol dan asid sitrik bertindak secara sinergi. Bincangkan.

(10 markah)

b) β-Karoten diguna sebagai pewarna makanan, pro-vitamin A, dan pengantioksida. Bincangkan.

(10 markah)

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4. a) Bincangkan kelebihan & kelemahan pemprosesan minyak sawit mentah secara fizik dan kimia.

(10 markah)

b) Bincangkan bagaimana modifikasi kimia terhadap kanji dan selulosa telah memperluaskan penggunaannya.

(10 markah)

5. a) Berikan tiga jenis aditif makanan yang berlainan dan terangkan bagaimana ia meningkatkan mutu makanan.

(12 markah)

b) Terangkan apakah pendenaturan protein.

(8 markah)

6. Bincangkan perubahan kimia terhadap suatu minyak politaktepu semasa proses yang berikut:

a) Penghidrogenan bermangkin.
b) Menggoreng.
c) Interesterifikasi.

(20 markah)

7. a) Ion logam peralihan merosotkan mutu makanan yang mengandungi minyak. Terangkan.

(8 markah)

b) Bincangkan langkah-langkah pengawasan yang anda perlu beri perhatian dalam penentuan parameter mutu yang berikut:

(i) Nilai Iodin
(ii) Kandungan asid lemak bebas
(iii) Komposisi asid lemak
(iv) Titik awan

(12 markah)

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