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UNIVERSITI SAINS MALAYSIA

Second Semester Examination  
Academic Session 2007/2008

April 2008

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

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

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Please check that this examination paper consists of **TEN** printed pages before you begin the examination.

**Instructions:-**

Answer **FIVE** (5) questions.

Answer each question on a new page.

You may answer either in Bahasa Malaysia or in English.

If a candidate answers more than five questions, only the answers to the first five questions in the answer sheet will be graded.

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Answer FIVE (5) questions.

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

Parameter	Oil-A	Oil-B	Oil-C
Unsaturation (%)	80	20	50
Moisture (%)	0.02	0.50	0.10
FFA (%)	0.08	5.0	0.50
P.V.	10.0	2.0	0.5
A.V.	5.0	2.0	5.0

- a) Describe briefly how you would obtain the degree of unsaturation of an edible oil using the gas liquid chromatography technique.

(5 marks)

- b) Discuss and compare the chemical changes during frying of Oil-A and Oil-B.

(10 marks)

- c) In your opinion, which oil is the most suitable for frying? Give reasons.

(5 marks)

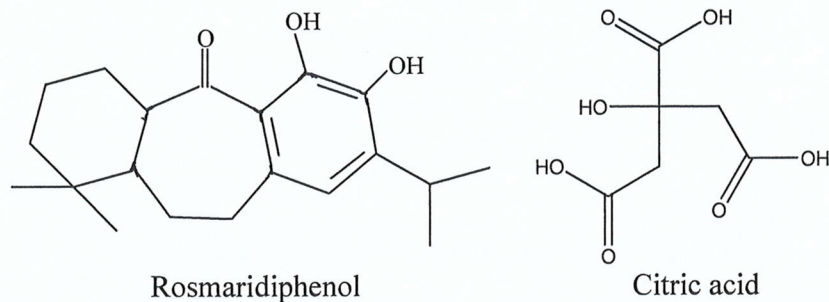
2. a) Explain how you would differentiate thermal oxidation and photo-oxidation. Show the mechanisms. You may use methyl oleate as an example.

(12 marks)

- b) Measurements at  $UV_{235}$  and  $UV_{269}$  of an oxidised oil correlate well with its Peroxide Value and Anisidine Value. Discuss.

(8 marks)

3. a) Rosmaridiphenol and citric acid are used as antioxidants in food. Discuss their mechanistic actions.



(10 marks)

- a)  $\beta$ -Carotene is used as a food additive, discuss its various functions.

(10 marks)

4. a) Metal ions like  $\text{Fe}^{2+}$  and  $\text{Cu}^+$  are detrimental to the quality of food containing fats. Explain.

(10 marks)

- b) Discuss two chemical modifications of starch that would enhance its usage.

(10 marks)

5. a) *Cis-trans* isomerisation occurs during oxidation and hydrogenation of an unsaturated fatty acid. Show the mechanisms. You may use any unsaturated fatty acid as an example.

(12 marks)

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

- i. Iodine Value
- ii. Free fatty acid content
- iii. Peroxide Value
- iv. Cloud point

(8 marks)

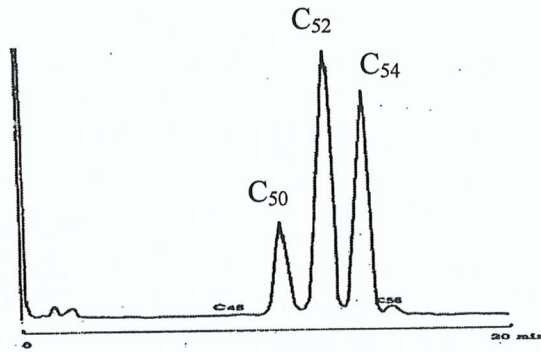
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6. Write short notes on any FOUR of the following topics:

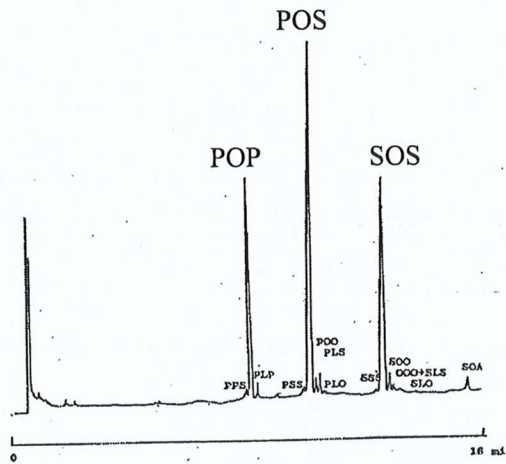
- a) Protein denaturation
- b) Food additives
- c) Cocoa butter substitute
- d) Food rancidity
- e) Induction Period

(20 marks)

7. Refer to the three gas liquid chromatograms A, B and C below:



Chromatogram A: Triglyceride composition by Carbon Number of an unknown fat



Chromatogram B: Triglyceride composition of a cocoa butter sample

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