UNIVERSITI SAINS MALAYSIA

First Semester Examination
2010/2011 Academic Session

November 2010

IMK 209 – PHYSICAL PROPERTIES OF FOOD
[SIFAT-SIFAT FIZIKAL MAKANAN]

Duration: 2 hours
[Masa: 2 jam]

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

[Sila pastikan bahawa kertas peperiksaan ini mengandungi DUA PULUH SATU muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions: Answer FOUR questions. Section A (Compulsory) question sheet will be collected together with the OMR form 1 hour after examination starts. You may answer the questions either in Bahasa Malaysia or in English.

[Arahan: *Jawab EMPAT soalan. Soalan Bahagian A (Wajib) akan dipungut bersama jawapan OMR selepas 1 jam peperiksaan bermula. 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 B
Answer THREE questions.

2. Answer all parts of this question.

(a) "There is no fundamental difference between liquids and solids – it is a matter of time scale". Explain briefly this statement using the concept of Deborah number.

(5 marks)

(b) Discuss the types of rheological (flow) behaviour that would be desirable in the following processes: Coating liquid chocolate on a cake, spray drying of milk, dispensing and forming a conical shape of Hershey chocolate.

(10 marks)

(c) Discuss the phenomena of "die swelling" in extrusion of expanded snack food in relation to viscoelastic properties.

(5 marks)

(d) Figure 1 shows a texture profile analysis for a jelly bear. The sample was compressed to 75% strain. Describe the textural properties of the jelly bear qualitatively. (5 marks)

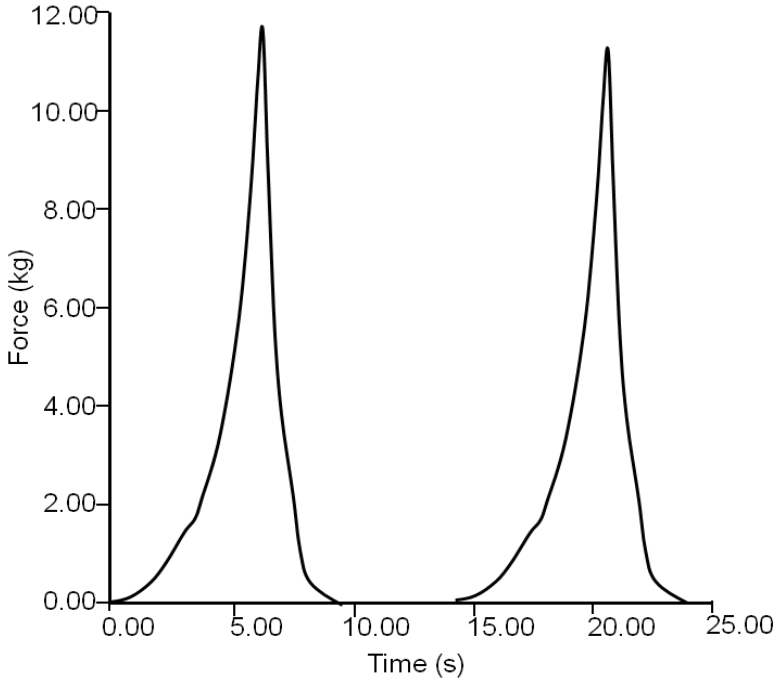

Figure 1. Texture profile analysis of jelly bear

3. Answer all parts of this question.

   (a) "Food colloids such as ice cream are a complex emulsion/foam system and often contain additional components in different phases". Briefly explain this statement.

   (8 marks)

   (b) Compare and contrast between emulsifier and stabilizer with respect to their properties and stabilization mechanism of emulsion.

   (7 marks)

   (c) For protein-stabilized emulsion, discuss the effect of pH and ionic strength on emulsion stability?

   (10 marks)

4. Answer all parts of this question.

   (a) By giving appropriate examples, explain how polymorphic transformation of fat crystals affects the physical properties of dark chocolate.

   (5 marks)

   (b) Discuss the various driving forces that drive and control the rate of nucleation during the initial stage of crystallization. Explain how the manipulation of the driving forces can be utilized to control the crystal size.

   (15 marks)

   (c) Addition of hydrocolloid such as carrageenan in ice cream mix will reduce the rate of nucleation. Why?

   (5 marks)

5. Answer all parts of this question.

   (a) List five (5) characteristics of a rubbery food material.

   (5 marks)

   (b) With the aid of state diagram, show and explain the path of a hard candy processing. Why is the glassy state desirable for hard candies?

   (10 marks)

   (c) Discuss the concept of water plasticization with respect to stickiness, caking and agglomeration of food powders. Explain ways to mitigate the problems.

   (10 marks)

BAHAGIAN B
Jawab TIGA soalan.

2. Jawab semua bahagian soalan berikut.

(a) "Tiada perbezaan asas di antara cecair dan pepejal – ia bergantung kepada skala masa". Terangkan secara ringkas kenyataan ini dengan menggunakan konsep nombor Deborah.

(5 markah)

(b) Bincangkan jenis kelakuan reologi (alir) yang diingini bagi proses berikut: menyalut kek dengan cecair coklat, pengeringan sembur susu, 'dispensing' dan membentuk bentuk kon coklat Hershey.

(10 markah)

(c) Bincangkan fenomena "pengembangan dai" dalam pengekstrudan makanan snek terkembang dan kaitannya dengan sifat viskoelastik.

(5 markah)

(d) Rajah 1 menunjukkan analisis profil tekstur bagi "jelly bear". Sampel telah dimampatkan sehingga 75% strain. Terangkan sifat tekstur "jelly bear" secara kualitatif.

(5 markah)

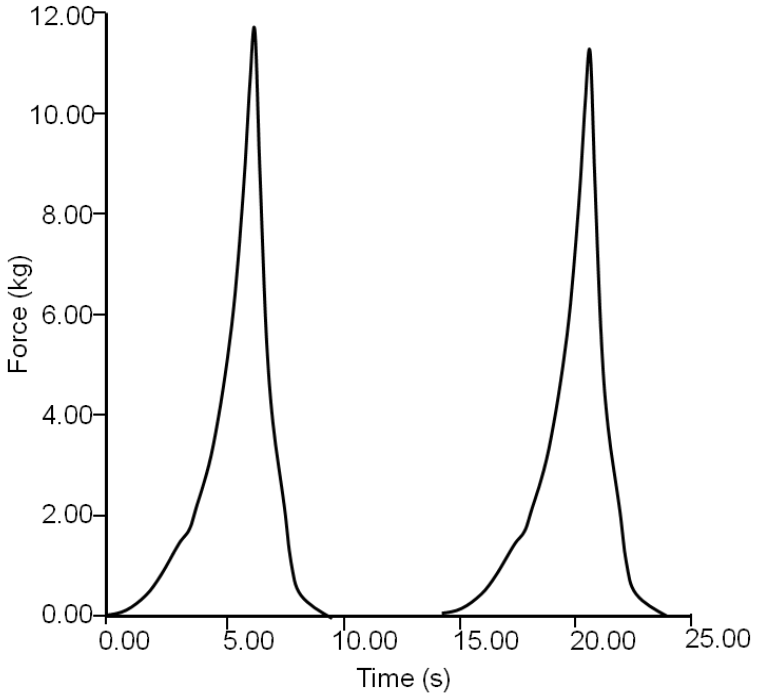

Figure 1. Texture profile analysis of jelly bear

3. Jawab semua bahagian soalan berikut.

(a) "Koloid makanan seperti ais krim adalah sistem emulsi/busa yang kompleks dan sering mengandungi komponen tambahan dalam fasa yang berlainan". Terangkan secara ringkas kenyataan ini.

(8 markah)

(b) Bandingkan dan bezakan antara pengemulsi dan penstabil dari segi mekanisme penstabilan emulsi.

(7 markah)

(c) Bagi emulsi yang distabilkan oleh protein, bincangkan pengaruh pH dan kekuatan ionik terhadap kestabilan emulsi.

(10 markah)

4. Jawab semua bahagian soalan berikut.

(a) Dengan memberi contoh yang sesuai, terangkan bagaimana transformasi polimorfik hablur lemak mempengaruhi sifat fizikal coklat gelap.

(5 markah)

(b) Bincangkan pelbagai daya penggerak yang menggerakkan dan mengawal kadar nukleasi semasa peringkat awal penghabluran. Terangkan bagaimana manipulasi daya penggerak boleh digunakan untuk mengawal saiz hablur.

(15 markah)

(c) Penambahan hidrokoloid seperti carrageenan ke dalam ais krim akan mengurangkan kadar nukelasi. Mengapa?

(5 markah)

5. Jawab semua bahagian soalan berikut.

(a) Senaraikan tiga (5) ciri-ciri bahan makanan dalam keadaan bergetah.

(5 markah)

(b) Dengan bantuan rajah keadaan, tunjukkan dan terangkan "path' bagi pemprosesan kandi keras. Mengapakah keadaan berkaca diingini bagi kandi keras?

(10 markah)

(c) Bincangkan konsep pemplastikan air dan kaitannya dengan kelekitan, pengkekan dan pengumpalan serbuk makanan. Terangkan kaedah bagi mengatasi masalah ini.

(10 markah)

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