

Name: _____ Student ID _____

**Prince of Songkla University
Faculty of Engineering**

Exam: Mid Term, Semester I

Academic Year: 2007 – 2008

Date: July 30, 2007

Time: 9:00 – 12:00 PM

**Subject: 230-591 - Special Topic
(Food Unit Operations)**

Room: Robot

ทฤษฎีในการสอบโทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทฤษฎี และพักการเรียน 1 ภาคการศึกษา

Instructions: This is a Closed Book exam consisting of 8 pages (not including the cover sheet). The points for each problem are not distributed evenly. Place your name and the student ID number on every page. Students are allowed to use only a pen or pencil and a calculator.

Points Distribution (For Grader Only)		
Part	Points Value	Score
1	20	
2	46	
3	20	
4	12	
5	32	
6	30	
7	20	
Total	180	

**Exam prepared by
Ram Yamsaengsung
July 21, 2007**

**PLEASE CHECK TO MAKE SURE THAT
YOU HAVE ALL 8 PAGES OF THE EXAM BEFORE BEGINNING.
GOOD LUCK!**

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I. True and Faults (T/F) (15 points)

- 1. Fructose can be found in sugar beets and sugar cane.
- 2. Cornflakes, which have a water activity (a_w) of 0.10, will gain moisture in a 5% RH environment.
- 3. Gel formation is the result of junction zone formation.
- 4. Foam is gas dispersed in a liquid.
- 5. Tortilla chips are made from wheat flour and fried to produce a crispy snack product.
- 6. Maltose has a sweetness value of 0.3 and glucose has a sweetness value of 0.5.
- 7. Sucrose is the reference point of sweetness and has a value of 1.0.
- 8. Water activity is the ratio P_s/P_v .
- 9. Fats provide sensory characteristics of mouth feel, juiciness, and flavor.
- 10. Syneresis is the process in which water is squeezed from the gel as the starch begins to interact and the junction zone collapses.
- 11. Proteins and starches are polymers, which will be in a rubbery state above T_g and glassy state below T_g .
- 12. Amylose is in the form of linear chains and amylopectin is highly branched.
- 13. Corn starch can be converted into glucose using acid, heat, and enzyme (producing corn syrup).
- 14. Setback is the process in which the viscosity of the gelatinized starch paste is reduced.
- 15. Amylose contributes to the high viscosity of the starch paste and amylopectin contributes to the gelling property.
- 16. Enzymes are proteins that catalyze chemical reactions.
- 17. Pudding can be made by adding cold water to pre-gelatinized starch.
- 18. Corn starches can be converted into fructose using acid, heat, and enzymes.
- 19. Whey proteins, gelatin, and soy proteins can be manipulated to form yogurt, cottage cheese, gelatin desserts, and tofu.
- 20. Potato chips are fried to low moisture content and packed in N_2 environment to preserve freshness and increase the shelf-life.

II. Fill in the blanks (46 points)

1. The five basic components of food consist of: water, _____, _____, _____, and _____.
2. Starch gelatinization takes place in the presence of _____, _____, and _____.
3. Plants store their surplus energy in two forms: _____ and _____.
4. A solid dispersed in a liquid is called a _____ and gas dispersed in liquid is called a _____.
5. _____ are used to stabilize oil and fat dispersions.
6. _____ pasteurization (72°C for 16 sec) is used in cheese and milk processing.
7. During the _____ process, the viscosity of the starch paste decreases dramatically as the molecules begin to orient themselves in the direction that the system is being stirred.
8. _____, which is extensible, cohesive, and elastic, provides the key properties of dough for making bread.
9. The types of fluids that have yield stress are _____ and _____.
10. Applesauce, banana puree, and orange juice are examples of _____ fluid.
11. Cone/plate viscometer measures _____ when rotating at discrete speed and correlates the information to the shear stress.
12. Apparent viscosity is the _____ divided by the _____.
13. Shear-thickening fluid has a _____ greater than 1.
14. Toothpaste and tomato ketchup (paste) are examples of _____ fluids, while milk and honey are examples of _____ fluids.
15. Irreversible thixotropy is called _____.
16. Two examples of artificial sweeteners are _____ and _____.
17. Examples of sugar alcohols include _____, _____, and _____.
18. Starches in their natural form provide _____, _____, _____, and _____.
19. Dairy, meat, and _____ proteins can be used to emulsify fat and stabilize emulsions
20. The 2 types of strains are _____ strain and _____ strain.
21. During the study of starch gelatinization, the products that were studied included _____ and _____.
22. The 4 ingredients used to make Pancake during class were _____, _____, _____, _____.
23. The 3 reactions that took place during the making of pancake and apple topping were _____, _____, _____, and _____.

III. Give a brief explanation of the following reactions and give one example of a food product in which this reaction takes place. (20 points)

1. Maillard Browning -

2. Caramelization -

3. Gelatinization -

4. Lipid Oxidation -

5. Retrogradation –

IV. Answer the following questions based on your trips to Tesco Lotus, Hat Yai. (12 points)

(1) Name 4 brands of salty snacks. **(2 points)**

(2) Name 2 examples dessert snacks and 2 of its major ingredients. **(2 points)**

(3) Name 3 brands of ice cream and what is its most important ingredient. **(2 points)**

(4) Name 3 brands of soft drinks and what makes it sweet (do not use sugar).
(2 points)

(5) Name 4 types (plants) of cooking oil. **(2 points)**

(6) List 4 types of fresh fruits in their English names. **(2 points)**

V. Answer the following questions based on your trips to Tesco Lotus, Hat Yai. (32 points)

- (1) Name the 6 sections in which the Lotus Bakery is divided into. **(6 points)**

- (2) What is the top selling product at Lotus? What is the product that was being prepared for the weekend promotion? **(2 points)**

- (3) What does DC stand for and where is it located in Thailand? **(2 points)**

- (4) What is the average temperature and relative humidity used in making dough rise at the Lotus Bakery? **(2 points)**

- (5) What are the temperatures used to bake bread and frying doughnuts at the Lotus Bakery? **(2 points)**

- (6) What is the average temperature of the freezer at Lotus? Name one type of product stored in there. **(2 points)**

(7) Name the 7 processing steps required to make doughnuts. **(8 points)**

(8) What type of flour is used to make doughnuts? What type of oil is used to fry doughnuts? **(2 points)**

(9) Name 4 equipments required to make croissant. **(4 points)**

(10) Why must bread be cooled before slicing? Give 2 reasons. **(2 points)**

**VI. Answer the following questions about the Food Ingredients Presentation.
(30 points)**

(1) Name 8 products that were presented by you and your classmates in the Food Ingredients Presentation and the MAJOR ingredient in each (not including water).
(8 points)

(2) Give 2 advantages of using sugar alcohol. **(2 points)**

(3) For the ingredients presentation that your team gave in class, list the major ingredients and their functions? **(20 points)**

VII. Answer the following questions about the Food Rheology. (20 points)

1. Write down the equation for shear strain and define γ . (2 points)
2. Write down the equation for Hookean's Law and define each term. (4 points)
3. Experimental results with a concentric cylinder viscometer used for banana puree at 340 K were as followed:

Shear Rate [10⁻³ x 1/s]	Shear Stress [10⁻⁴ x Pa]
1.0	2.40
1.5	3.20
2.0	3.50
3.0	4.50
4.0	4.60
5.0	4.90
6.0	5.20
7.0	5.30

Assuming Power-Law behavior, determine the rheological parameters required to describe the product. (14 points)