

Name: _____ Student ID _____

**Prince of Songkla University
Faculty of Engineering**

**Exam: Mid Term, Semester II
Date: December 17, 2012
Subject: 230-560 - Food Unit Operations**

**Academic Year: 2012 – 2013
Time: 1:30 – 4:30 PM
Room: R201**

ทฤษฎีในการสอบโทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทฤษฎี และพักการเรียน 1 ภาคการศึกษา

Instructions: This is a Closed Book exam consisting of 11 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	35	
3	20	
4	15	
5	20	
6	40	
7	25	
8	15	
Total	190	

**Exam prepared by
Ram Yamsaengsung
December 10, 2013**

**PLEASE CHECK TO MAKE SURE THAT
YOU HAVE ALL 10 PAGES OF THE EXAM BEFORE BEGINNING.
GOOD LUCK!**

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I. True and Faults (T/F). If Faulty, make the statement True. (20 points)

- 1. Gel formation is the result of junction zone formation.
- 2. Pudding can be made by adding cold water to pre-gelatinized starch.
- 3. Proteins and starches are polymers, which will be in a glassy state above T_g and rubbery state below T_g.
- 4. Whey proteins, gelatin, and soy proteins can be manipulated to form yogurt, cottage cheese, gelatin desserts, and tofu.
- 5. Lactose has a sweetness value of 0.3 and maltose has a sweetness value of 0.7.
- 6. Emulsifiers are proteins that catalyze chemical reactions.
- 7. Retrogradation is the process in which water is squeezed from the gel as the starch begins to interact and the junction zone collapses.
- 8. Legumes include beans, peas, and lentils.
- 9. Water activity is the ratio P_v/P_s .
- 10. Gel is gas dispersed in a liquid.
- 11 Cornflakes, which have a water activity (a_w) of 0.10, will gain moisture in a 5% RH environment.
- 12. Amylopectin is in the form of linear chains and amylose is highly branched.
- 13. Potato chips are fried to low moisture content and packed in O₂ environment to preserve freshness and increase the shelf-life.
- 14. Starch is found in granules which have amorphous and crystalline regions.
- 15. Amylopectin contributes to the high viscosity of the starch paste and amylose contributes to the gelling property.
- 16. Corn starch can be converted into fructose using acid, heat, and enzyme (producing corn syrup).
- 17. Fructose can be found in sugar beets and sugar cane.
- 18. Glucose is the reference point of sweetness and has a value of 1.0.
- 19. Shear thinning is the process in which the viscosity of the gelatinized starch paste increases.
- 20. Proteins provide sensory characteristics of mouth feel, juiciness, and flavor.

II. Fill in the blanks (35 points)

1. The five basic components of food consist of: _____, _____, _____, _____, and _____.
2. Starch gelatinization takes place in the presence of _____, _____, and _____.
3. A solid dispersed in a liquid is called a _____ and gas dispersed in liquid is called a _____.
4. Shear-thickening fluid has a _____ greater than 1.
5. The types of fluids that have yield stress are _____ and _____.
6. The 2 types of strains _____ strain and _____ strain.
7. _____, which is extensible, cohesive, and elastic, provides the key properties of dough for making bread.
8. During the study of starch gelatinization, the products that were studied included _____, _____, _____ and _____.
9. 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.
10. Plants store their surplus energy in two forms: _____ and _____.
11. _____ pasteurization (72°C for 16 sec) is used in cheese and milk processing.
12. _____ are used to stabilize oil and fat dispersions.
13. Toothpaste and tomato ketchup (paste) are examples of _____ fluids, while milk and honey are examples of _____ fluids.
14. The process in which water seeps (releases) from the gel onto its surface is called _____ or _____.
15. Starches in their natural form provide _____, _____, _____, and _____.
16. In order to prevent water from seeping to the surfaces of gels, _____ is added.
17. Applesauce, banana puree, and orange juice are examples of _____ fluid.

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 trip to Tesco Lotus, Hat Yai. (15 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 (expensive) ingredient. **(2 points)**

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

(5) Name 6 types (plants) of cooking oil. **(3 points)**

(6) List 8 types of fresh fruits in their English names. **(4 points)**

V. For Chemical Engineering Students Only:

Answer the following questions about 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)

For Non-Chemical Engineering Students:

Answer the following questions in ENGLISH. (20 points)

1. Discuss which cooking method you think is the best for chicken wings and why. (10 points)

2. Describe how you made your pancake or crepe and what you would do differently to make it better the next time. (10 points)

VI. Answer the following questions about the Food Companies and Food Ingredients Presentations. (40 points)

(1) Name the 5 companies that were presented by you and your classmates and list 3 major products, type of products, or flavors of the products by each company. **20 points)**

(2) Answer the following questions. (20 points)

2.1 Which company founded Mama noodle? (1 point)

2.2 Give 3 examples of Spirits produced by ThaiBev? (3 point)

2.3 Which company produces Ruski, Bissin, and Green Mate? (1 point)

2.4 Fill in the following slogan, "Have a _____, Have a Kit Kat". (2 point)

2.5 Which company was founded in Chicago and has the slogan, "Every time you pop a lid, it's a grand opening"? (2 point)

2.6 Which company produces coffee, soft drink, fruit drinks, and seaweed snacks as part of its product line? (1 point)

2.7 Which product has the slogan, "Good Taste Together with Good Health"? (2 Point)

2.8 In 2010 (2553), 540 of these were eaten every second around the world? (2 points)

2.9 What company was founded in 1937 in Winston-Salem, North Carolina and uses a “Hot Now” sign in its stores? (2 points)

2.10 What company used the slogan, “Living the Values”? (2 points)

2.11 Which two foreign companies presented by your friends have store branches at Siam Paragon in Bangkok? (2 points)

**VII. Answer the following questions about Food Ingredients Presentations.
(25 points)**

(1) Name 5 products that were presented by you and your classmates in the Food Ingredients Presentation. List THREE MAJOR ingredient in each product (not including water). **Underline** the #1 ingredient in each product. **(15 points)**

(2) For the ingredients presentation that your team gave in class, list the major ingredients and their functions? **(10 points)**

VIII. Answer the following questions about the Food Rheology. (15 points)

1. Write the shear stress versus shear rate equations for the 5 types of time-independent fluids (Newtonian and Non-Newtonians) and write give the approximate value of its flow behavior index, consistency coefficient, and yield stress. **(10 points)**

General Equation:

Fluid	K	n	σ_0
Herschel-Bulkley			
Newtonian			
Shear-thinning (pseudoplastic)			
Shear-thickening (dilatant)			
Bingham plastic			

2. Draw the shear stress versus shear rate graphs for the 5 types of time-independent fluids (Newtonian and Non-Newtonians). (5 points)

Congratulations! End of Exam! Happy New Year's 2013!!!



Bonus: Where was the picture above taken (be specific)? (4 points)

Swensen's at Lee Garden