Prince of Songkla University
Faculty of Engineering

Exam: Mid Term, Semester II   **Academic Year: 2010 – 2011**
Date: December 20, 2010   **Time: 1:30 –4:30 PM**
Subject: 230-560 - Food Unit Operations   **Room: S817**

ทุจริตในการสอบโทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

Instructions: This is a Closed Book exam consisting of 10 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	45	
6	30	
Total	165	

Exam prepared by
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December 20, 2010

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 False (T/F) (20 points) If FALSE, make the statement TRUE.

___ 1. Legumes include beans, peas, and lentils.

___ 2. Pudding can be made by adding cold water to pre-gelatinized starch.

___ 3. Whey proteins, gelatin, and soy proteins can be manipulated to form yogurt, cottage cheese, gelatin desserts, and tofu.

___ 4. Gel is gas dispersed in a liquid.

___ 5. Emulsifiers are proteins that catalyze chemical reactions.

___ 6. Fructose can be found in sugar beets and sugar cane.

___ 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. Proteins and starches are polymers, which will be in a glassy state above Tg and rubbery state below Tg.

___ 9. Gel formation is the result of junction zone formation.

___ 10. Starch is found in granules which have amorphous and crystalline regions.

___ 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. Lactose has a sweetness value of 0.3 and maltose has a sweetness value of 0.7.

___ 14. Glucose is the reference point of sweetness and has a value of 1.0.

___ 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. Potato chips are fried to low moisture content and packed in O_2 environment to preserve freshness and increase the shelf-life.

___ 18. Shear thinning is the process in which the viscosity of the gelatinized starch paste increases.

___ 19. Water activity is the ratio P_v/P_s.

___ 20. Proteins provide sensory characteristics of mouth feel, juiciness, and flavor.

II. Fill in the blanks (35 points)

1. During the study of starch gelatinization, the products that were studied included
   _____, _____, _____ and
   _____.

2. The five basic components of food consist of: _____ ,
   _____, _____, _____, and
   _____.

3. Shear-thickening fluid has a _____ greater than 1.

4. _____ pasteurization (72°C for 16 sec) is used in cheese and milk
   processing.

5. Starch gelatinization takes place in the presence of _____, _____,
   and _____.

6. _____ are used to stabilize oil and fat dispersions.

7. Toothpaste and tomato ketchup (paste) are examples of _____ fluids,
   while milk and honey are examples of _____ fluids.

8. _____, which is extensible, cohesive, and elastic, provides the key
   properties of dough for making bread.

9. Plants store their surplus energy in two forms: _____ and
   _____.

10. The types of fluids that have yield stress are _____ and
    _____.

11. A solid dispersed in a liquid is called a _____ and gas dispersed in liquid
    is called a _____.

12. The 2 types of strains _____ strain and _____ strain.

13. Starches in their natural form provide _____, _____,
    _____, and _____.

14. The process in which water seeps (releases) from the gel onto its surface is called
    _____ or _____.

15. In order to prevent water from seeping to the surfaces of gels, _____ is
    added.

16. Applesauce, banana puree, and orange juice are examples of _____
    fluid.

17. 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.

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. (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. Answer the following questions about the Food Companies and Food Ingredients Presentations. (45 points)

(1)Name the 6 companies that were presented by you and your classmates and list two major products by each company. **(6 points)**

(2) Answer the following questions. **(15 points)**

2.1 Which company was founded by a drugstore keeper (pharmacist)?

2.2 Fill in the following slogan. "Low Calories ....."?

2.3 Which company has the slogan, "Adding Vitality to Life"?

2.4 Which company produces Nestea, water, and orange juices?

2.5 What company owns the #1 Global Brand in the world?

2.6 Which company has the slogan, "Kitchen of the World"?

2.7 Give two "side orders" offered by KFC in the USA, but not offered in Thailand?

2.8 What is the current slogan for Coca-Cola?

2.9 What is the "life-style" drink produced by Singha Corporation?

2.10 Fill in the following slogan. "Our Country...?

2.11 Which company is the youngest of all the company that was presented?

2.12 Besides from Fresh Product and Appetizers, what are the other two major types of products produced by CP?

2.13 Which company began its business from a food and fertilizer company?

2.14 What is the largest food company in the world?

2.15 Unilever has headquarters in which two countries?

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

(4) For the ingredients presentation that your team gave in class, list the major ingredients and their functions? **(9 points)**

VI. Answer the following questions about the Food Rheology. (30 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. **(3 points)**

3. 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. **(5 points)**

General Equation: $\sigma = \sigma_o + K\dot{\gamma}^n$

Fluid	K	n	σ_o
Herschel-Bulkley	> 0	$0 < n < \infty$	> 0
Newtonian	> 0	1	0
Shear-thinning (pseudoplastic)	> 0	$0 < n < 1$	0
Shear-thickening (dilatant)	> 0	$1 < n < \infty$	0
Bingham plastic	> 0	1	> 0

4. Experimental results with a concentric cylinder viscometer used for banana puree at 310 K were as followed:

Shear Rate $[10^{-3} \times 1/s]$	Shear Stress $[10^{-4} \times Pa]$
1.0	2.30
1.5	2.85
2.0	3.40
3.0	4.30
4.0	5.30
5.0	6.40
6.0	7.60
7.0	8.50

Assuming Power-Law behavior, determine the rheological parameters required to describe the product. Is the product shear-thinning or shear-thickening?
(15 points)

5. 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 2011!!!

Bonus: What is the name of this restaurant? (2 points)

Fuji Lee Garden's Plaza

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