

Name: _____ Student ID _____

**Prince of Songkla University
Faculty of Engineering**

Exam: Final Exam, Semester I
Date: December 17, 2015
Subject: 230-560 Food Unit Operations

Academic Year: 2015 – 2016
Time: 1:30 – 4:30 PM
Room: A400

ทฤษฎีในการสอบโทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทฤษฎี และพักการเรียน 1 ภาคการศึกษา

Instructions: This exam is a Closed Book Exam. 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. Write your English Nickname and your Team Name above.

Points Distribution (For Grader Only)		
Part	Points Value	Score
I	20	
II	35	
III	15	
IV	35	
V	40	
VI	40	
Total	185	

Exam prepared by
Ram Yamsaengsung
December 8, 2015

PLEASE CHECK TO MAKE SURE THAT
YOU HAVE ALL 12 PAGES OF THE EXAM BEFORE BEGINNING
(not including the cover sheet).
GOOD LUCK!

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CLOSED BOOK EXAM (180 points)

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

- 1. Cornflakes, which have a water activity (a_w) of 0.10, will gain moisture in a 5% RH environment.
- 2. Legumes include beans, peas, and lentils.
- 3. Shear thinning is the process in which the viscosity of the gelatinized starch paste increases.
- 4. Pudding can be made by adding cold water to pre-gelatinized starch.
- 5. Lactose has a sweetness value of 0.3 and maltose has a sweetness value of 0.7 0.
- 6. Corn starch can be converted into fructose using acid, heat, and enzyme (producing corn syrup).
- 7. Whey proteins, gelatin, and soy proteins can be manipulated to form yogurt, cottage cheese, gelatin desserts, and tofu.
- 8. Gel formation is the result of junction zone formation.
- 9. Proteins and starches are polymers, which will be in a rubbery state above T_g and glassy state below T_g .
- 10. Enzymes are proteins that catalyze chemical reactions.
- 11. Proteins provide sensory characteristics of mouth feel, juiciness, and flavor.
- 12. Amylopectin contributes to the high viscosity of the starch paste and amylose contributes to the gelling property.
- 13. Gel is gas dispersed in a liquid.
- 14. Glucose is the reference point of sweetness and has a value of 1.0.
- 15. Potato chips are fried to low moisture content and packed in O_2 environment to preserve freshness and increase the shelf-life.
- 16. Starch is found in granules which have amorphous and crystalline regions.
- 17. Fructose can be found in sugar beets and sugar cane.
- 18. Amylopectin is in the form of linear chains and amylose is highly branched.
- 19. Water activity is the ratio P_w/P_v .
- 20. Retrogradation is the process in which water is squeezed from the gel as the starch begins to interact and the junction zone collapses.

Part 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. 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.
4. Plants store their surplus energy in two forms: _____ and _____.
5. Enzymatic browning that is produced in bruised apples and fruits (or peeled fruits) are called _____ because they are caused by enzymes in the presence of oxygen.
6. _____ pasteurization (72°C for 16 sec) is used in cheese and milk processing.
7. The process in which water seeps (releases) from the gel onto its surface is called _____ or _____.
8. Starches in their natural form provide _____, _____, _____, and _____.
9. Common forms of cooking sugar from sugarcane include _____, _____, and _____.
10. Fat soluble color pigments include: _____ (green) which is found in plants, _____ (orange-red) are found in carrots, squash, tomatoes, pineapples, oranges, corn, and other plant materials
11. Water soluble color pigments include: _____ (red to blue) which are found in berries, grapes, apples, cabbages, and cherries.
12. In _____ such as those in bruised apples and overly ripened bananas and mangos, enzymes, such as _____ and catechol oxidase, create _____ and benzoquinone from natural phenols, resulting in brown color.
13. When the structure of proteins is altered, its properties are changed irreversibly. This process is called _____ which can be caused by _____, agitation, solvents, and _____.
14. Egg white proteins develop foam with agitation while proteins such as _____ and _____, when mixed with water, form _____, which is extensible, cohesive, and _____.

Part III. Answer the following questions based on your trip to Tesco Lotus Bakery, Hat Yai. (15 points)

- (1) Name the 5 sections in which the Lotus Bakery is divided into. **(5 points)**

- (2) What product was Lotus Bakery making when we visited? **(2 points)**

- (3) What does DC stand for? **(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 combination of cooking oil (2 types of vegetable oil) is used for frying donuts at the Lotus Bakery? **(2 points)**

**Part IV. Answer the following questions about your Process Presentations.
(35 points)**

1. Match the following products with the descriptions below. **(15 points)**

- (a) Coffee
- (b) Mama
- (c) Canned Tuna
- (d) Magnum
- (e) Chocolate
- (f) Beer

- _____ 1. Frying
- _____ 2. Aroma Recovery
- _____ 3. Filtration
- _____ 4. Steam Cooking (2 answers)
- _____ 5. Pasteurization
- _____ 6. Extraction and Evaporation
- _____ 7. Dipping (2 answers)
- _____ 8. Sterilizing
- _____ 9. Fermentation
- _____ 10. Freezing (2 answers)
- _____ 11. Roasting
- _____ 12. Lauter Turn, Mashing

2. For the industrial food processing presentation that your team gave in class before the mid-term exam, list all the processes involved from raw materials to the finished product. Draw a flow diagram. **(10 points)**

3. Draw a flow diagram for Potato Chips production from raw materials to shipping and distribution. **(10 points)**

Flow Diagram of Potato Chips

Part V. Shorts Answers (40 points)

1. Name 2 types of refrigerants that are commonly used in freezing systems.
(2 points)

2. Name 4 types of drying equipment. **(4 points)**

3. What is the difference between PSL and HQL? **(4 points)**

4. Discuss each of the cooking technique below. What is the **heat and mass transfer mechanism** of each? What happens to product in terms of color, texture, product surface, and water content? Give example of **3 products** that you find in restaurants or supermarkets for each cooking type (cannot use cooked chicken by itself).
(15 points)

4.1 Steaming:

Examples:

4.2 Grilling:

Examples:

4.3 Microwave:

Examples:

5. What is the difference between the crust region and the crumb region of a product? Draw a picture showing these regions and give 2 examples of foods that have both regions. **(5 points)**

Crust –

Crumb –

Example:

6. Discuss the heat and mass transfer processes that take place during the frying of French fries. Draw a diagram and use arrows to show direction of heat and mass transfer. What are some major differences between French fries and potato chips? **(10 points)**

Heat Transfer:

Mass Transfer:

Part VI. Food Processes and Cooking Presentations (40 points)

1. List the 6 products that were presented by your classmates during the Food Cooking Presentation. Mention how each of the products could be improved in terms of taste, the way it looks, packaging, marketing, etc. **(10 points)**

2. Product Development and Marketing (30 Points)

You have just been given **100 million baht** to build a food factory. Your job is to design the product, the production process, and the marketing strategies.

List the **major ingredients**, **how to make it**, what **processes and equipment** will you need, how to **package** it, the **price per unit**, the **units per package**, etc. Finally, discuss additional **marketing strategies** (5 P's) that could be used to increase profit. Don't forget to **name your product** and give a **slogan**. (30 points)

Name of Products:

Ingredients:

Equipment Needed:

Flow Diagram/How to Make it:

MARKETING STRATEGIES

Slogan:

Price per Unit:

PACKAGING DESIGN

Bonus: What is the name (or nickname) of the head of bakery at Tesco Lotus that we visited?



**END OF EXAM!
CONGRATULATIONS!
AND
HAVE A GOOD VACATION!**