Arkansas Food Science & Technology CDE Workbook

2012-2016

National FFA Food Science and Technology Career Development Event

A Special Project of the National FFA Foundation

Important Note

Please thoroughly read the Introduction Section at the beginning of this handbook for complete rules and procedures that are relevant to all National FFA Career Development Events.

I. Purpose

The food science and technology career development event is designed to promote learning activities in food science and technology related to the food industry and to assist students in developing practical knowledge of principles used in a team decision-making process.

II. Objectives

A. To encourage FFA members to gain an awareness of career and professional opportunities in the field of food science and technology.
B. To provide FFA members with the opportunity to experience group participation and leadership responsibilities in a competitive food science and technology program.
C. To help FFA members develop technical competence and personal initiative in a food science and technology occupation.

III. Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards

With the recommendation of the National FFA Board of Directors, all national FFA programs have incorporated these standards to guide the direction and content of program materials and activities. Refer to Appendix A in this chapter of the handbook for a complete list of the measurable activities that participants will carry out in this event. For details about the incorporation of AFNR standards, refer to the Introduction chapter of the CDE handbook.

IV. Event Rules

A. Team make-up- The team will consist of four members with all four members' scores being totaled for the team score.
B. It is highly recommended that participants wear FFA Official Dress for this event.
C. Any participant in possession of an electronic device, except a calculator, in the event area is subject to disqualification.

V. Event Format

A. The food science and technology career development event will consist of four activities: a team product development project, an objective test, a food safety and quality practicum and a sensory evaluation practicum.
B. All team members will participate in all of the activities. There will be a possible 1,000 total points per team. The team product development project will be worth 400 points per team, the objective test will be worth 50 points per individual and each of the two practicums will be worth 50 points per individual.
C. Allergy Information: Food products used in this event may contain or come in contact with potential allergens. Advisors must submit a special needs request form for participants with any allergies with certification. The event committee will make all reasonable efforts to accommodate students with food allergies.

D. Each participant must provide:
   1. A clipboard that is clean and free of notes.
   2. Two sharpened No. 2 pencils.
   3. Electronic calculator- Calculators used in this event should be non-programmable and non-graphing. Calculators should have only basic functions such as addition, subtraction, multiplication, division, equals, percent, square root, +/- key. No other calculators are allowed to be used during the event including cell phones.
   4. Teams and/or individuals will not be permitted to use electronic media during the event. This includes but is not limited to cell phones, mp3 players, cameras, etc.

E. Team Product Development Project
   1. Each team will receive a product development scenario describing the need for a new or redesigned product that appeals to a potential market segment. The team's task will be to design a new food product or reformulate an existing product based on information contained within the product development scenario.
   2. The team will be responsible for understanding and using the following concepts:
      a. Formulation of product to meet specified requirements.
      b. Package design and labeling requirements to reflect the developed product.
      c. Nutritional fact development.
      d. Production and packaging equipment.
      e. Quality control and safety programs, i.e., good manufacturing practices (GMP) and hazard analysis critical control points (HACCP).
      f. Formulation and costing (ingredient, packaging, etc.).
      g. Current food trends.
      h. Market segments.
   3. Each team will be provided with packaging materials, ingredients and necessary ingredient information in order to develop, label and package a product.
   4. The team will have 60 minutes to respond to the product development scenario and reformulate or develop a product, calculate a nutritional label, develop the ingredient statement and information panel and develop the front or principle display panel to reflect the new product.
   5. After this time period, each team member will contribute to a ten minute oral presentation delivered to a panel of judges. No electronic media will be used in the presentation.
   6. Following the presentation there will be a ten minute question and answer period with the judges in which each team member is expected to contribute. All materials will be collected after the presentation.
   7. Total time involved for each team will be 80 minutes. Total number of points possible for this activity will be 400 points.
   8. Product development scenarios will describe a category, platform and market. These may include but are not limited to the following categories, platforms and markets listed below.
      a. Categories
         i. Cereal
         ii. Snacks
         iii. Meals
         iv. Side dishes
         v. Beverages
         vi. Supplements
         vii. Condiments
         viii. Desserts

b. Platform
    i. Frozen
    ii. Refrigerated
    iii. Shelf-stable
    iv. Convenience
    v. Ready to eat
    vi. Heat and serve
c. Market (domestic and international)
    i. Retail
    ii. Wholesale
    iii. Food service
    iv. Convenience store

9. Example of scenario product from past events:
    a. Ready to eat breakfast cereal for retail
    b. Refrigerated frozen cookie dough for wholesale
    c. Yogurt parfait for convenience store
    d. Refrigerated, heat and serve pizza for retail
    e. Shelf stable, dried fruit snack mix for retail
10. Evaluation criteria and points for team activity can be found on the team product development project scorecard at the end of this chapter.

F. Individual Activities
1. Objective Test
    a. The objective questions administered during the food science and technology examination will be designed to determine each team member's understanding of the basic principles of food science and technology. The test will be primarily based on the list of references at the end of this chapter.
    b. Team members will work individually to answer each of the 50 questions. Each person will have 60 minutes to complete the examination. Each question will be worth 1 point, for a total of 50 points.
2. Practicums—Each team member will complete all parts of both practicums.
    a. Food Safety and Quality Practicum- 50 points
        i. *Customer Inquiry*- Each participant will be given five scenarios representing general consumer inquiries. Participants must determine if the consumer inquiry reflects a quality or safety issue and determine if it is a biological, chemical or physical concern or hazard. (25 points)
        ii. *Food Safety/Sanitation*- Each participant will be given ten situations (e.g., photos, videos, written scenarios, live demonstrations or a combination). A numbered list of problems will be provided at the beginning of this practicum segment. The list will contain concepts such as good manufacturing practices (GMP), sanitation, food handling/storage and other pre-requisite programs. Participants will identify if there is a violation presented in the situation. If participants decide that there is a violation, they will indicate the number of the violation from the list of problems provided. (25 points)
    b. Sensory Evaluation Practicum- 50 points
        i. *Triangle Tests*- Three different triangle tests will be conducted. Participants are expected to identify the different samples through flavor, aroma, visual cues and/or textural differences. Answers will be given on the sheet provided. No list will be provided for this segment of the practicum. Each test is worth 5 points. (15 points)

ii. *Flavor Identification*- Three samples will be tasted. Participants will be expected to discern the flavor of each sample by taste. Flavors may include but are not limited to fruits, vegetables, florals, savory, sweeteners, etc. Each sample is worth 5 points. (15 points)

iii. *Aromas*- Each participant will be asked to identify four different aromas from vials provided at each station and record the answer on the sheet provided. A list of potential aromas will be provided to each person. Each sample is worth 5 points. (20 points)

Aromas

Cinnamon	Grape
Chocolate	Garlic
Maple	Peppermint
Oregano	Clove
Basil	Nutmeg
Lemon	Ginger
Lime	Molasses
Orange	Wintergreen
Vanilla	Banana
Smoke (liquid)	Coconut
Cherry	Lilac
Pine	Raspberry
Onion	Strawberry
Butter	Licorice (anise)
Menthol	

VI. Scoring

Section	Time Allowed	Section Points	Total Points
Individual Activities			
Objective Test	60 minutes		50
Food Safety and Quality Practicum			50
Customer Inquiry		25	
Food Safety/Sanitation		25	
Sensory Evaluation			50
Triangle Tests		15	
Flavor Identification		15	
Aromas		20	
Total Individual Points			**150**
Team Product Development Project	80 minutes		400
Package Design		100	
Product Development		250	
Response to Judges' Questions		50	
Individual Points (150 pts x 4 members)			600
TOTAL TEAM POINTS			**1000**

VII. Tiebreakers

A. **Team**: Should a tie occur in the overall team placing, the tie will be broken by the highest team product development project score. If this score does not break the tie, then the highest number of total points earned from the objective test (adding all four team member scores) will break the tie. If a third tiebreaker is needed, the total points earned by the team in the food safety and quality practicum will be used.

B. **Individual**: To identify the high individual for this event in case of a tie, the highest objective test score will be used as the first tiebreaker, followed by the highest food safety and quality practicum score as the second tiebreaker.

VIII. Awards

Awards will be presented to individuals and/or teams based upon their rankings at an awards ceremony. Awards are sponsored by a cooperating industry sponsor(s) as a special project, and/or by the general fund of the National FFA Foundation.

IX. References

This list of references is not intended to be all-inclusive. Other sources may be utilized, and teachers are encouraged to make use of the very best instructional materials available. The following list contains references that may prove helpful during event preparation.

National FFA Core Catalog—CDE Questions and Answers
http://shop.ffa.org/cde-qas-c1413.aspx

Mehas and Rodgers, 5th Edition, 2006. Kay Yockey Mehas and Sharon Lesley Rodgers, Glencoe/McGraw, New York.

Food Science and Safety, 2nd Edition, 2004, George J. Seperich, Pearson Publishers

Principles of Food Sanitation, 5th Edition, 2006, Norman G. Marriott and Robert B. Gravani, Springer Science + Business Media, Inc.

Institute of Food Technology website, http://www.ift.org

USDA Food Safety and Inspection Service website, http://www.fsis.usda.gov

Penn State Kitchen Chemistry: Experiments, resources and materials for educators and students, http://foodscience.psu.edu/public/kitchen-chemistry

Food Safety Education, http://www.fsis.usda.gov/food_safety_education/for_kids_&_teens/index.asp

Partnership for Food Safety Education, http://www.fightbac.org

FoodSafety.gov, http://www.foodsafety.gov

Objective Test

The objective questions administered during the food science and technology examination will be designed to determine each team member's understanding of the basic principles of food science and technology. The test will be primarily based on the list of questions contained in this workbook.

Team members will work individually to answer each of the 50 questions. Each person will have 60 minutes to complete the examination. Each question will be worth 1 point, for a total of 50 points.

FOOD SCIENCE AND TECHNOLOGY
CAREER DEVELOPMENT EVENT
TEST QUESTION BANK

1. The % Daily Value is based on a _____calorie diet.
a. 2000
b. 2500
c. 3000
d. 3500

2. Which of the following may NOT be used as a claim on a food label?
a. calorie free
b. low calorie
c. sugar free
d. low sugar

3. Which of the following foods is NOT exempted from food labeling?
a. whole coffee beans
b. dehydrated vegetables-condiment type
c. plain instant tea (unsweetened)
d. unpopped popcorn

4. The basal metabolism rate of a human being is NOT affected by ___
a. diet
b. size
c. sex
d. age

5. Water functions in the body to
a. serve as a medium for chemical reactions
b. dissolve oxygen
c. induce glycogen
d. moderate metabolism

6. A calorie is the amount of energy required to raise _____of water one degree _____
a. 1 ounce, Fahrenheit
b. 1 gram, Centigrade
c. 1 kilo, Fahrenheit
d. 1 gram, Centigrade

7. In food, carbohydrates supply_____Kcal. per gram.
a. 4
b. 5
c. 6
d. 7

8. Which of the following food processing operations is NOT for cooling food products?
a. air blast
b. ice water bath
c. extrusion
d. vacuum oven

9. In food, proteins supply _Kcal. per gram.
a. 4
b. 5
‘. c. 6
d. 7

10. Which one of the following is a type of food preserved, in part, by bacteria?
a. yogurt
b. bread
c. wine
d. whole milk

11. Which of the following is NOT an essential function of a food container?
a. tamper-resistant
b. refrigerator fit
c. light protection
d. sanitary protection

12. Protein is required for
a. production of antibodies
b. bacteria inhibition
c. proper bowel function
d. absorption of water

13. Bacteria cannot grow in an all_____environment because of lack of available moisture.
a. sugar
b. milk
c. meat
d. vegetables

14. Which of the following work together to maintain chemical, fluid, and electrical balance between tissue cells and blood?
a. sodium and potassium
b. calcium and phosphorus
c. iron and vitamin C
d. calcium and vitamin D

15. Which of the following cannot be digested, absorbed, but looks, feels, and behaves like fat?
a. Olestra
b. Trailblazer
c. Simplesse
d. Aspartame

16. Which of the following is a macromineral needed by our bodies to maintain health?
a. copper
b. tin
c. magnesium
d. iron

17. To make some ready-to-eat cereals, manufacturers use:
a. extending and fluffing
b. flaking and shredding
c. inflaking and inshredding
d. posting and kellogging

18. To ensure that the foods you store maintain their safety and quality, make sure your refrigerator is at _____degrees Fahrenheit.
a. 35
b. 40
c. 45
d. 50

19. A fatty acid does NOT contain which of the following elements?
a. carbon
b. nitrogen
c. oxygen
d. hydrogen

20. To increase shelf life, the air in a controlled atmosphere storage room containing apples should contain only_____% oxygen rather than the 21% found in normal air.
a. 3
b. 5
c. 7
d. 9

21. The _____ regulates genetically engineered microbes used in natural pesticides.
a. Environmental Protection Agency
b. United States Department of Agriculture
c. United States Department of Genetic Engineering
d. Food and Drug Administration

22. The _____dose is the largest dose that the animal in an experiment can take without endangering its health.

a. acceptable daily intake
b. maximum tolerated dose
c. no-observed effect level
d. LD5O

23. Application efficiency of pesticides can be improved by

a. scouting fields
b. certified seed application
c. cultivating fields
d. using resistant fertilizer

24. A left-over hotdish needs to be reheated prior to serving again. The internal temperature of the food should reach_____degress F.

a. 140
b. 150 and held for two hours
c. 160
d. 165

25. In which of the following foods is solanine considered a toxin?

a. potato
b. tomato
c. coffee
d. tea

26. An emulsifier _____

a. prevents the separation of oil and water in food
b. maintains the shape or crispness of fruits and vegetables
c. controls insects and pests
d. produces or stimulates C02 production

27. A food additive that retards rancidity of unsaturated oils and prevents browning in fruits and vegetables that occur during exposure to oxygen is called an

a. anti-caking free-flowing agent
b. antimicrobial agent
c. antioxidant
d. antibuffer agent

28. Starch is a_____ *

a. protein
b. carbohydtrate
c. fat
d. mineral

29. If the legal maximum of nitrite (N02) is 156 ppm, how much sodium nitrite can you legally add to 1 kg. of meat?

a. 156mg
b. 31.2oz
c. 78mg
d. 15.6 ounces

30. _____ stands for a system that is used to enhance food safety in food processing, packaging, storage, distribution, and preparation.

a. Good manufacturing practices
b. Hazard analysis and critical control point
c. High accuracy and contamination control point
d. Best management practices

31. Theregisters or approves the use of pesticide tolerance levels for pesticide levels in food.

a. USDA
b. FDA
c. NMFS
d. EPA

32. _____are places in the food processing system where the lack of proper control can result in a safety risk for the consumer.

a. Concentrated contamination control processes
b. Critical control points
c. Critical contamination places
d. Contamination processing points

33. A food additive that promotes or produces a desired physical state or texture is called a(n)_____

a. enzyme
b. formulation aid
c. firming agent
d. humectants

34. Tomatoes are stored and shipped at temperatures between

a. 70°to9O°F
b. 15°to2O°F
c. 500 to 65°F
d. 0^0to25^0F

35. _____is defined as individual cells of crop plants exhibiting desirable characteristics, which are selected and grown into mature plants.
a. recombinant DNA
b. recombinant RNA
c. pathoclonal variation
d. somaclonal variation

36. A bacteria that can contaminate poultry products and cause foodbome illness in humans is_____
a. Lactobacillus
b. Clostridium
c. Gram Positive
d. Salmonella

37. Two factors that accelerate rancidity in food prâducts are_____and_
a. temperature and light
b. light and oxygen
c. light and moisture
d. light and soluable minerals

38. The most effective way to eliminate living microorganisms in spices is
a. freezing
b. irradiation
c. heat
d. selected chemicals

39. A method of food preservation that does destroy microorganism and enzymes is _____
a. drying
b. freezing
c. microwaving foods
d. pressure canning

40. The food pyramid indicates that the_____group is the where you should obtain the most servings each day.
a. mHk
b. fruit
c. vegetable
d. bread

41. An addition to of a nutrient to foods such as adding vitamin 0 to milk is called_____
a. irradiation
b. fermentation
c. nutrification
d. fortification

42. Only Lactic acid bacteria can ferment sugars and nutrients in pickles because they

a. use a natural occuring enzyme
b. are tolerant of salt levels
c. produce lactic acid
d. use acetic acid

43. Which is of the following food components is primarily derived from fruits, vegetables, and grains?

a. fat
b. protein
c. minerals
d. carbohydrates

44. _____grams of a day's food intake should be protein

a. 30
b. 35
c. 40
d. 45

45. A list of ingredients must be included on a food label. The first ingredient listed is by its amount of

a. percent protein
b. grams of carbohydrates
c. total weight
d. fat content

46. Anemia is a disease resulting from a low red blood cell count. The red blood cells are the cells that carry_____ throughout the body ~or absorbtion.

a. fiber
b. vitamin B12
c. iron
d. carbon dioxide

47. Fiber is not digestible, it passes through the intestine system and is removed in the stools. It absorbs water on its way through the digestive systems and results in a softer stool, reducing the risk of:

a. osteoporosis
b. hemorrhoids
c. pernicious anemia
d. heart disease

48. Soy sauce is made with the use of_____
a. mold
b. bacteria
c. fungi
d. yeast

49. Fats and oils are part of a family of compounds called _____
a. proteins
b. carbohydrates
c. lipids
d. fiber

50. The government agency responsible for ensuring that meat and poultry are safe and wholesome for consumption is the _____
a. Food and Drug Administration
b. United States Department of Agriculture
c. Department of Health and Human Services
d. Animal and Plant Health Inspection Service

51. Glucose, a simple sugar, melts at 150°C. This is equivalent to
a. 101.1°F
b. 238°F
c. 65.5°F
d. 302°F

52. It is important for a food technologist to measure the relative number of hydrogen and hydroxide ions in a food system. This is also known as measuring the _____ of a food.
a. water activity
b. brix
c. pH
d. sodium concentration

53. _____ reacts with amino acids when milk is heated to contribute to the tan color and slightly caramelized flavor of cooked milk products.
a. Lactose
b. Casein
c. Whey
d. Milk fat

54. An additive that can keep a compound, mixture or solution from changing its form or chemical nature is called a
a. antioxidant
b. buffer
c. stabilizer
d. preservative

55. A microorganism commonly found in human nasal passages and on the skin that can cause foodborne illness if food becomes contaminated is

a. *Clostridiurn peifringens*
b. *Staphylococcus aureus*
c. *Clostridiuni botulinum*
d. *Escherichia coIl* 01 57:H7

56. Flavor is sensed by taste buds which are sensory organs located on parts of the tongue. The taste buds on the sides of the tongue respond to _____ flavors.

a. sweet
b. bitter
c. salty
d. sour

57. A process that changes the shape of a protein molecule without breaking its covalent bonds is called _____

a. denaturation
b. coagulation
c. agglutination
d. saturation

58. A food technologist developing a formulation for a soft dough should use

a. an equal ratio of liquid to flour
b. two parts flour to one part liquid
c. three parts flour to one part liquid
d. six parts flour to one part liquid

59. Microorganisms that cause human disease are known as _____

a. parasites
b. pathogens
c. spores
d. vegetative cells

60. Oil and water normally separate because they are_____

a. emulsified
b. immiscible
c. Qt9bili7Pd
d. a colloidal dispersion

61. _____ is the complete destruction of all microorganisms, except some bacterial spores.

a. Commercial sterilization
b. Pasteurization
c. Irradiation
d. Sterilization

62. A _____ is an illness caused by consuming a food that contains a harmful metabolite from a microorganism.
a. food borne infection
b. baceriocide
c. bacteriostat
d. food borne intoxication

63. A synthetic sweetener made of aspartic acid and phenylalanine that is found in many diet soft drinks is called _____
a. asparatame
b. sorbitol
c. saccharin
d. cyclamates

64. _____ is an alternative name for baking soda.
a. Carbon dioxide
b. Potassium bitartrate
c. Sodium bicarbonate
d. Calcium carbonate

65. Vegetables are stored in individual rooms within a warehouse. The room storing would be expected to generate the most heat in one 24 hour period in their confined storage space.
a. snap beans (5600 BTU/Ton124 hours)
b. asparagus (3440 BTU/Ton!l2 hours)
c. cucumbers (8400 BTU/Ton!48 hours)
d. lima beans (4100 BTU/TonI6 hours)

66. The use of biochemical techniques to alter the genetic makeup of a plant to enhance characteristics for food production is called _____
a. biogenetics
b. biotechnology
c. biophysiology
d. biophysics

67. The use of food additives in the U.S. is regulated by the
a. Food and Drug Administration
b. United States Department of Agriculture
c. Department of Health and Human Services
d. Animal and Plant Health Inspection Service

68. Fruits and vegetables discolor when bruised or cut due to
a. caramelization
b. sulfiting
c. dehydration
d. enzymatic browning

69. The part of a cauliflower used for food by consumers is (are) the
a. tuber
b. bulb
c. flower buds
d. berries

70. A food contains 8 grams of fat, 4 grams of carbohydrates and S grams of protein. That would be equivalent to calories.
a. 88
b. 108
c. 93
d. 113

71. A food technologist is formulating a low carbohydrate pasta so they need to select a grain source that has the highest amount of protein and lowest amount of carbohydrates. They should use
a. hard wheat
b. millet
c. rice
d. soft wheat

72. Food that is dried at too high a temperature during dehydration can become on the outside of the product.
a. blanched
b. lyophilized
c. mushy
d. casehardened

73. One of the functions of sodium nitrite in meat products is to _____
a. inhibit mold growth
b. inhibit growth of *Clostridium botulinum* in vacuum packaged cured meats
c. minimize purge in vacuum packaged meats
d. reduce color fading in aerobically packaged cured meats

74. Sodium benzoate is used in soft drinks primarily to inhibit
a. rancidity
b. color deterioration
c. mold growth
d. flavor breakdown

75. A company is formulating a high quality ice cream and wants to use milk from a breed of cow' that will provide the highest percentage of butterfat in its milk. Milk from a _____ cow should be used.

a. Jersey
b. Holstein
c. Shorthorn
d. Brown Swiss

76. Vitamin D is added to milk to prevent a condition called _____

a. scun'y
b. pellagra
c. rickets
d. beriberi

77. There are _____ principles of HACCP.

a. 3
b. 5
c. 7
d. 9

78. Chocolate undergoes a _____ process as part of one of the production steps from harvest to a finished chocolate candy bar.

a. pasteuriztion
b. homogenation
c. fermentation
d. lyophilization

79. GMP is an acronym for _____ in the food industry.

a. get more practice
b. good manufacturing procedures
c. good methods procedures
d. good manufacturing practices

80. Energy lost when water molecules form ice crystals is called

a. specific heat
b. latent heat
c. heat of fusion
d. heat of vaporization

81. A compound that destroys bacteria on contact and has residual activity to continue to kill bacteria on a surface is called a _____

a. bactericide
b. bacteristat
c. chemicide
d. chemistat

82. A retort is a piece of equipment used for _____
a. flying
b. drying
c. canning
d. baking

83. The purpose for using a leavening agent such as baking soda or baking powder in cakes and cookies is to provide a source of _____
a. sodium dioxide
b carbon monoxide
c. sodium monoxide
d. carbon dioxide

84. To test a food manufacturing process with batches lager then bench top size, but smaller than full scale industry size, processors will use _____
a. mass production
b. batch production
c. pilot scale production
d. prototype production

85. Once food production operations are finished, a sanitation crew will remove all visible dirt, grime and grease. This step is also called _____
a. cleaning
b. sanitizing
c. rinsing
d. disassembly

86. Fruits and vegetables are primarily composed of_____
a. carbohydrates
b. water
c. protein
d. fiber

87. _____ is (are) required, by law, to be on all food labels.
a. The product price
b. Preparation instructions
c. The quantity
d. Suggested uses

88. If a food product contains 10,000,000 (1 0~) microbes per gram, and experiences a 99.9999 percent kill rate, then_____microbes per gram will survive.
a. 1
b. 10
c. 100
d. 1,000

89. Butter is made by agitating cream to form a _____ emulsion.
a. water-in-oil
b. gas-in-liquid
c. oil-in-water
d. gas-in-solid

90. Water activity is the degree of availability of water in food. The water activity of pure water is _____
a. 0.100
b. 1.000
c. 10.00
d. 100.0

91. The sugar _____ is sweeter than sucrose.
a. fructose
b. lactose
c. glucose
d. maltose

92. The _____ a fatty acid chain attached to a glycerol becomes, the more solid a fat will be at room temperature.
a. shorter
b. longer
c. fatty acid chain length has no impact on how solid a fat becomes
d. more unsaturated

93. To control crystal size when making candy, an interfering agent such as_____ is added.
a. salt
b. sugar
c. water
d. cream of tartar

94. The protein in meat that is primarily responsible for meat color is _____
a. myosin
b. actin
c. myoglobin
d. hemoglobin

95. Inorganic elements essential for human health and growth are called
a. vitamins
b. minerals
c. proteins
d. fiber

96. The technical name for freeze drying is _____

a. lyophilization
b. sublimation
c. condensation
d. evaporation

97. Food scientists, who use their ability to view and understand the entire production process well enough to identif~' problems areas or deficiencies, are _____

a. monitoring quality assurance
b. troubleshooting
c. implementing HACCP
d. pilot testing

98. _____ is a globular protein that is found in milk.

a. Casein
b. Keratin
c. Elastin
d. Gluten

99. Sucrose, galactose and glucose caramelize at 170°C. This is equivalent to _____

a. 126°F
b. 338°F
c. 248°F
d. 77°F

100. _____ is scientifically evaluating a new food product such as Pop-Tarts Yogurt Blasts for appearance, odor, taste, and mouthfeel.

a. Proximate analysis
b. Food chemistry
c. Market analysis
d. Sensory evaluation

101. An example of a homogenous mixture is (a)

a. pizza
b. salad containing lettuce, vegetables and cheese
c. cola
d. beef stew

102. Food heats up in a microwave oven primarily due to vibration of_____ molecules.

a. water
b. fat
c. protein
d. carbohydrate

103. *Clostridium botulinwn* is the organism that causes _____
a. hemolytic uremic syndrome
b. vomiting
c. botulism
d. necrotic enteritis

104. Meat, fruits and vegetables contain between 70 to 90 percent
a. carbohydrates
b. protein
c. fat
d. water

105. Pudding that is prepared by cooking thickens as it cools due to the use of a. milk
a. starch
b. sugar
c. vanilla

106. Using a process called _____, liquid vegetable oils are changed to shortening and margarine.
a. hydrogenation
b. oxidation
c. saturation
d. aeration

107. _____ is an elastic, siretchy protein found in wheat.
a. Myosin
b. Casein
c. Gluten
d. Albumin

108. Processed food products such as cereals and orange juice may be fortified with to enhance their nutritional content.
a. stabilizers
b. chelators
c. antioxidants
d. vitamins and minerals

109. When fruits such as pears, apples, or bananas are cut or bruised, causes the cut surface to become discolored
a. the maillard reaction
b. enzymatic browning
c. exposure to light
d. catabolism

110. Since oil and water normally separate because they are immiscible, an _____ can be used to keep these liquids mixed together in solution.
a. invertase
b. antimicrobial
c. caking agent
d. emulsifier

111. Chemical leavening agents such as baking soda and baking powder produce _____ during baking to lighten or aerate baked goods.
a. carbon monoxide
b. carbon dioxide
c. sodium bicarbonate
d. steam

112. During the production of sauerkraut, cabbage is _____ to contribute to the aroma, flavor and color of sauerkraut.
a. fermented
b. homogenized
c. pasteurized
d. lyophilized

113. _____ is the time a food product can be stored before deteriorating.
a. Retail life
b. Refrigeration life
c. Quality life
d. Shelf life

114. HTST milk is milk that has been processed using _____.~. procedures.
a. homogenous tempering short time
b. high temperature short time
c. hot temperature short tempering
d. homogenization time scalding temperature

115. _____ are microorganisms that cause disease in humans.
a. Thermophiles
b. Prions
c. Pathogens
d. Parasites

116. Instant mashed potatoes flakes are an example of a food product that has undergone a _____ process.
a. fermentation
b. curing
c. dehydration
d. carmelization

117. The FDA has a list of over 600 ingredients considered safe and not designated as additives that appear on a GRAS list. GRAS is an acronym for _____

a. generally recognized as safe
b. government recognition as sound
c. government recognized as safe
d. generally recognized as secure

118. Pressure canners used in the commercial manufacture of canned products are known as —-

a. steam blanchers
b. retorts
c. plate exchangers
d. sublimators

119. Meat products that have been irradiated bear _____ on the product label at retail.

a. a radura
b. no symbol or term indicating the product has been irradiated
c. the term electronically pasteurized
d. the term electronically sterilized

120. A food contains 4 grams of protein, 5 grams of fat, and 2 grams of carbohydrates. That would be equivalent to _____ calories.

a. 64
b. 69
c. 54
d. 128

121. _____ is added to meat to produce a cured meat color and flavor, and to serve as an antibotulinal agent.

a. Sodium erythorbate
b. Sodium phosphate
c. Sodium chloride
d. Sodium nitrite

122. _____ is considered to be basic because the number of hydroxide ions outnumber the hydrogen ions in a solution.

a. lemon juice
b. water
c. baking soda
d. coffee

.

123. To determine the amount of free water available for microbes to use in a food system, a food scientist would measure the _____ of that food.

a. water activity
b. percent water
c. pH
d. brix

124. When peanuts are ground to make peanut butter, a _____ is added. This keeps the peanut oil from separating out to the top of the jar during storage.

a. caking agent
b. stabilizer
c. hum ectant
d. antioxidant

125. The family of compounds that includes fats and oils is called _____

a. carbohydrates
b. proteins
c. lipids
d. amines

126. Which of the following packages is an example of aseptic packaging?

a. plastic milk carton
b. Tetra Pak drink box
c. glass drink bottle
d. plastic bread bag

127. Polyethylene terephtalate, commonly known as is the packaging material used for 2 liter soda bottles.

a. PolyT
b. PETP
c. PT
d. PET

128. A food that would be rich in omega-3 fatty acids would be _____

a. fatty fish
b. lard
c. olive oil
d. butter

129. To measure the texture of a d=Anjou pear, a food technologist might use a

a. spiral plater
b. gas chromatograph
c. texture analyzer
d. stomacher.

130. What happens to the boiling point of water when it is heated at high altitudes?
a. It increases
b. It decreases
c. It stays the same
d. Water doesn=t boil at high altitude

131. Regulations prescribe how ingredients must be listed on food labels. What is the general stipulation with respect to the order that ingredients are listed?
a. By alphabetical order
b. By ascending order of proportion by weight
c. By descending order of proportion by weight
d. By descending order of proportion by volume

132. Cheese curd is primarily composed of coagulated
a. protein
b. fat
c. carbohydrate
d. lactose

133. Sodium benzoate is used as a preservative in soft drinks to inhibit growth of _____
a. bacteria
b. molds
c. yeasts
d. viruses

134. The red color of a tomato is due to a compound called
a. beta carotene
b. lycopene
c. limonene
d. myosin

135. Peppers can deliver a very hot sensation when consumed because of the level in the pepper.
a. fructose
b. citric acid
c. theobromine
d. capsaicin

136. The chemical name for table salt is _____
a. sodium bicarbonate
b. potassium nitrate
c. sodium chloride
d. sodium bisulfite

137. When proteins begin to break down in meat, the process is called _____

a. proteolysis
b. lipolysis
c. glycolysis
d. hydrolysis

138. A compound that has little or no flavor itself but is added to food to assist or boost the primary flavor of the food to which it is added is a _____

a. processing aid
b. humectant
c. stabilizer
d. flavor enhancer

139. Glucose is a simple sugar, also known as a _____

a. disaccharide
b. monosaccharide
c. polysaccharide
d. multisaccharide

140. When a food processing plant is cleaned at the end of a production day, the order of clean-up is _____

a. rinse, clean with detergent, dry pick up, rihse, sanitize
b. clean with detergent, rinse, sanitize, rinse, dry pick up
c. dry pick up, rinse, clean with detergent, rinse, sanitize
d. dry pick up, rinse, clean with detergent, sanitize, rinse

141. When water is used as an ingredient in food formulations, it must be

a. soft water
b. potable water
c. hard water
d. purified water

142. _____ is an ingredient used in food to slow the reaction of lipids forming free radicals leading to oxidative rancidity in food.

a. Butylated hydroxyanisole
b. Sodium caseinate
c. Potassium sorbate
d. Disodium inosinate

143. All the essential amino acids would most likely be found in one serving of _____

a. peanuts
b. legumes
c. bran cereal
d. beef

144. Milk and ice cream processing involves both homogenization and pasteurization. Homogenization is _____

a. evaporation of liquid under vacuum leaving a concentrate
b. addition of bacterial starter cultures
c. reduction in size of fat globules by forcing the milk or cream through a very small opening under pressure
d. rapid heating of milk to very high temperatures to kill disease-causing bacteria in the milk product

145. The brownish color of aerobically packaged ground beef that has been stored in a refrigerator for several days is due to

a. deoxymyoglobin
b. metmyoglobin
c. myoglobin
d. oxymyoglobin

146. _____ is a preventative food safety program required by juice processors.

a. GMP=s
b. SSOP=s
c. Quality assurance
d. HACCP

147. The building blocks of protein are called

a. amino acids
b. monosaccharides
c. fatty acids
d. triglycerides

148. The enzyme added to milk to cause curd formation in cheese is called

a. amylase
b. rennin
c. lactase
d. maltase

149. Good Manufacturing Practices are used to:

a. enforce strict laws related to safety regulations
b. evaluate the design of food processing plants -
c. cover the consumer aspect of food processing
d. brief food suppliers of their product's safety

150. FSIS stands for: -
a. Food Safety and Inspection Administration
b. Food Safety and Inspection Service
c. Fiber Safety Inspection Service
d. Food and Drug Administration

151. The HACCP process uses _____to show the entirefood processing operation.
a. personnel
b. flow charts and diagrams
c. food processing software
d. risk assessment

152. Poultry consumption in the United States has increased_____from 1976 to 1989.
a. 25°!.
b. only slightly
c. less than beef consumption
d. more that 65%
a. none of the above

153. In HACCP systems, critical points should be identified so that hazard can be_____
a. produced
b. eliminated
c. detoured
d. detected

154. An example of a GMP would be
a. concrete walls
b. concrete floors filtering air
c. double-pane windows e. noneoftheabove

155. A bacteria that infects plants through would sites and can inject DNA into cefls is:
a. agrobacterlUm
b. aflotoxin
c. Selenastrum Capricontum Prinhz
d. Clostridlum periringens

156. Surface-like agents that prevent like-particle conglomeration are:
a. Adenosine trlphosphates
b. Emulsifiers
c. Pathogens
d. Cladocerans

157. _____means that the product contains bacteria that can make more of the product.
a. active ingredients
b. active culture
c. active byproducts
d. live bacteria

158. Which one of the following uses mold to derive the final product?
a. yogurt
b. soysauce
c. pickles
d. whole milk

159. Which of the following would be a requirement or function of a commercial food container:
a. gas and odor protection
b. sanitary protection
c. degradable
d. resistance to impact

160. A synthetic hormone to increase milk production is
a. BSA
b. BSE
c. BST
d. none of the above

161. Bacteria cannot grow in all_____environment because of lack of available moisture.
a. sugar
b. milk
c. meat
d. vegetables

162. Which of the following is NOT a type of food processing?
a. Cold processing
b. Rehydration
c. Fermentation
d. Irradiation

163. Which of the following processes changes liquid oils into semisolids and makes the oil less susceptaible to oxidation and rancidity?
a. fermentation
b. hydrogenation
c. rehydration
d. oxidization

164. The demand for which of the following food products would go up the least if per capita income increased significantly?
a. alcoholic beverages
b. dairy products
c. food purchased away from home
d. red meat and poultry

165. An addition of a nutrient to foods such as adding vitamin D to milk is called_____
a. irradiation
b. fermentation
c. nutrification
d. fortification

166. If acidic foods(such as tomatoes) are added to milk,
a. fat coagulates
b. fat content increases
c. casein coagulates
d. whey coagulates

167. Which of the following foods cannot be effectively frozen?
a. broccoli
b. cabbage
c. carrots
d. lettuce

168. Which of the following is not an essential function of a food container?
a. tamper-resistant
b. refrigerator fit
c. light protection
d. sanitary protection

169. A discovery by a it centruy economist relating family income with food puchases as a proportion of totoal expenditures is often referred to as:
a. ingail's law
b, Engie's Law
c. Angels's Law
d. Einstein's law

170. A major criticism of American diets and eating patterns is that our diet contains far too much
a. carbohydtrates
b. starch
c. fat
d. protein

171. Only three processes have been lndentifled to safely eliminate living microorganisms. They are:
a. freezing, heat, and irradiation
b. dehydration, selected chemicals, and irradiation
c. heat, sleected chemicals, and irradiation
d. heat, heavy saiting. and irradiation

172. A list of ingredients must be included on a food label. The first ingredient listed is by its amount of:
a. percent protein
b. grams of carbohydrates
c. total weight
d. fat content

173. In most cases, which phrase meant that the food product in question contains no nutritive carbohydrate sweetner, either added or naturally occuring, and is a low or reduced calorie food?
a. "sugar free"
b. "low in sugar"
c. "no sugar added"
d. "reduced sugar"

174. Three kinds of information must be found on a food label. One of those listed is incorrect. Which one of the following is incorrect?
a. product identification
b. name and address of the manufacturer, packer, or distributor
c. net contents or net weight
d. sources of food ingredients

175. If NOEL value of a pesticide is 1 gram, what is the Acceptable Daily Intake (ADD for each kIlogram of body weight?
a. 1 gram
b. 0.1 gram
c. 1 0 milligrams
d. 100 millIgrams

176. Antioxidants perform all of the following except:
a. Prevent protein degradation
b. Preserve color
c. Minimize rancidity
d. Preserve flavor

177. A chemical linked to long-term effect such as cancer, sterility and birth defects could cause which of the following:

a. chronic toxicity
b. acute toxicity
c. defect action levels
d. total adverse response

178. LD5O represents:

a. The concentration of a chemical at which half of the test animals die
b. A test for neurotoxins
c. Lethality when~the dosage level is multiplied by 50
d. A measurement of speicies specificity

179. A toxin commonly found in corn and peanuts is:

a. Solanine
b. Protease
c. Goitrogens
d. Aflatoxins

180. Which of the following is NOT a way to control food pathogens?

a. wash hands frequently
b. keep food at 40-140 F 00
c. cook foods thoroughly
d. thaw meats in the refrigerator

181. Which one of the following is NOT a type of food preserved by mold?

a. Blue cheese
b. Soy sauce
c. gari
d. pickles

182. The acceptable daily intake (ADI) of a non.carcinogen is:

a. 1/100 of a no-observed effect level (NOEL)
b. 1/1 000 of no-observed effect level (NOEL)
c. zero
d. one-tenth of a no-observed effect level (NOEL).

183. Cholesterol is a chemical that actually belongs to the ____ family.

a. carbohydrate
b. protein
c. alcohol
d. fat

184. Which is of the following food component is primarily derived from red meat and poultry?

a. ash
b. protein
c. minerals
d. carbohydrates

185. Which of the following is not a primary function of protein?

a. growth and maintenance of cells
b. production of antibodies
c. provides good and readily available source of energy
d. tissue and nerve development

186. Using salt to control the unwanted growth of microorganisms in food:

a. has been used for many years
b. is only effective if foods are stable
c. preserves food by Increasing available water (AW)
d. a & b

187. When a food scientist appraises a food using sight, smell, taste and possibly touch, this is often referred to as:

a. extra sensory perception
b. sensory perceptIon
c. sensory orientation
d. sensory evaluation

188. Bacteria do not thrive below 40 degrees Fahrenheit or above _____ degrees Fahrenheit.
a. 11OF
b. 120F
c. 130F
d. 140F

189. Only three processes have been identified to safely eliminate living microorganisms. They are:

a. freezing, heat, and irradiation
b. dehydration, selected chemicals, and irradiation
c. heat, selected chemicals, and irradiation
d. heat, heavy salting, and irradiation

190. A list of ingredients must be included on a food label. The first ingredient listed is by its amount of:

a. percent of fat
b. grams of carbohydrates
c. total weight
d. total volume

191. If NOEL value of a pesticide is 3 grams, what is the ADI for each kilogram of body weight?

a. 3gram
b. 0.3 gram
c. 30 milligrams
d. 300 milligrams

192. LD50 represents:

a. The concentration of a chemical at which half of the test animals die
b. A test for neurotoxins
c. Lethality when the dosage level is multiplied by 50
d. A measurement of species specificity

193. All meat should be cooked to the following temperature to kill Salmonella species:

a. 121F
b. 145F
c. 16SF
d. 170F

194. The terms “chewy”, “fibrous”, “gritty”, “mealy”, and “sticky” are important in the of foods.

a. grading
b. flavor
c. nutritional value
d. texture

195. The correct calculation for optimal inventory is:

a. O1=1/2 RQ+PO
b. Ol=OP+$^{1}/_{2}$ RO
c. Ol=RQ+$^{1}/_{2}$ P0
d. None of the above

196. Egg white changes from a clear liquid to an opaque white solid upon heating due to_____ denaturation

a. fat
b. protein
c. carbohydrate
d. glycogen

197. _____ is the process of thawing frozen products.

a. Flaking
b. Tamping
c. Tempering
d. Blanching

198. Margarine is formed by adding hydrogen atoms to unsaturated fatty acids, a process otherwise known as

a. oxidation
b. hydrogenation
c. mastication
d. esterificatiori

199. At sea altitude, water boils at —_____

a. 1000° F
b. 212° F
c. 212° C
d. 900° C

200. Starch is a type of _____

a. protein
b. fat
c. carbohydrate
d. mineral

201. _____ is the science of evaluating a food product for smell, appearance, taste and texture.

a. Proximate analysis
b. Food chemistry
c. Rheology
d. Sensory evaluation

202. An eating establishment that does not have table service is considered to be a _____ restaurant.

a. white-tablecloth
b. fast-food
c. full-service
d. gourmet dining

203. When marketing a new food product nationally to the public, major food companies will launch a _____

a. product rollout
b. market channel
c. product extension
d. regional promotion

204. When vegetables are stored they undergo a process termed _____ that yields principally water and carbon dioxide.

a. respiration
b. perspiration
c. dehydration
d. oxidation

205. A food that can be stored at room temperature for a prolonged or indefinite time period with minimal quality deterioration is said to be _____

a. room stable
b. shelf superior
c. shelf stable
d. room superior

206. _____ is the ingredient that imparts a unique color and flavor to cured neat products.

a. Sodium chloride
b. Sodium nitrate
c. Sodium citrate
d. Sodium nitrite

207. Chemically leavened dough uses _____ as a leavening agent.

a. air
b. baking powder
c. yeast
d. steam

208. Milk undergoes a process called _____ that is intended to break down fat globules so they are smaller and more uniform in size.

a. homogenization
b. pasteurization
c. encapsulation
d. emulsification

209. _____ is responsible for the bright cherry red color of ground beef.

a. Myoglobin
b. Oxymyoglobin
c. Metmyoglobin
d. Dinitrosohemochromogen

210. HACCP is an acronym that stands for _____

a. hazard analysis and critical control program
b. have a cup of coffee and pray
c. hazard analysis and critical control point
d. hazard analysis and critical command program

211. Foods that have a pH>5.3 are considered to be _____

a. high-acid foods
b. acid foods
c. medium-acid foods
d. low-acid foods

212. By using _____ the microbial species introduced for fermentation can be controlled.

a. back slopping
b. natural contamination
c. a starter culture
d. a mother culture

213. Proteins are primarily composed of _____

a. lipids
b. amino acids
c. sugars
d. carbohydrates

214. To determine the amount of free water available for microorganisms to grow in a food product, _____ is measured.

a. water activity
b. moisture content
c. relative humidity
d. water concentration

215. The process when ice becomes water vapor without first going through a liquid state is called _____

a. convection
b. evaporation
c. sublimation
d. osmosis

216. Lemon juice which is acidic would have an approximate pH of _____

a. 7.2
b. 8.1
c. 2.3
d. 6.8

217. Sucrose, or table sugar, is _____

a. a complex carbohydrate
b. made of galactose and fructose
c. made of glucose and galactose
d. a simple carbohydrate

218. A food contains 6 grams of fat. That would be equivalent to _____ calories.

a. 54
b. 24
c. 42
d. 60

219. A complex protein molecule that stimulates or speeds up a specific chemical reaction without being used up itself is called a(n)

a. microorganism
b. experiment
c. mycelium
d. enzyme

220. _____ is a system for monitoring food production for compliance with health, safety and product standards.

a. Research and development
b. HACCP
c. Quality assurance
d. Government inspection

221. Fragments of lipids and other components that are formed in lipid-containing foods that undergo irradiation are called

a. radiolytic products
b. nuclear waste
c. proteolytic products
d. radioactive

222. _____ is composed of one molecule of glycerol and three fatty acids.

a. Tryptophan
b. Maltose
c. Glycogen
d. A triglyceride

223. During the freezing process _____ can damage cell walls leading to changes in product texture and quality.

a. sugar crystals
b. salt crystals
c. carbon dioxide
d. ice crystals

224. Oil and water separate when mixed together due to the _____ portions of fatty acids in oil.

a. hydraulic
b. hydrophilic
c. hydrophobic
d. hydroscopic

225. Of the estimated 10,000 products introduced each year approximately_____ percent will survive in the marketplace.

a. 1
b. 26
c. 50
d. 75

226. A list of ingredients must be included on a food label. These ingredients are listed in descending order according to ingredient

a. bulk
b. weight
c. particle size
d. volume

227. A mom-and-pop store is a _____

a. store associated with chains that is smaller than the average supermarket and has limited food and household items
b. large self-service retail store commonly associated with chains
c. retail outlet that is not part of a chain, but is privately owned and operated
d. store associated with chains that are designed for one-stop shopping

228. An extruder is a piece of equipment commonly used to form _____
   a. meat patties
   b. crackers
   c. tortillas
   d. pasta

229. _____ was the first person to develop frozen foods on a commercial basis.
   a. H. Benjamin
   b. Clarence Birdseye
   c. Mark Labrador
   d. Colonel Sanders

230. Retail marketing of meat was revolutionized with the introduction of _____ in the 1960's.
   a. carcasses on the rail
   b. irradiated meat
   c. boxed meat
   d. MAP packaged meat

231. The _____ are the major parts of a wheat kernel.
   a. germ, bran, endosperm and husk
   b. germ, bran and endosperm
   c. fiber, germ bran and husk
   d. oil, bran, endosperm and hull

232. A plant employee that wears street shoes in a food manufacturing facility is not following
   a. HACCP
   b. GSP's
   c. OMP's
   d. SSOP's

233. Carbonation in soft drinks is commonly achieved by adding
   a. sodium bicarbonate
   b. sodium carbonate
   c. calcium carbonate
   d. carbon dioxide

234. The use of food additives in U.S. food products is regulated by the _____
   a. U.S. Food and Drug Administration
   b. U.S. Department of Agriculture Food Safety and Inspection Service
   c. U.S. Department of Commerce
   d. U.S. Environment Protection Agency

235. Removing all of the visible dirt, grime, grease and food particles in a food processing facility is called _____

a. sanitizing
b. cleaning
c. cleaning and sanitizing
d. dry pick-up

236. *Listeria monocytogenes* is a bacteria that grows at refrigeration temperatures and is considered to be a _____

a. refrigophile
b. psychrophile
c. mesophile
d. therinophile

237. An ingredient statement for a food product states that the food contains 'flour, starch, salt, flavorings, MSG and BHT. MSC is considered to be a _____

a. flavoring agent
b. colorant
c. anticaking agent
d. flavor enhancer

238. Casein in milk is an example of a _____

a. solid in liquid where the liquid is the dispersed phase and the solid is the continuous phase
b. gas in liquid where the gas is the dispersed phase and the liquid is the continuous phase
c. gas in liquid where the liquid is the dispersed phase and the gas is the continuous phase
d. solid in liquid where the solid is the dispersed phase and the liquid is the continuous phase

239. Oil is heated and reaches a temperature when small free fatty acids are volatized. This is called the _____

a. melting point of fat
b. smoke point
c. flash point
d. fire point

240. To produce sauerkraut, cabbage undergoes a _____ process.

a. fermentation
b. drying
c. freezing
d. cold sterilization

241. An antioxidant is added to food products to _____
   a. slow protein oxidation which causes rancidity
   b. slow lipid oxidation which causes caramelization
   c. inhibit the Maillard reaction
   d. slow lipid oxidation which causes rancidity

242. Essential amino acids _____
   a. are produced in our body through biochemical pathways
   b are only acquired through dietary intake
   c. are not necessary for survival
   d. are available in protein free foods

243. _____ is the number of degrees Fahrenheit required for a specific thermal death time curve to pass through one log cycle, or achieve 90% destruction.
   a. D-value
   b. F-value
   c. L-value
   d. Z-value

244. Canning food products is a method of
   a. preservation
   b. deterioration
   c. pasteurization
   d. aseptic processing

245. An example of a food attribute would be the _____
   a. flavor of a chocolate bar
   b. color of meat
   c. texture of a tomato
   d. all of the above

FOOD SCIENCE AND TECHNOLOGY
CAREER DEVELOPMENT EVENT
2005 WILD HOG WORKSHOP

1. Sucrose, galactose and glucose caramelize at 170°C. This is equivalent to _____.
   a. 126°F
   b. 338°F
   c. 248°F
   d. 77°F

2. _____ is scientifically evaluating a new food product such as Pop-Tarts Yogurt Blasts for appearance, odor, taste, and mouthfeel.
   a. Proximate analysis
   b. Food chemistry
   c. Market analysis
   d. Sensory evaluation

3. An example of a homogenous mixture is (a)
   a. pizza
   b. salad containing lettuce, vegetables and cheese
   c. cola
   d. beef stew

4. Food heats up in a microwave oven primarily due to vibration of _____ molecules.
   a. water
   b. fat
   c. protein
   d. carbohydrate

5. *Clostridium botulinum* is the organism that causes _____.
   a. hemolytic uremic syndrome
   b. vomiting
   c. botulism
   d. necrotic enteritis

6. Meat, fruits and vegetables contain between 70 to 90 percent _____.
   a. carbohydrates
   b. protein
   c. fat
   d. water

7. Pudding that is prepared by cooking thickens as it cools due to the use of _____.
   a. milk
   b. starch
   c. sugar
   d. vanilla

8. Using a process called _____ liquid vegetable oils are changed to shortening and margarine.
   a. hydrogenation
   b. oxidation
   c. saturation
   d. aeration

9. _____ is an elastic, stretchy protein found in wheat.
   a. Myosin
   b. Casein
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19. The FDA has a list of over 600 ingredients considered safe and not designated as additives that appear on a GRAS list. GRAS is an acronym for _____.
    a. generally recognized as safe
    b. government recognition as sound
    c. government recognized as safe
    d. generally recognized as secure

20. Pressure canners used in the commercial manufacture of canned products are known as _____.
    a. steam blanchers
    b. retorts
    c. plate exchangers
    d. sublimators

21. Meat products that have been irradiated bear _____ on the product label at retail.

a. a radura
b. no symbol or term indicating the product has been irradiated
c. the term electronically pasteurized
d. the term electronically sterilized

22. A food contains 4 grams of protein, 5 grams of fat, and 2 grams of carbohydrates. That would be equivalent to _____ calories.

a. 64
b. 69
c. 54
d. 128

23. _____ is added to meat to produce a cured meat color and flavor, and to serve as an antibotulinal agent.

a. Sodium erythorbate
b. Sodium phosphate
c. Sodium chloride
d. Sodium nitrite

24. _____ is considered to be basic because the number of hydroxide ions outnumber the hydrogen ions in a solution.

a. lemon juice
b. water
c. baking soda
d. coffee

25. To determine the amount of free water available for microbes to use in a food system, a food scientist would measure the _____ of that food.

a. water activity
b. percent water
c. pH
d. brix

26. When peanuts are ground to make peanut butter, a _____ is added. This keeps the peanut oil from separating out to the top of the jar during storage.

a. caking agent
b. stabilizer
c. humectant
d. antioxidant

27. The family of compounds that includes fats and oils is called _____.
    a. carbohydrates
    b. proteins
    c. lipids
    d. amines

28. Which of the following packages is an example of aseptic packaging?
    a. plastic milk carton
    b. Tetra Pak drink box
    c. glass drinkbottle
    d. plastic bread bag

29. Polyethylene terephtalate, commonly known as _____, is the packaging material used for 2 liter soda bottles.
    a. PolyT
    b. PETP
    c. PT
    d. PET

30. A food that would be rich in omega-3 fatty acids would be _____.
    a. fatty fish
    b. lard
    c. olive oil
    d. butter

31. To measure the texture of a d=Anjou pear, a food technologist might use a _____
    a. spiral plater
    b. gas chromatograph
    c. texture analyzer
    d. stomacher

32. What happens to the boiling point of water when it is heated at high altitudes?
    a. It increases
    b. It decreases
    c. It stays the same
    d. Water doesn't boil at high altitude

33. Regulations prescribe how ingredients must be listed on food labels. What is the general stipulation with respect to the order that ingredients are listed?
    a. By alphabetical order
    b. By ascending order of proportion by weight
    c. By descending order of proportion by weight
    d. By descending order of proportion by volume

34. Cheese curd is primarily composed of coagulated _____.
    a. protein
    b. fat
    c. carbohydrate
    d. lactose

35. Sodium benzoate is used as a preservative in soft drinks to inhibit growth of_____.
    a. bacteria
    b. molds
    c. yeasts
    d. viruses

36. The red color of a tomato is due to a compound called _____.
    a. beta carotene
    b. lycopene
    c. limonene
    d. myosin

37. Peppers can deliver a very hot sensation when consumed because of the _____ level in the pepper.
    a. fructose
    b. citric acid
    c. theobromine
    d. capsaicin

38. The chemical name for table salt is _____.
    a. sodium bicarbonate
    b. potassium nitrate
    c. sodium chloride
    d. sodium bisulfite

39. When proteins begin to break down in meat, the process is called _____.
    a. proteolysis
    b. lipolysis
    c. glycolysis
    d. hydrolysis

40. A compound that has little or no flavor itself but is added to food to assist or boost the primary flavor of the food to which it is added is a _____.
    a. processing aid
    b. humectant
    c. stabilizer
    d. flavor enhancer

41. Glucose is a simple sugar, also known as a _____.

a. disaccharide
b. monosaccharide
c. polysaccharide
d. multisaccharide

42. When a food processing plant is cleaned at the end of a production day, the order of clean-up is _____

a. rinse, clean with detergent, dry pick up, rinse, sanitize
b. clean with detergent, rinse, sanitize, rinse, dry pick up
c. dry pick up, rinse, clean with detergent, rinse, sanitize
d. dry pick up, rinse, clean with detergent, sanitize, rinse

43. When water is used as an ingredient in food formulations, it must be _____.

a. soft water
b. potable water
c. hard water
d. purified water

44. _____ is an ingredient used in food to slow the reaction of lipids forming free radicals leading to oxidative rancidity in food.

a. Butylated hydroxyanisole
b. Sodium caseinate
c. Potassium sorbate
d. Disodium inosinate

45. All the essential amino acids would most likely be found in one serving of_____.

a. peanuts
b. legumes
c. bran cereal
d. beef

46. Milk and ice cream processing involves both homogenization and pasteurization. Homogenization is _____.

a. evaporation of liquid under vacuum leaving a concentrate
b. addition of bacterial starter cultures
c. reduction in size of fat globules by forcing the milk or cream through a very small opening under pressure
d. rapid heating of milk to very high temperatures to kill disease-causing bacteria in the milk product

47. The brownish color of aerobically packaged ground beef that has been stored in a refrigerator for several days is due to _____.

a. deoxymyoglobin
b. metmyoglobin
c. myoglobin
d. oxymyoglobin

48. _____ is a preventative food safety program required by juice processors.
    a. GMP's
    b. SSOP's
    c. Quality assurance
    d. HACCP

49. The building blocks of protein are called _____.
    a. amino acids
    b. monosaccharides
    c. fatty acids
    d. triglycerides

50. The enzyme added to milk to cause curd formation in cheese is called _____.
    a. amylase
    b. rennin
    c. lactase
    d. maltase

2005 WILD HOG EXAM ANSWERS

1. B
2. D
3. C
4. A
5. C
6. D
7. B
8. A
9. C
10. D
11. B
12. D
13. B
14. A
15. D
16. B
17. C
18. C
19. A
20. B
21. A
22. B
23. D
24. C
25. A
26. B
27. C
28. B
29. D
30. A
31. C
32. B
33. C
34. A
35. B
36. B
37. D
38. C
39. A
40. D
41. B
42. C
43. B
44. A
45. D
46. C
47. B
48. D
49. A
50. B

1998 FFA Food Science Exam

Team ID#_____ Name:_____

Select the appropriate answer for each of the following questions by circling the letter that precedes the best response to the question.

1. Which of the following foodborne illnesses is due to ingestion of a toxin?

a) salmonellosis
b) botulism
c) camplobacteriosis
d) yersiniosis

2. What is the largest cost of producing food?

a) materials
b) labor
c) packaging
d) storage

3. What is the number one ingredient that older people (out of high school) in American are concerned about in foods today?

a) iron
b) calcium
c) fat
d) protein

4. How is the order of additives determined on the label of a product?

a) by toxicity level
b) by prevalence in the product
c) by caloric index
d) by producer expense

5. What food group generally varies the most throughout the year?

a) dairy products
b) grains
c) meat products
d) seasonal fruits and vegetables

6. How big is the food industry?

a) 2"d largest industry in the US
b) 6d' largest industry in the US
c) 13th largest industry in the US
d) largest industry in the US

7. What is sensory evaluation of foods?

a) evaluation of foods by analytical methodology
b) evaluation of foods by use of smell, taste and sight
c) an FDA procedure developed to evaluate foods
d) a descriptive database developed to evaluate foods

8. What country spends the smallest proportion of their income on food?

a) USA
b) Norway
c) Ethiopia
d) Japan

For questions 9-13, what is the role of each of the processing systems with regard to the conditions necessary for microbial growth?

9. How much water is found in produce?

a) 35-47% water
b) 50-60% water
c) 70-90% water
d) 95-98% water

10. What is the role of dehydration?

a) makes microbes dormant, preventing growth
b) removes moisture, preventing growth of microbes
c) destroys the DNA of microbes
d) fractures the cell walls of microbes

11. What is the role of refrigeration in food processing?

a) destroys microbial growth
b) slows microbial growth
c) changes moisture, preventing microbial growth
d) prevents re-colonization of microbes

12. What is the major concern about microbial growth in foods?

a) development of off flavors
b) production of toxins
c) shortened shelf life
d) fermentation and production of alcohol

13. What is the role of irradiation?

a) Most microbes are burnt and will not recover.
b) eliminates microbes
c) destroys cancerous microbes
d) DNA damage to most microbes

14. What is the role of milling and cereal processing?

a) physically destroys most microbes
b) does little to inhibit microbial growth
c) eliminates pathogens found in the hull of wheat
d) slows growth of yeasts and molds

15. What is the role of fermentation?

a) raises ethanol content inhibiting hazardous microbes
b) yeasts engorge and destroy unwanted microbes
c) acetic acid is produced, killing microbes
d) alters pH, encouraging only friendly microbes to grow

16. What is the major cause of deterioration of potato chips?

a) browning reactions
b) oxidation
c) loss of moisture
d) carmelization

17. Why are agrichemicals used to produce our food supply?

a) as a method to increase yields
b) control unwanted pests
c) none of the above
d) both a and b above

18. What are the best packaging materials for freezing foods?

a) materials that allow the food to breath
b) materials that: seal moisture in and conform to food
c) materials that expand with the ice crystals
d) inexpensive materials that allow the food to breath

19. The process of heating milk is called pasteurization. The primary objective of pasteurization is to:

a) increase the nutritional value
b) destroy potential pathogens present in the milk
c) improve the keeping quality of the milk
d) none of the above

20. What steps would you take to prepare beef for freezing?

a) cut into small pieces, remove excess fat and moisture
b) remove excess fat and store like cuts together
c) add water solution to larger cuts of beef
d) individually wrap cuts of meat and add water

21. How do bacteria reproduce?

a) symbiosis
b) expansion and division
c) binary fission
d) phagocytosis

22. How do yeasts reproduce?

a) fission
b) division
c) phagocytosis
d) budding

23. Most food poisoning outbreaks in the U.S. are due to consuming food contaminated with:

a) antibiotics
b) pesticides
c) pathogenic bacteria
d) heavy metals

24. Conditions that promote bacterial growth are:

a) suitable temperature
b) available moisture
c) available nutrients
d) all of the above

25. What are the three types of microorganisms?

a) rods, cones and spheres
b) aerobic, semi-aerobic, and anaerobic
c) psychrotrophic, psychrophillic and mesophillic
d) yeasts, molds and bacteria

26. How are yeasts and molds similar?

a) Both are plants.
b) Both are animals.
c) Both are single-celled.
d) Both reproduce by division.

27. Under what conditions will mold not grow?

a) pH 6.3 or below
b) anaerobic conditions
c) microaerophillic conditions
d) at refrigerated temperatures

28. What is catalase and where is it found/used?

a) a chemical used to inhibit sprout formation
b) an insecticide used on crops
c) a protein found in wheat
d) an enzyme found in most aerobic cells

29. Are all molds growing in food undesirable?

a) Yes, molds product toxins.
b) Yes, mold:, cause the deterioration of produce.
c) Yes, molds produce off flavors in foods.
d) No, molds are deliberately inoculated into some foods.

30. Who discovered the role of yeast in fermentation?

a) L. Pasteur in 1859
b) E. Fermi in 1859
c) A. Flemming in 1907
d) none of the above

31. Molds need oxygen to grow.

a) True
b) False

32. Are foodborne illnesses always easy to diagnose?

a) Yes, the common symptom of nausea occurs in all cases.
b) No, it takes a well trained physician to diagnose foodborne illness.
c) No, often symptoms do not appear for days or months.
d) No, examination of the causative agent is needed for diagnosis.

33. What are two factors that accelerate rancidity in food products?

a) light and heat
b) light and oxygen
c) heat and moisture
d) moisture and light

34. Which of the following are all produced by lactic acid fermentation?

a) pickles, mustard, and cheese
b) cheese, soy sauce, yogurt, and sauerkraut
c) soy sauce, cheese, yogurt, and buttermilk
d) pickles, cheese, yogurt, and olives

35. What are common problems associated with the development of new pesticides in the U.S.?

a) cost of development
b) dangers of testing new pesticides
c) destruction of nitrogen in soil
d) time period from development to marketing

36. Chymosin is-an enzyme preparation that performs the following function:

a) hydrolyses starch to glucose
b) hydrolyses pectins
c) coagulates milk
d) hydrolyses lactose to glucose + galactose

37. All processed foods contain added chemical preservatives

a) True
b) False

38. Which animals are selected in testing for toxins in foods?

a) old and helpless animals
b) animals are selected based on intelligence
c) animals are selected by age
d) animals are selected with the highest sensitivity to the substance to be tested

39. What color is nitrosomyoglobin and nitrosohemochrome found in uncooked and cooked meats, respectively?

a) pink, brown
b) dark red, light pink
c) red, colorless
d) blue, blue-gray

40. Why do plants have natural toxic substances?

a) so animals won't eat them
b) to preserve flavor compounds
c) to provide halucinogenic effects
d) defense against bacteria, molds and insects

41. What is NAACP?

a) a governmental agency that assures truth in labeling
b) a governmental agency that guarantees price controls
c) guidelines to insure food safety in processing, packaging, distribution, storage and preparation of food
d) guidelines for employee training in the food industry

42. What is the natural toxin present in potatoes?

a) solanine
b) aflatoxin
c) brucella
d) none of the above

43. The federal regulatory agency responsible for approving food additives is:

a) FDA
b) NASA
c) USDA
d) EPA

44. Who is responsible for monitoring the food supply for pesticide residues?

a) FDA
b) USDA
c) EPA
d) all of the above

45. When determining the toxicity of chemicals in foods, what is an MTD?

a) medium target dose
b) minimum target dose
c) maximum target dose
d) medical target dose

46. Why are processed foods often more nutritious than fresh foods

a) Fresh foods have a short shelf life.
b) Fresh foods often have mold growth.
c) Bacteria frequently decrease the nutritional content of fresh foods.
d) Fresh foods are not fortified like processed foods.

47. Organic foods are:

a) more nutritious than conventional foods
b) less nutritious than conventional foods
c) the same as conventional foods
d) much more nutritious than conventional foods

48. Herbicides are used:

a) to increase crop yields
b) to kill insects
c) to kill weeds
d) to kill fungus

49. What is the number one nutritional problem in the United States?

a) heart disease
b) obesity
c) diabetes
d) anorexia

50. What percentage of pesticide residues in foods has exceeded the tolerance levels in the past 25 years?

a) less than 1
b) between 1 and 3%
c) 5%
d) 7%

1999 FFA Food Science Exam

Team ID# _____ Name:_____

Select the appropriate answer for each of the following questions by circling the letter that precedes the best response to the question.

1. The process of heating milk is called pasteurization. The primary objective of pasteurization is to:

a) increase the nutritional value
b) destroy potential pathogens present in the milk
c) improve the keeping quality
d) improve the flavor and mouthfeel

2. Nutrients for which health claims are allowed on packaging include all of the following **EXCEPT**

a) calcium (osteoporosis)
b) dietary fiber (cardiovascular disease and cancer)
c) sodium (hypertension)
d) Zinc (skin conditioning)

3. What are common problems associated with the development of new pesticides in the U.S.?

a) cost of ingredients
b) dangers of testing new pesticides
c) destruction of nitrogen in soil
d) time period from development to marketing

4. The purpose of blanching is to

a) kill pathogens in a product
b) kill all bacteria in a product
c) inactivate enzymes in a product
d) reduce the amount of water in a product

5. Agricultural commodity groups are

a) farm groups which sponsor and promote advertising, research and educational activities.
b) responsible for setting base wholesale prices for agricultural products.
c) no longer important in the U.S. because of corporations.
d) designed to protect consumers from foodbome illness.

6. Dehydration is

a) addition of antioxidants to foods
b) a form of food preservation
c) removal of fat from a food product
d) removal of off flavors from a food product

7. What is HAACP?

a) a governmental agency that assures truth in labeling
b) a governmental agency that guarantees price controls
c) guidelines to insure food safety in processing, packaging, distribution, storage and preparation of food
d) guidelines for employee training in the food industry

8. What is the primary role of fermentation?

a) raises ethanol content, inhibiting hazardous microbes
b) yeasts grow, destroying unwanted microbes
c) acetic acid is produced, killing microbes
d) alters pH, encouraging desirable microbes to grow

9. What are the best packaging materials for freezing foods?

a) materials that allow the food to breath
b) materials that seal moisture in and conform to food
c) materials that expand with the ice crystals
d) inexpensive materials

10. What steps would you take to prepare beef for freezing?

a) cut into small pieces, remove excess fat and moisture
b) remove excess fat and store like cuts together
c) add water solution to larger cuts of beef
d) individually wrap cuts of meat and add water

11. The main goal of food biotechnology is to

a) improve the health and safety of foods
b) clone tomatoes
c) increase milk production
d) develop foods for space flight

12. The purpose of hydrogenation of oils is to do all of the following **EXCEPT**

a) Make the fat or oil less susceptible to oxidation and rancidity.
b) Change liquid oils into semisolids.
c) improve the nutritive quality
d) Increase the melting point of the fat.

13. Why do plants have natural toxic substances?

a) so animals won't eat them
b) to preserve flavor compounds
c) to provide halucinogenic effects
d) defense against bacteria, molds and insects

14. All of the following statements about irradiation are true **EXCEPT**

a) Natural levels of radioactivity are not raised to harmful levels.
b) Irradiated foods taste different than their non-irradiated counterparts.
c) Significant levels of toxins or carcinogens are not produced in foods.
d) Irradiated foods are nutritious.

15. Food products that are packaged hermetically are

a) impervious to water, gases and vapors.
b) edible.
c) recyclable.
d) commercially sterile.

16. Distinguish between enriched and fortified. Enrichment is the addition of nutrients

a) to replace those lost during processing (not in excess of natural levels).
b) to replace those lost during processing (in excess of natural levels).
c) in amounts greater than normally found in the given food.
d) to products that do not normally contain the nutrient.

17. Why are processed foods often more nutritious than fresh foods?

a) Fresh foods have a short shelf life.
b) Fresh foods often have mold growth.
c) Bacteria frequently decrease the nutritional content of fresh foods.
d) Fresh foods are not fortified like processed foods.

18. Organic foods are

a) more nutritious than conventional foods
b) less nutritious than conventional foods
c) the same as conventional foods
d) much more nutritious than conventional foods

19. Psychrotrophic / psychrophilic bacteria

a) grow at high temperatures (110-140°F)
b) grow at intermediate temperatures (50-100°F)
c) grow down to the freezing point (< 50°F)
d) are sensitive to salt.

20. The Federal Trade Commission (FTC)

a) regulates all international trade.
b) oversees shipment of goods across state lines
c) inspects all product that enters the U.S.
d) is in charge of maintaining standards in advertising

21. The Consumer Price Index (CPI) is

a) the annual average per capita expenditure
b) the annual average per capita expenditure on food
c) a measure of the average change in prices over time for specific goods or services
d) a one-year advance projection of the average per capita cost of goods and services

22. Tests that measure for the presence of carcinogens in the food supply are very sensitive. If a carcinogen is reported to be found in a food product at parts per billion (PPB), what level is this?

a) milligrams (10-3)
b) micrograms (10-6)
c) nanograms (10-6)
d) pictograms (10-")

23. Which of the following is NOT a carbohydrate:

a) lactose
b) fiber
c) beta-glucan
d) beta-lactoglobulin

24. How is the order determined for the list of ingredients on the label of a product?

a) by toxicity level
b) by weight per volume
c) by caloric index
d) by producer expense

25. What color is oxymyoglobin and myoglobin found in uncooked and cooked meats, respectively?

a) bright red, brown
b) dark red, light pink
c) red, colorless
d) blue, blue-gray

26. The process by which heat is transferred into a product by direct contact is called

a) conduction
b) convection
c) radiation
d) surface action

27. Which of the following foodborne illnesses is due to ingestion of a toxin?

a) salmonellosis
b) botulism
c) listeriosis
d) yersimosis

28. Which of the following do all microorganisms need to live

a) oxygen
b) light
c) water
d) all of the above

29. Most food poisoning outbreaks in the U.S. are due to consuming food contaminated with:

a) antibiotics
b) pesticides
c) pathogenic bacteria
d) heavy metals

30. Both oil-in-water and water-in-oil emulsions exist in food products. Which of the following is an oil-in-water emulsion?

a) milk shake
b) brownie
c) ketchup
d) butter

31. What percentage of pesticide residues in foods has exceeded the tolerance levels in the past 25 years?

a) less than 1
b) between 1 and 3%
c) 5%
d) 7%

32. What is the largest cost of producing food?

a) materials
b) storage
c) packaging
d) labor

33. The amount of each of the following nutrients must be listed on a food label **EXCEPT**

a) fat
b) sodium
c) total carbohydrates
d) calcium

34. The process by which a protein is broken down into peptides is called

a) peptidolysis
b) proteolysis
c) lipolysis

d) glycolysis

35. Which of the following costs the food industry the most money in losses each year?

a) microorganisms
b) rodents
c) thefts
d) natural disasters

36. How many servings of breads, cereals, rice and/or pasta should you consume each day?

a) 2-3
b) 3-5
c) 6-11
d) 12-14

37. Which country spends the smallest proportion of their income on food?

a) USA
b) Norway
c) Ethiopia
d) Japan

38. How much water is typically found in fresh produce?

a) 3-10%
b) 15-20%
c) 75-90%
d) 95-98%

39. Oxidation is the process where

a) a reactant gains electron(s).
b) a reactant loses electron(s).
c) fat is digested.
d) protein is digested.

40. What is the major cause of deterioration of potato chips?

a) browning reactions
b) oxidation
c) loss of moisture
d) gain of moisture

41. How do yeasts reproduce?

a) fission
b) division
c) phagocytosis

d) budding

42. Under what conditions will mold NOT grow?

a) pH 6.3 or below
b) anaerobic conditions
c) microaerophillic conditions
d) at refrigerated temperatures

43. Chymosin is an enzyme preparation that hydrolyses

a) starch to glucose
b) pectins
c) proteins in milk into peptides
d) lactose to glucose and galactose

44. Which federal regulatory agency is responsible for approving food additives?

a) FDA
b) NASA
c) USDA
d) EPA

45. Who is responsible for monitoring the food supply for pesticide residues?

a) FDA
b) NASA
c)USDA
d) EPA

46. Lyophilization is the technical term for

a) freeze drying
b) blanching
c) digestion
d) bread rising

47. What is the natural toxin present in potatoes?

a) solanine
b) aflatoxin
c) brucella
d) alar

48. When determining the toxicity of chemicals in foods, what is a MTD?

a) minimum tolerated dose
b) maximum tolerated dose
c) military target dose

d) medical target dose

49. Herbicides are used

a) to increase herb yields
b) to kill insects
c) to kill weeds
d) to kill fungus

50. What is the number one nutritional problem in the United States?

a) heart disease
b) obesity
c) diabetes
d) anorexia

2000 FFA Food Science Exam

Team ID# _____ Name: _____

Select the appropriate answer for each of the following questions by circling the letter that precedes the best response to the question.

1. The diet we consume can influence quality and length of our lives. The leading cause of death in the US is:

a) Diabetes
b) Motor vehicle accidents
c) Heart diseases
d) Food poisoning

2. Nutrients for which health claims are allowed on packaging include all of the following **EXCEPT:**

a) Calcium (osteoporosis)
b) Dietary fiber (cardiovascular disease and cancer)
c) Sodium (hypertension)
d) Zinc (skin conditioning)

3. Stabilizers are common food additives. Their primary role is to:

a) maintain the texture and body of food products by binding water.
b) retain moisture and keep foods soft.
c) keep foods dry and prevent clumping as moisture is absorbed in foods.
d) improve baking properties and whiten appearance of a food.

4. Dehydration is:

a) addition of antioxidants to foods
b) a form of food preservation
c) removal of fat from a food product
d) removal of off flavors from a food product

5. Sanitation:

a) Kills all vegetative and non-vegetative microorganisms in a product
b) Yields a product that is shelf stable for up to 12 months
c) Yields a product that has an extended shelf life under refrigerated conditions
d) Destroys pathogens and other organisms on a clean surface

6. The purpose of blanching is to:

a) kill pathogens in a product.
b) kill all bacteria in a product.
c) inactivate enzymes in a product.
d) reduce the amount of water in a product.

7. Agricultural commodity groups are:

a) responsible for setting base wholesale prices for agricultural products.
b) no longer important in the U.S. because of corporations.
c) designed to protect consumers from foodborne illness.
d) farm groups which sponsor and promote advertising, research and education.

8. HAACP is:

a) a governmental agency that assures truth in labeling.
b) a governmental agency that guarantees price controls.
c) guidelines followed by food processors to insure food safety.
d) guidelines for employee training in the food industry.

9. What is the primary benefit of fermentation?

a) raises ethanol content, inhibiting hazardous microbes
b) promotes yeast growth, destroying unwanted microbes
c) produces acetic acid, enhancing nutritive value
d) alters pH, encouraging desirable microbes to grow

10. What are the best packaging materials for frozen foods?

a) Materials that allow the food to breathe
b) Materials that seal moisture in and conform to food
c) Materials that expand with the ice crystals
d) Inexpensive materials

11. What steps would you take to prepare beef for freezing?

a) Cut into small pieces, remove excess fat and moisture
b) Remove excess fat and store like cuts together
c) Add water solution to larger cuts of beef
d) Individually wrap cuts of meat and add water

12. The main goal of food biotechnology is to:

a) Improve the health and safety of foods
b) Clone products that are in highest demand
c) Increase life expectancy of human beings
d) Develop foods for space flight

13. Why do plants have natural toxic substances?

a) So animals won't eat them.
b) To preserve flavor compounds.
c) To provide halucinogenic effects.
d) To provide defense against bacteria, molds and insects.

14. Why are processed foods often more nutritious than fresh foods?

a) Fresh foods have a short shelf life.
b) Fresh foods often have mold growth.
c) Bacteria frequently decrease the nutritional content of fresh foods.
d) Fresh foods are not fortified like processed foods.

15. Organic foods are:

a) more nutritious than conventional foods.
b) less nutritious than conventional foods.
c) nutritionally the same as conventional foods.
d) less regulated than conventional foods.

16. Psychrotrophic/psychrophilic bacteria grow:

a) at high temperatures (110-140°F)
b) down to the freezing point (< 50°F)
c) at low pH.
d) at high salt concentrations (up to 10%).

17. Facultative anaerobes:

a) Do not grow in the presence of oxygen.
b) Do not grow in the absence of oxygen.
c) Can grow both in the presence and absence of oxygen.
d) Survive, but do not grow in the absence of oxygen.

18. Some microorganisms can potentially be beneficial in foods, including all **EXCEPT:**

a) Saccharomyces
b) Lactobacillus
c) Penicillium
d) Escherichia Coli

19. Unsaturated fatty acids:

a) Contain at least one double bond between carbon atoms
b) Contain no double bonds between carbon atoms
c) Are more abundant in animal tissue than plant tissue
d) Have short carbon chains.

20. Food products that are packaged hermetically are

a) edible.
b) recyclable.
c) commercially sterile.
d) impervious to water, gases and vapors.

21. Enrichment is the addition of nutrients

a) to replace those lost during processing (not in excess of natural levels).
b) to replace those lost during processing (in excess of natural levels).
c) in amounts greater than normally found in the given food.
d) to products that do not normally contain the nutrient.

22. Fortification is the addition of nutrients

a) to replace those lost during processing (not in excess of natural levels).
b) to replace those lost during processing (in excess of natural levels).
c) in amounts greater than normally found in the given food.
d) to products that do not normally contain the nutrient.

23. The Federal Trade Commission (FTC):

a) regulates all international trade.
b) oversees shipment of goods across state lines
c) inspects all product that enters the U.S.
d) is in charge of maintaining standards in advertising

24. The Consumer Price Index (CPI) is

a) the annual average per capita expenditure.
b) the annual average per capita expenditure on food.
c) a measure of the average change in prices over time for specific goods or services.
d) a one-year advance projection of the average per capita cost of goods and services.

25. All of the following statements about irradiation are true **EXCEPT:**

a) Natural levels of radioactivity are not raised to harmful levels.
b) Irradiated foods taste different than their non-irradiated counterparts.
c) Significant levels of toxins or carcinogens are not produced in foods.
d) Irradiated foods are nutritious.

26. Tests that measure for the presence of carcinogens in the food supply are very sensitive. If a carcinogen is found in a food product at parts per billion (PPB), what level is this?

a) milligrams (10^{-3})
b) micrograms (10^{-6})
c) nanograms (10^{-9})
d) pictograms (10^{-12})

27. Which of the following is NOT a carbohydrate:

a) lactose
b) fiber
c) beta-glucan
d) beta-lactoglobulin

28. How is the order determined for the list of ingredients on the label of a product?

a) alphabetically
b) by weight per volume
c) by caloric contribution
d) by producer expense

29. What color is oxymyoglobin and myoglobin found in uncooked and cooked meats, respectively?

a) bright red, brown
b) dark red, light pink
c) red, colorless
d) blue, blue-gray

30. The process by which heat is transferred into a product by direct contact is called

a) conduction
b) convection
c) radiation
d) surface action

31. Which of the following foodborne illnesses is due to ingestion of a toxin?

a) salmonellosis
b) botulism
c) listeriosis
d) yersiniosis

32. Which of the following do all microorganisms need to live?

a) oxygen
b) light
c) water
d) all of the above

33. Most food poisoning outbreaks in the U.S. are due to consuming food contaminated with:

a) antibiotics
b) pesticides
c) pathogenic bacteria
d) heavy metals

34. Both oil-in-water and water-in-oil emulsions exist in food products. Which of the following is an oil-in-water emulsion?

a) milk shake
b) brownie
c) ketchup
d) butter

35. What percentage of pesticide residues in foods has exceeded the tolerance levels in the past 25 years?

a) less than 1 %
b) between 1 and 3
c) 5%
d) 7%

36. The amount of each of the following nutrients must be listed on a food label **EXCEPT:**

a) fat
b) sodium
c) total carbohydrates
d) calcium

37. The process by which a protein is broken down into peptides is called

a) hemolysis
b) proteolysis
c) lipolysis
d) glycolysis

38. Which of the following costs the food industry the most money in losses each year?

a) microorganisms
b) rodents
c) thefts
d) natural disasters

39. How many servings of breads, cereals, rice and/or pasta should you consume each day?

a) 2-3
b) 3-5
c) 6-11
d) 12-14

40. Which country spends the smallest proportion of their income on food?

a) USA
b) Norway
c) Ethiopia
d) Japan

41. How much water is typically found in fresh produce?

a) 3-10%
b) 15-20%
c) 75-90%
d) 95-98%

42. Oxidation is the process where:

a) a reactant gains electron(s).
b) a reactant loses electron(s).
c) fat is digested.
d) protein is digested.

43. What is the major cause of deterioration of potato chips?

a) browning reactions
b) oxidation
c) loss of moisture
d) gain of moisture

44. How do yeasts reproduce?
a) fission
b) division
c) phagocytosis
d) budding

45. Under what conditions will mold **NOT** grow?

a) pH 6.3 or below
b) anaerobic conditions
c) microaerophillic conditions
d) at refrigerated temperatures

46. Which federal regulatory agency is responsible for approving food additives?

a) FDA
b) NASA
c) USDA
d) EPA

47. Who is responsible for monitoring the food supply for pesticide residues?

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b) NASA
c) USDA
d) EPA

48. Lyophilization is the technical term for:

a) freeze drying
b) blanching
c) digestion
d) bread rising

49. What is the natural toxin present in potatoes?

a) solanine
b) aflatoxin
c) brucella
d) afar

50. When determining the toxicity of chemicals in foods, what is a MTD?

a) minimum tolerated dose
b) maximum tolerated dose
c) military target dose
d) medical target dose

2001 FFA Food Science Exam

Team ID#_____ Name:_____

Circle the letter that precedes the best response to the question.

1. The Federal Trade Commission (FTC):
   a) regulates all international trade.
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   c) inspects all products that enter the U.S.
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2. The Consumer Price Index (CPI) is:
   a) the annual average per capita expenditure.
   b) the annual average per capita expenditure on food.
   c) a measure of the average change in prices over time for specific goods or services.
   d) a one-year advance projection of the average per capita cost of goods and services.

3. Saturated fats…
   a) contain double bonds between carbon atoms.
   b) do not contain double bonds between carbon atoms; unsaturated fats do.
   c) are bad for human health.
   d) make a person feel satiated after eating a meal.

4. Nutrient health claims are allowed on packaging for each of the following, **EXCEPT**:
   a) Calcium (osteoporosis)
   b) Dietary fiber (cardiovascular disease, cancer)
   c) Sodium (hypertension)
   d) Zinc (skin conditioning)

5. Sanitizers:
   a) Yield a product that is shelf stable for up to 12 months.
   b) Yield a product that has an extended shelf life under refrigerated conditions.
   c) Kill all vegetative and non-vegetative microorganisms in a food product.
   d) Destroy pathogens and other organisms on a clean surface.

6. The purpose of blanching is to:
   a) inactivate enzymes in a product.
   b) reduce the amount of water in a product.
   c) kill pathogens in a product.
   d) kill all bacteria in a product.

7. Psychrotrophic/psychrophilic bacteria grow:
   a) at high temperatures (110-140˚F)
   b) down to the freezing point (< 50˚F)
   c) at low pH.
   d) at high salt concentrations (up to 10%).

8. Facultative anaerobes:
   a) Do not grow in the presence of oxygen.
   b) Do not grow in the absence of oxygen.
   c) Can grow both in the presence and absence of oxygen.
   d) Survive, but do not grow in the absence of oxygen.

9. Agricultural commodity groups are:
    a) responsible for setting base wholesale prices for agricultural products.
    b) no longer important in the U.S. because of corporations.
    c) designed to protect consumers from foodborne illness.
    d) farm groups which sponsor and promote advertising, research and education.

10. HAACP is a:
    a) governmental agency that assures truth in labeling.
    b) governmental agency that guarantees fair prices.
    c) set of guidelines followed by food processors to insure food safety.
    d) set of guidelines for employee training in the food industry.

11. What are the best packaging materials for frozen foods?
    a) Materials that allow the food to breathe
    b) Materials that seal moisture in and conform to food
    c) Materials that expand with the ice crystals
    d) Inexpensive materials

12. The main goal of food biotechnology is to:
    a) Improve the health and safety of foods
    b) Clone products that are in highest demand
    c) Increase life expectancy of human beings
    d) Develop foods for space flight

13. Why do plants have natural toxic substances?
    a) So animals won't eat them.
    b) To preserve flavor compounds.
    c) To provide halucinogenic effects.
    d) To provide defense against bacteria, molds and insects.

14. Why are processed foods often more nutritious than fresh foods?
    a) Fresh foods have a short shelf life.
    b) Fresh foods often have mold growth.
    c) Bacteria frequently decrease the nutritional content of fresh foods.
    d) Fresh foods are not fortified like processed foods.

15. Organic foods are:
    a) more nutritious than conventional foods.
    b) less nutritious than conventional foods.
    c) nutritionally the same as conventional foods.
    d) less regulated than conventional foods.

16. Stabilizers are common food additives. Their primary role is to:
    a) maintain the texture and body of food products by binding water.
    b) retain moisture and keep foods soft.
    c) keep foods dry and prevent clumping as moisture is absorbed in foods.
    d) improve baking properties and whiten appearance of a food.

17. Dehydration is:

a) addition of antioxidants to foods
b) a form of food preservation
c) removal of fat from a food product
d) removal of off flavors from a food

18. For safety, maintain the internal temperature of foods that will be served hot at or above:
a) 40˚F
b) 100˚F
c) 140˚F
d) 180˚F

19. All of the following are fermented products, **EXCEPT**:
a) wine
b) pickles
c) hot dogs
b) yogurt

20. All of the following statements about irradiation are true **EXCEPT:**
a) Natural levels of radioactivity are not raised to harmful levels.
b) Irradiation significantly affects the color, aroma and flavor of foods.
c) Significant levels of toxins or carcinogens are not produced in foods.
d) Irradiated foods are nutritious.

21. Examples of stabilizers used in foods include **all** of the following, **EXCEPT**:
a) Gums
b) Retinol
c) Starch
d) Dextrins

22. Many of today's nutritional problems in the U.S. are related to over-consumption of each of the following, **EXCEPT**:
a) Food
b) Fat
c) Cholesterol
d) Artificial sweeteners

23. Some microorganisms can potentially be beneficial in foods, including all **EXCEPT**:
a) Saccharomyces
b) Lactobacillus
c) Bifidobacterium
d) Escherichia coli

24. Which of the following is **NOT** a carbohydrate?
a) lactose
b) fiber
c) beta-glucan
d) beta-lactoglobulin

25. The diet we consume can influence quality and length of our lives. The leading cause of death in the US is:
a) Food poisoning
b) Diabetes
c) Heart diseases
d) Motor vehicle accidents

26. Tests that measure for the presence of carcinogens in the food supply are very sensitive. If a carcinogen is found in a food product at parts per billion (PPB), what level is this?
a) milligrams (10^{-3})
b) micrograms (10^{-6})
c) nanograms (10^{-9})
d) pictograms (10^{-12})

27. Which of the following products are commercially sterile?
a) bagged, ready to eat baby carrots
b) frozen beans

c) bagged, shredded Mozzarella cheese d) canned corn

28. How is the order determined for the list of ingredients on the label of a product?
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34. Both oil-in-water and water-in-oil emulsions exist in food products. Which of the following is a **water-in-oil** emulsion?
    a) milk shake b) brownie
    c) ketchup d) butter

35. Left-over refrigerated cooked meat and meat dishes should be consumed:
    a) the next day or discarded b) within 1-4 days
    c) within 1-7 days d) within 1-10 days

36. The amount of each of the following nutrients **must** be listed on a food label **EXCEPT:**
    a) fat b) sodium
    c) total carbohydrates d) calcium

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Food Science Exam Keys

Question	1997	1998	1999	2000	2001
1		B	B	C	D
2		B	D	D	C
3		C	D	A	B
4		B	C	B	D
5		D	A	D	D
6		D	B	C	A
7		B	C	D	B
8		A	D	C	C
9		C	B	D	D
10		B	A	B	C
11		B	A	A	B
12		B	C	A	A
13		B	D	D	D
14		B	B	D	D
15		D	A	C	C
16		B	A	B	A
17		D	D	C	B
18		B	C	D	C
19		B	C	A	C
20		A	D	A	B
21		C	C	A	B
22		D	C	D	D
23		C	D	D	D
24		D	B	C	D
25		D	A	B	C
26		A	A	C	C
27		B	B	D	D
28		D	C	B	B
29		D	C	A	A
30		A	A	A	A
31		A	A	B	B
32		C	D	C	C
33		B	D	C	C
34		D	B	A	D
35		D	A	A	B
36		C	C	D	D
37		B	A	B	B
38		D	C	A	A
39		B	B	C	C
40		D	B	A	A
41		C	D	C	C
42		A	A	B	B
43		A	C	B	B

44	B	A	D	D
45	C	D	A	B
46	D	A	A	A
47	C	A	D	D
48	C	B	A	D
49	B	C	A	A
50	A	B	B	B

FOOD SCIENCE AND TECHNOLOGY
CAREER DEVELOPMENT EVENT
2003 TEST

1. Sucrose, galactose and glucose caramelize at 170°C. This is equivalent to _____.
   a. 126°F
   b.338°F
   c.248°F
   d. 77°F

2. _____is scientifically evaluating a new food product such as Pop-Tarts Yogurt Blasts for appearance, odor, taste, and mouthfeel.
   a. Proximate analysis
   b. Food chemistry
   c. Market analysis
   d. Sensory evaluation

3. An example of a homogenous mixture is (a) _____.
   a. pizza
   b. salad containing lettuce, vegetables and cheese
   c. cola
   d. beef stew

4. Food heats up in a microwave oven primarily due to vibration of _____ molecules.
   a. water
   b.fat
   c. protein
   d. carbohydrate

5. *Clostridium botulinum* is the organism that causes _____.
   a. hemolytic uremic syndrome
   b. vomiting
   c. botulism
   d. necrotic enteritis

6. Meat, fruits and vegetables contain between 70 to 90 percent _____.
   a. carbohydrates
   b. protein
   c. fat
   d. water

7. Pudding that is prepared by cooking thickens as it cools due to the use of _____.
   a. milk
   b. starch
   c. sugar
   d. vanilla

8. Using a process called _____, liquid vegetable oils are changed to shortening and margarine.
   a. hydrogenation
   b. oxidation
   c. saturation
   d. aeration

9. _____ is an elastic, stretchy protein found in wheat.

a. Myosin
b. Casein
c. Gluten
d. Albumin

10. Processed food products such as cereals and orange juice maybe fortified with _____ to enhance their nutritional content.

a. stabilizers
b. chelators
c. antioxidants
d. vitamins and minerals

11. When fruits such as pears, apples, or bananas are cut or bruised, _____ causes the cut surface to become discolored.

a. the maillard reaction
b. enzymatic browning
c. exposure to light
d. catabolism

12. Since oil and water normally separate because they are immiscible, an _____ used to keep these liquids mixed together in solution.

a. invertase
b. antimicrobial
c. caking agent
d. emulsifier

13. Chemical leavening agents such as baking soda and baking powder produce _____ during baking to lighten or aerate baked goods.

a. carbon monoxide
b. carbon dioxide
c. sodium bicarbonate
d. steam

14. During the production of sauerkraut, cabbage is _____ to contribute to the aroma, flavor and color of sauerkraut.

a. fermented
b. homogenized
c. pasteurized
d. lyophilized

15. _____ is the time a food product can be stored before deteriorating.

a. Retail life
b. Refrigeration life
c. Quality life
d. Shelf life

16. HTST milk is milk that has been processed using _____ procedures.

a. homogenous tempering short time
b. high temperature short time
c. hot temperature short tempering
d. homogenization time scalding temperature

17. _____ are microorganisms that cause disease in humans.
a. Thermophiles
b. Prions
c. Pathogens
d. Parasites

18. Instant mashed potato flakes are an example of a food product that has undergone a _____ process.
a. fermentation
b. curing
c. dehydration
d. carmelization

19. The FDA has a list of over 600 ingredients considered safe and not designated as additives that appear on a GRAS list. GRAS is an acronym for _____.
a. generally recognized as safe
b. government recognition as sound
c. government recognized as safe
d. generally recognized as secure

20. Pressure canners used in the commercial manufacture of canned products are known as _____.
a. steam blanchers
b. retorts
c. plate exchangers
d. sublimators

21. Meat products that have been irradiated bear _____ on the product label at retail.
a. a radura
b. no symbol or term indicating the product has been irradiated
c. the term electronically pasteurized
d. the term electronically sterilized

22. A food contains 4 grams of protein, 5 grams of fat, and 2 grams of carbohydrates. That would be equivalent to _____ calories.
a. 64
b.69
c.54
d.128

23. _____ is added to meat to produce a cured meat color and flavor, and to serve as an antibotulinal agent.
a. Sodium erythorbate
b. Sodium phosphate
c. Sodium chloride
d. Sodium nitrite

24. _____ is considered to be basic because the number of hydroxide ions outnumber the hydrogen ions in a solution.
a. lemon juice
b. water
c. baking soda
d. coffee

25. To determine the amount of free water available for microbes to use in a food system, a food scientist would measure the _____ of that food.

a. water activity
b. percent water
c. pH
d. brix

26. When peanuts are ground to make peanut butter, a _____ is added. This keeps the peanut oil from separating out to the top of the jar during storage.

a. caking agent
b. stabilizer
c. humectant
d. antioxidant

27. The family of compounds that includes fats and oils is called _____.

a. carbohydrates
b. proteins
c. lipids
d. amines

28. Which of the following packages is an example of aseptic packaging?

a. plastic milk carton
b. Tetra Pak drink box
c. glass drink bottle
d. plastic bread bag

29. Polyethylene terephtalate, commonly known as _____, is the packaging material use for 2 liter soda bottles.

a. PolyT
b. PETP
c. PT
d.PET

30. A food that would be rich in omega-3 fatty acids would be _____.

a. fatty fish
b. lard
c. olive oil
d. butter

31. To measure the texture of a d=Anjou pear, a food technologist might use a _____

a. spiral plater
b. gas chromatograph
c. texture analyzer
d. stomacher

32. What happens to the boiling point of water when it is heated at high altitudes?

a. It increases
b. It decreases
c. It stays the same
d. Water doesn=t boil at high altitude

33. Regulations prescribe how ingredients must be listed on food labels. What is the general stipulation with respect to the order that ingredients are listed?

a. By alphabetical order
b. By ascending order of proportion by weight
c. By descending order of proportion by weight
d. By descending order of proportion by volume

34. Cheese curd is primarily composed of coagulated _____.

a. protein
b. fat
c. carbohydrate
d. lactose

35. Sodium benzoate is used as a preservative in soft drinks to inhibit growth of____.

a. bacteria
b. molds
c. yeasts
d. viruses

36. The red color of a tomato is due to a compound called _____.

a. beta carotene
b. lycopene
c. limonene
d. myosin

37. Peppers can deliver a very hot sensation when consumed because of the _____ level in the pepper.

a. fructose
b. citric acid
c. theobromine
d. capsaicin

38. The chemical name for table salt is_____.

a. sodium bicarbonate
b. potassium nitrate
c. sodium chloride
d. sodium bisulfite

39. When proteins begin to break down in meat, the process is called _____.

a. proteolysis
b. lipolysis
c. glycolysis
d. hydrolysis

40. A compound that has little or no flavor itself but is added to food to assist or boost the primary flavor of the food to which it is added is a _____.

a. processing aid
b. humectant
c. stabilizer
d. flavor enhancer

41. Glucose is a simple sugar, also known as a _____.

a. disaccharide
b. monosaccharide
c. polysaccharide
d. multisaccharide

42. When a food processing plant is cleaned at the end of a production day, the order of clean-up is _____.

a. rinse, clean with detergent, dry pick up, rinse, sanitize
b. clean with detergent, rinse, sanitize, rinse, dry pick up
c. dry pick up, rinse, clean with detergent, rinse, sanitize
d. dry pick up, rinse, clean with detergent, sanitize, rinse

43. When water is used as an ingredient in food formulations, it must be ————————.

a. soft water
b. potable water
c. hard water
d. purified water

44. _____ is an ingredient used in food to slow the reaction of lipids forming free radicals leading to oxidative rancidity in food.

a. Butylatedhydroxyanisole
b. Sodium casemate
c. Potassium sorbate
d. Disodium inosinate

45. All me essential amino acids would most likely be found in one serving of————.

a. peanuts
b. legumes
c. bran cereal
d. beef

46. Milk and ice cream processing involves both homogenization and pasteurization. Homogenization is _____.

a. evaporation of liquid under vacuum leaving a concentrate
b. addition of bacterial starter cultures
c. reduction in size of fat globules by forcing me milk or cream through a very small opening under pressure . .
d. rapid heating of milk to very high temperatures to kill disease-causing bacteria in the milk product

47. The brownish color of aerobically packaged ground beef that has been stored in a refrigerator for several days is due to _____.

a. deoxymyoglobin
b. metmyoglobin
c. myoglobin
d. oxymyoglobin

48. _____ is a preventative food safety program required by juice processors.

a. GMP=s
b. SSOP=s
c. Quality assurance
d. HACCP

49. The building blocks of protein are called_____.

a. amino acids
b. monosaccharides
c. fatty acids
d. triglycerides

50. The enzyme added to milk to cause curd formation in cheese is called.

a. amylase
b. rermin
c. lactase
d. maltase

National FFA Food Science & Technology Exam Key 2003

1.B
2.D
3.C
4.A
5.C
6.D
7.B
8.A
9.C
10.D
11.B
12.D
13.B
14.A
15.D
16.B
17.C
18.C
19.A
20.B
21.A
22.B
23.D
24.C
25.A
26.B
27.C
28.B
29.D
30.A
31.C
32.B
33.C
34.A
35.B
36.B
37.D
38.C
39.A
40.D
41.B
42.C
43.B
44.A
45.D
46.C
47.B
48.D
49.A
50.B

FOOD SCIENCE AND TECHNOLOGY
CAREER DEVELOPMENT EVENT
2004 TEST

1. Fats and oils are part of a family of compounds called
   a. proteins
   b. carbohydrates
   c. lipids
   d. fiber

2. The government agency responsible for ensuring that meat and poultry are safe and wholesome for consumption is the _____.
   a. Food and Drug Administration
   b. United States Department of Agriculture
   c. Department of Health and Human Services
   d. Animal and Plant Health Inspection Service

3. Glucose, a simple sugar, melts at 150°C. This is equivalent to _____.
   a.101.1°F
   b. 238°F
   c. 65.5°F
   d.302°F

4. It is important for a food technologist to measure the relative number of hydrogen and hydroxide ions in a food system. This is also known as measuring the ____ of a food.
   a. water activity
   b. brix
   c.pH
   d. sodium concentration

5. _____ reacts with amino acids when milk is heated to contribute to the tan color and slightly caramelized flavor of cooked milk products.
   a. Lactose
   b. Casein
   c. Whey
   d. Milk fat

6. An additive that can keep a compound, mixture or solution from changing its form or chemical nature is called a _____.
   a. antioxidant
   b. buffer
   c. stabilizer
   d. preservative

7. A microorganism commonly found in human nasal passages and on the skin that can cause foodbome illness if food becomes contaminated is _____.
   a. *Clostridium perfringens*
   b. *Staphylococcus aureus*
   c. *Clostridium botulinum*
   d. *Escherichia coli* 0157:H7

8. Flavor is sensed by taste buds which are sensory organs located on parts of the tongue. The taste buds on the sides of the tongue respond to _____ flavors.

a. sweet
b. bitter
c. salty
d.sour

9. A process that changes the shape of a protein molecule without breaking its covalent bonds is called _____.

a. denaturation
b. coagulation
c. agglutination
d. saturation

10. A food technologist developing a formulation for a soft dough should use _____.

a. an equal ratio of liquid to flour
b. two parts flour to one part liquid
c. three parts flour to one part liquid
d. six parts flour to one part liquid

11. Microorganisms that cause human disease are known as _____.

a. parasites
b. pathogens
c. spores
d. vegetative cells

12. Oil and water normally separate because they are_____.

a. emulsified
b. immiscible
c. stabilized
d. a colloidal dispersion

13. _____ is the complete destruction of all microorganisms, except some bacterial spores.

a. Commercial sterilization
b. Pasteurization
c. Irradiation
d. Sterilization

14. A _____ is an illness caused by consuming a food that contains a harmful metabolite from a microorganism.

a. food borne infection
b. baceriocide
c. bacteriostat
d. food borne intoxication

15. A synthetic sweetener made ofaspartic acid and phenylalanine that is found in many diet soft drinks is called _____ .

a. asparatame
b. sorbitol
c. saccharin
d. cyclamates

16. _____ is an alternative name for baking soda.

a. Carbon dioxide
b. Potassium bitartrate
c. Sodium bicarbonate
d. Calcium carbonate

17. Vegetables are stored in individual rooms within a warehouse. The room storing _____ would be expected to generate the most heat in one 24 hour period in their confined storage space.

a. snap beans (5600 BTU/Ton/24 hours)
b. asparagus (3440 BTU/Ton/12 hours)
c. cucumbers (8400 BTU/Ton/48 hours)
d. lima beans (4100 BTU/Ton/6 hours)

18. The use of biochemical techniques to alter the genetic makeup of a plant to enhance characteristics for food production is called _____.

a. biogenetics
b. biotechnology
c. biophysiology
d. biophysics

19. The use of food additives in the U.S. is regulated by the _____.

a. Food and Drug Administration
b. United States Department of Agriculture
c. Department of Health and Human Services
d. Animal and Plant Health Inspection Service

20. Fruits and vegetables discolor when bruised or cut due to _____ .

a. caramelization
b. sulfiting
c. dehydration
d. enzymatic browning

21. The part of a cauliflower used for food by consumers is (are) the _____.

a. tuber
b. bulb
c. flower buds
d. berries

22. A food contains 8 grams of fat, 4 grams of carbohydrates and 5 grams of protein. That would be equivalent to _____ calories.

a. 88
b. 108
c.93
d. 113

23. A food technologist is formulating a low carbohydrate pasta so they need to select a grain source that has the highest amount of protein and lowest amount of carbohydrates. They should use _____.

a. hard wheat
b. millet
c. rice
d. soft wheat

24. Food that is dried at too high a temperature during dehydration can become ___ on the outside of the product.

a. blanched
b. lyophilized
c. mushy
d. casehardened

25. One of the functions of sodium nitrite in meat products is to _____.

a. inhibit mold growth
b. inhibit growth of *Clostridium botulinum* in vacuum packaged cured meats
c. minimize purge in vacuum packaged meats
d. reduce color fading in aerobically packaged cured meats

26. Sodium benzoate is used in soft drinks primarily to inhibit _____.

a. rancidity
b. color deterioration
c. mold growth
d. flavor breakdown

27. A company is formulating a high quality ice cream and wants to use milk from a breed of cow that will provide the highest percentage ofbutterfat in its milk. Milk from a _____ cow should be used.

a. Jersey
b. Holstein
c. Shorthorn
d. Brown Swiss

28. Vitamin D is added to milk to prevent a condition called _____.

a. scurvy
b. pellagra
c. rickets
d.beriberi

29. There are _____ principles ofHACCP.

a. 3
b.5
c.7
d.9

30. Chocolate undergoes a _____ process as part of one of the production steps from harvest to a finished chocolate candy bar.

a. pasteuriztion
b. homogenation
c. fermentation
d. lyophilization

31. GMP is an acronym for _____ in the food industry.

a. get more practice
b. good manufacturing procedures
c. good methods procedures
d. good manufacturing practices

32. Energy lost when water molecules form ice crystals is called _____,
a. specific heat
b. latent heat
c. heat of fusion
d. heat of vaporization

33. A compound that destroys bacteria on contact and has residual activity to continue to kill bacteria on a surface is called a _____.
a. bactericide
b. bacteristat
c. chemicide
d. chemistat

34. A retort is a piece of equipment used for _____.
a. frying
b. drying
c. canning
d. baking

35. The purpose for using a leavening agent such as baking soda or baking powder in cakes and cookies is to provide a source of _____.
a. sodium dioxide
b. carbon monoxide
c. sodium monoxide
d. carbon dioxide

36. To test a food manufacturing process with batches lager then bench top size, but smaller than full scale industry size, processors will use _____.
a. mass production
b. batch production
c. pilot scale production
d. prototype production

37. Once food production operations are finished, a sanitation crew will remove all visible dirt, grime and grease. This step is also called _____.
a. cleaning
b. sanitizing
c. rinsing
d. disassembly

38. Fruits and vegetables are primarily composed of_____.
a. carbohydrates
b. water
c. protein
d. fiber

39. _____ is (are) required, by law, to be on all food labels.
a. The product price
b. Preparation instructions
c. The quantity
d. Suggested uses

40. If a food product contains 10,000,000 (107) microbes per gram, and experiences a 99.9999 percent kill rate, then _____ microbes per gram will survive.

a. 1
b. 10
c. 100
d. 1,000

41. Butter is made by agitating cream to form a _____ emulsion.

a. water-in-oil
b. gas-in-liquid
c. oil-in-water
d. gas-in-solid

42. Water activity is the degree of availability of water in food. The water activity of pure water is _____.

a. 0.100
b. 1.000
c. 10.00
d. 100.0

43. The sugar _____ is sweeter than sucrose.

a. fructose
b. lactose
c. glucose
d. maltose

44. The _____ a fatty acid chain attached to a glycerol becomes, the more solid a fat will be at room temperature.

a. shorter
b. longer
c. fatty acid chain length has no impact on how solid a fat becomes
d. more unsaturated

45. To control crystal size when making candy, an interfering agent such as ____ added.

a. salt
b.sugar
c. water
d. cream of tartar

46. The protein in meat that is primarily responsible for meat color is _____

a. myosin
b. actin
c. myoglobin
d. hemoglobin

47. Inorganic elements essential for human health and growth are called _____

a. vitamins
b. minerals
c. proteins
d. fiber

48. The technical name for freeze drying is _____.

a. lyophilization
b. sublimation
c. condensation
d. evaporation

49. Food scientists, who use their ability to view and understand the entire production process well enough to identify problems areas or deficiencies, are _____

a. monitoring quality assurance
b. troubleshooting
c. implementing HACCP
d. pilot testing

50. _____ is a globular protein that is found in milk.

a. Casein
b. Keratin
c. Elastin
d. Gluten

2004 TEST KEY

1.	C
2.	B
3.	D
4.	C
5.	A
6.	C
7.	B
8.	D
9.	A
10.	C
11.	B
12.	B
13.	A
14.	D
15.	A
16.	C
17.	D
18.	B
19.	A
20.	D
21.	C
22.	B
23.	A
24.	D
25.	B
26.	C
27.	A
28.	C
29.	C
30.	C
31.	D
32.	B
33.	A
34.	C
35.	D
36.	C
37.	A
38.	B
39.	C
40.	B
41.	A
42.	B
43.	A
44.	B
45.	D
46.	C
47.	B
48.	A
49.	B
50.	A

Team Product Development

Each team will receive a product development scenario describing the need for a new or redesigned product that appeals to a potential market segment. The team's task will be to design a new food product or reformulate an existing product based on information contained within the product development scenario.

The team will be responsible for understanding and using the following concepts:

a. Formulation of product to meet specified requirements.
b. Package design and labeling requirements to reflect the developed product.
c. Nutritional fact development.
d. Production and packaging equipment.
e. Quality control and safety programs, i.e., good manufacturing practices (GMP) and hazard analysis critical control points (HACCP).
f. Formulation and costing (ingredient, packaging, etc.).
g. Current food trends.
h. Market segments.

Each team will be provided with packaging materials, ingredients and necessary ingredient information in order to develop, label and package a product.

The team will have 60 minutes to respond to the product development scenario and reformulate or develop a product, calculate a nutritional label, develop the ingredient statement and information panel and develop the front or principle display panel to reflect the new product. After this time period, each team member will contribute to a ten minute oral presentation delivered to a panel of judges. No electronic media will be used in the presentation. Following the presentation there will be a ten minute question and answer period with the judges in which each team member is expected to contribute. All materials will be collected after the presentation.

Total time involved for each team will be 80 minutes. Total number of points possible for this activity will be 400 points.

Product development scenarios will describe a category, platform and market. These may include but are not limited to the following categories, platforms and markets listed below.

a. Categories
    i. Cereal
    ii. Snacks
    iii. Meals
    iv. Side dishes
    v. Beverages
    vi. Supplements
    vii. Condiments
    viii. Desserts

b. Platform
    i. Frozen
    ii. Refrigerated
    iii. Shelf-stable
    iv. Convenience
    v. Ready to eat
    vi. Heat and serve

c. Market (domestic and international)
    i. Retail
    ii. Wholesale
    iii. Food service
    iv. Convenience store

Evaluation criteria and points for team activity can be found on the team product development project scorecard.

Food Science and Technology CDE
Team Product Development Project Scorecard

State: _____ **Team #:** _____

Package Design	Possible Score	Team Score
o Use and development of nutrition label		
o Required information present	10	
o Correct calculations	10	
o Correct organization	10	
o Use and development of the ingredient statement		
o Present	10	
o Correct order and all ingredients included	10	
o Location on package	10	
o Use of principle display panel to convey information		
o All required components	15	
o Correct information	15	
o Location on package	10	
Package Design Subtotal	100	
Product Development Oral Presentation	**Possible Score**	**Team Score**
• Cost of Goods Sold o Costing o Accuracy	20	
• Nutrition o Communicate nutritional quality of product o Apply nutritional quality to health benefits	20	
• Target Audience o Identification of key consumer	20	
• Quality Control o Key quality attribute of consistent product o Examples: Flavor, color, texture, net weight, size, etc.	20	
• Marketing & Sales o Communicated with future users o Promotions o Market location	20	

• Product o Appearance o Texture o Shelf-life o Interaction of ingredients o Creativity	20	
• Processing o Description of how to make product o Equipment o Flow diagram, unit operations o People	20	
• Packaging o Materials used o Appropriate for use of product o Creativity	20	
• Food Safety o Discussed potential hazards/concerns associated with products	20	
• Formulation Concepts		
o How well did product match concept/product development scenario	30	
o Category	5	
o Platform	5	
• Quality of Presentation		
o Equitable participation of team members	5	
o Organization	5	
o Use of time allowed	5	
o Professionalism	5	
o Presence & enthusiasm	5	
o Mannerisms	5	
Product Development Oral Presentation Subtotal	250	
Response to Judges' Questions	**Possible Score**	**Team Score**
• Team Participation in Question Response o All team members contributed	25	
• Quality of Response o Accuracy o Ability to answer o Originality o Knowledge	25	
Response to Judges' Questions Subtotal	50	
TOTAL POINTS	400	

Steps for Team Product Development Section

- Read given scenario and consider your target market and their requirements
- Determine which ingredients you will use in your product that best fits your target markets' needs
- Package Design
    - Calculate the nutritional label
    - Develop the ingredient statement and educational panel and develop the front display panel
        - http://www.cfsan.fda.gov/~dms/flg-toc.html
- Research possible equipment that you would use to produce your food product
- Develop a flow chart of the processing methods used
    - See page 3
- Research good manufacturing practices (GMP) and hazard analysis critical control point (HACCP) and decide how you would implement these into the production of your product

Product Development Tips

- Use the first few minutes to collaborate on what ingredients your product will contain to meet market demands and what the name of your product will be and how to market the product.

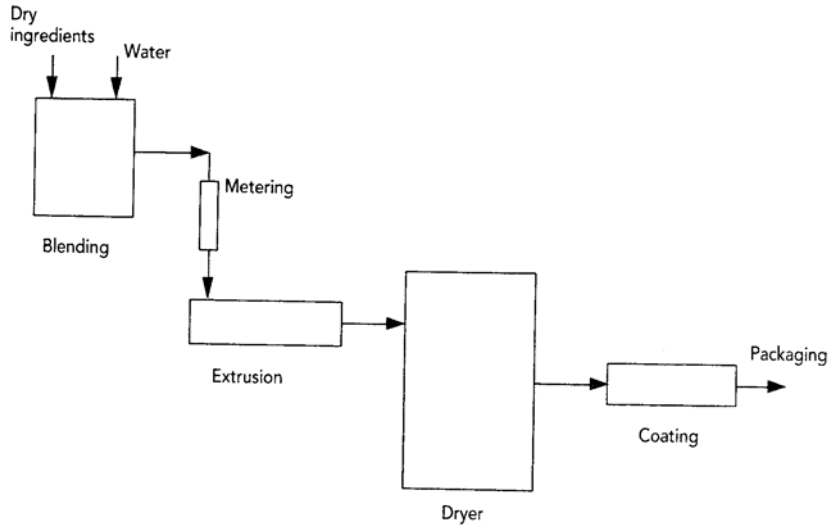
Then:

- Have a creative or artsy person working on the labeling of your product.
- Have one person working on the calculations of the nutritional label
- Have one student work on the manufacturing practices that will be used to produce your product
- Don't forget about the production, labor, advertising & transportation cost when considering economics
- Know the difference between food safety and food quality

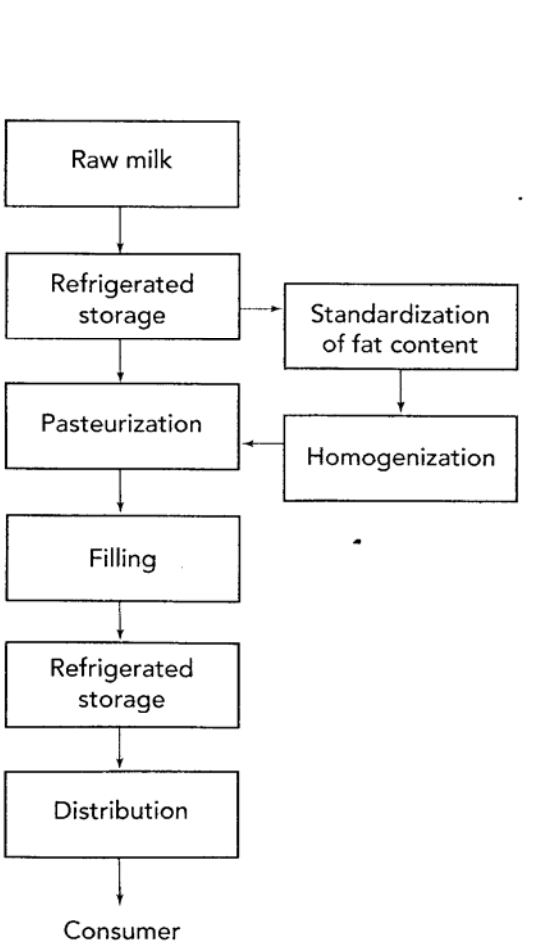
Presentation Tips

- Have all team members speak during presentation. Have one team member who introduces the group and gives a brief overview of the product/scenario and then have the other three team members cover different areas such as packaging, nutrition, HACCP, marketing, how your product meets target audience, economics, etc.
- Take turns on answering questions as well. All team members need equal participation.
- Make a flow chart to bring in with you in the presentation – it makes it easier for you to follow when talking about equipment, production and HACCP.
- Also make a flow chart for the cost of product

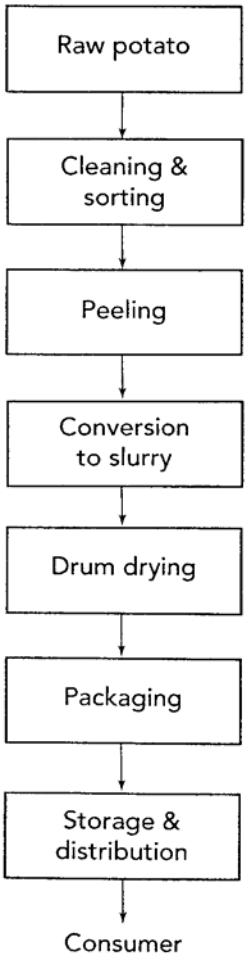
Example Flowcharts of Food Processing



10.7 Typical process steps in production of direct expanded snack foods.



1.4 figure Processing steps for the manufacture of pasteurized milk.



1.5 figure Processing steps for the manufacture of dry potato flakes.

MARKETING SCENARIO
FOOD SCIENCE CAREER DEVELOPMENT EVENT – 2001

Memorandum

TO: Product Development Group
FROM: Marketing Research and Business Development
SUBJECT: Meeting Market Needs for a Personal Pan Pizza

TASK: Using the materials, ingredients, pricing, and nutritional information provided, design a pizza to meet the needs of your defined target market.

The latest marketing report documented that pizza is just behind hamburgers and hot dogs on teenagers' list of most favorite meals. At the same time, another study has shown that parents with purchasing power are more concerned about their children's nutrition and health. However, the buying patterns of teenagers indicate they will not sacrifice taste to achieve healthier goals.

Pizza businesses have spent millions of dollars perfecting frozen pizzas for home use. These products have greatly improved in quality since their inception. There is however a large segment of the population that prefers a pizza that has not been frozen, is fresher and thus believed to be higher in quality than frozen pizzas. There are great opportunities to increase overall pizza market share in the retail food supply chain through the development of a fresh pizza that tastes great to teenagers and is perceived as a healthy choice for parents.

A new innovation in food retailing called TOTE (Take-Out-To-Eat), provides a new way to market fresher tasting pizzas. However, efficient distribution systems, and modified atmosphere packaging materials are required since refrigerated pizzas

have a much shorter shelf life than frozen pizzas. As a group you will create a pizza that incorporates the TOTE concept and the best health aspects of a pizza to satisfy parents' concerns over viewing pizza as another "junk food". You also must satisfy the marketing department of your company by producing a finished product that meets costs and sales projections. The target group for your product is teenagers. This product will be cooked at home and will typically be consumed after school or on the weekends when friends come over. The pizzas will be refrigerated, not frozen, to provide for better taste appeal and faster reheating.

Your company has a respectable market share of the frozen pizza business. However, fresh pizzas could offer a substantial increase to sales and profit for the company. In order to make your product launch a success, you must carefully consider the best way to implement the following concepts, programs, and procedures:

- Target Market – The marketing information given above indicates your pizza needs to appeal to the taste of a wide variety of teenagers and the health concerns of their parents'.
- Product Design – Your pizza will need to be designed to meet the target market and you must be able to explain how your product accomplishes this.
- Product Size and Weight – The pizza will be placed on a 12" crust. Though you can vary the amount of toppings (you can use any amount of all or none), the marketing group has informed you that the competition is producing pizzas with an approximate net wt. of 2.2 lbs.
- Economics – The marketing group has also informed you that the company needs a profit of at least 20% and in order to be competitive in the existing market, the pizza should be sold for no more than $4.29 to the final customer. You must also account for the $0.50 per pizza stocking fee the supermarkets will add to your selling price. The marketing group indicates a sales potential of 10,000 pizzas per week. The factory you design will need this capacity.
- Packaging – The pizza needs to be packaged in a manner to sustain the quality of the product throughout its shelf life. Your research indicates this

product can be packaged in either a 5-day or 10-day shelf life packaging film. In choosing your packaging, you need to consider cost differences in the film versus the requirements of your distribution system.

- Labeling – Your product must have display panel designs and name that appeals to your target market, an ingredient statement, use-by date, and a net wt. statement. Also, you need to include the nutritional information for your pizza by using the information on the nutritional data sheet for your raw materials. There is one serving per slice of pizza and each pizza contains eight slices. The nutritional data sheet for your available ingredients is stapled to the back of this outline.
- Advertising – Your marketing department has given you the following cost structure to follow some types of advertising. You can choose any combination of these or choose to market your product in a different manner.
    - Weekly newspaper ads - $100/week or $0.01/pizza
    - Radio advertising, 15 sec. spots, 6 times/day - $200/wk. or $0.02/pizza
    - Television commercial, 30 sec. spot, 1 time/day - $1000/wk or $0.10/pizza

- Raw Material Supply – You will need to explain how you will set up, approve and maintain a list of approved suppliers. What should you expect from all of your suppliers? You will need to consider how you will ensure your raw materials meet specified quality standards. Also, you should have a system to track all ingredients purchased and used to manufacture your product. An ingredient list with pricing information is stapled to the back of this outline.
- Equipment – What equipment is needed to manufacture your product?
- Labor, Equipment, and Capacity – You are given two different models for labor and equipment costs and line capacity. You should be able to discuss your reasoning for choosing model "A" or model "B".

	A		**B**	
Equipment Costs Per Hour	$22.00		$49.00	
Labor Costs Per Hour		$35.00		$23.00
Overhead Costs Per Hour	$13.00		$10.00	
Maintenance Costs Per Hour		$18.00		$11.00
Line Capacity Per Hour	85		100	

- Product Safety – You should be prepared to discuss the potential hazards and food safety concerns associated with this product and how they will be effectively monitored and controlled. Also, you should discuss the prerequisite programs needed before a functional HACCP plan can be implemented.
- Finished Product Quality – You will need to discuss the various tests and checks that will be performed on your product during and after manufacture to ensure product quality.

- Distribution – Your distribution system can be set up in one of two following scenarios. You should be prepared to justify the reasoning for your decision.

  Scenario 1: The product you produce is packaged in a 5-day shelf life material. In order to maintain a fresh stock of material you will be required to make two deliveries of 5,000 pizzas per week. Due to having twice the number of deliveries you receive a discount from your chosen distributor of 20%. The total cost per shipment is $500.00.

  Scenario 2: The product you produce is packaged in a 10-day shelf life material. In order to maintain a fresh stock of material you will be required to make one delivery of 10,000 pizzas per week at a cost of $625.00 per shipment.

- Sales Price – Now the fun begins. Have you developed a product that meets all of the goals of your marketing group? You will need to add up all of your material, production, advertising, and distribution costs as well as stocking fees, and determine your profit for each pizza sold.

Remember your team must be able to explain and discuss how you would

accomplish each of the above elements. This is a team event and it is very important for

your group to equally present material and provide answers to the judges' questions.

Good luck!

PRICING INFORMATION FOR FOOD INGREDIENTS AND PACKAGING MATERIALS

ITEM	UNIT COST
MEAT	
Chicken Strips	$0.10/ounce
Ham	$0.07/ounce
Pepperoni	$0.04/ounce
Italian Sausage	$0.05/ounce
VEGETABLES	
Mushroom	$0.05/ounce
Onion	$0.02/ounce
Green Pepper	$0.03/ounce
Pineapple	$0.04/ounce
Black Olive	$0.03/ounce
CHEESE	
Skim Mozzarella	$0.06/ounce
Mozzarella & Parmesan	$0.04/ounce
Four Cheese	$0.10/ounce
Light Mozzarella	$0.06/ounce
PIZZA CRUST	$0.20/crust
PIZZA SAUCE	$0.01/ounce
PACKAGING	
Craft Paper	$0.01/sheet
Cardboard slip sheets	$0.02/pizza
5 Day Shelf Life	$0.04/pizza
10 Day Shelf Life	$0.08/pizza
Pizza Box	$0.10/pizza

NUTRITIONAL DATA SHEET FOR PIZZA INGREDIENTS

ITEM	Serving Size	Calories	Protein (grams)	Fat (grams)	Saturated Fat (grams)	Cholesterol (milligrams)	Sodium (milligrams)	Carbohydrate (grams)	Dietary Fiber (grams)	Sugars (grams)
MEAT										
Chicken Strips	1 ounce	37	6.0	1.0	0.5	18	257	0.5	0.0	0.5
Ham	1 ounce	34	5.0	2.0	1.0	14	297	0.5	0.0	0.5
Pepperoni	1 ounce	130	7.0	13.0	5.0	27	500	0.5	0.5	0.5
Italian Sausage	1 ounce	84	4.0	7.0	2.0	18	305	1.0	0.0	0.0
VEGETABLES										
Mushroom	1 ounce	7	1.0	0.0	0.0	0	0	1.0	0.5	0.0
Onion	1 ounce	11	0.5	0.0	0.0	0	1	2.0	0.5	0.0
Green Pepper	1 ounce	8	0.5	0.0	0.0	0	1	1.0	0.5	0.5
Pineapple	1 ounce	18	0.0	0.0	0.0	0	1	5.0	0.5	4.0
Black Olive	1 ounce	49	0.5	5.0	0.0	0	207	1.0	1.0	0.0
CHEESE										
Skim Mozzarella	1 ounce	80	7.0	5.0	3.0	15	210	0.5	0.0	0.0
Mozzarella & Parmesan	1 ounce	85	6.0	7.0	4.0	21	204	1.0	0.0	0.0
Four Cheese	1 ounce	90	6.0	7.0	4.5	20	230	0.5	0.0	0.0
Light Mozzarella	1 ounce	70	8.0	3.5	2.5	10	200	0.5	0.0	0.0
PIZZA CRUST	2 ounces (1/8 crust)	150	6.0	3.0	1.0	0	300	25.0	1.0	1.0
PIZZA SAUCE	1 ounce	20	0.0	0.0	0.0	0	148	5.0	1.0	3.0

MARKETING SCENARIO
FOOD SCIENCE CAREER DEVELOPMENT EVENT – 2002

Memorandum

TO: Product Development Group
FROM: Marketing Research and Business Development
SUBJECT: Meeting Market Needs for a Sandwich Wrap

The latest marketing trends data indicated that sandwich wraps are catching on in a big way. Sandwich wraps are making a dent in hamburger and pizza sales to people between twenty and thirty years old. This group of consumers possesses a more discretionary palate than teenagers, and has the buying power needed to rev up sales for this new product line. This group of consumers is concerned about its health, but wants as much good taste as can be mustered in a ready-to-eat cold sandwich wrap.

Processed meat companies such as Oscar Mayer, Wilson, and Jennie-O have spent millions of dollars developing products and recipes for sandwich wraps to make at home with some success. Research indicates wrap products compete well against hamburgers and pizza. Pizzas and hamburgers have a longer preparation time and individuals may have more health concerns about these products than sandwich wraps. Sandwich wraps take less time to prepare and are usually more nutritious, but efficient distribution systems, packing considerations, and relatively short shelf life pose challenges when developing this product line. As a group you have decided that you want to develop a sandwich wrap that incorporates the health conscious lifestyle of this consumer group. Your group's course of action will also include the most efficient means to package the product and extend its shelf life. Another priority is to make sure

you develop a sandwich wrap that will appeal to a broad segment of your target population so regional culture and ethnicity need to be considered. You also need to satisfy the marketing department's finished product costs and sales projections by delivering a wrap that will be purchased by young adults on the run or on the weekends for outings in the park. The marketing department has set a price ceiling of $2.29 for the finished wrap. In order for your company to move forward with this project you must be able to make a minimum profit of 15 percent.

Your company has a respectable market share of the traditional ready-to-eat sandwich business on a regional level. However, sandwich wraps could offer additional sales and profit avenues. Taste tests by your research unit indicate that certain deli meats along with different cheeses and vegetable toppings have received good marks from targeted group of young adults who participated in your consumer research. Toppings that have received good reviews include onion, jalapeño peppers, black olives, green peppers, and iceberg lettuce. Cheeses that have won favor include Swiss, Cheddar, and Provolone. Popular Deli meats include pressed ham, turkey breast, Cotto salami, and smoked roast beef.

It is critical that your group develop packaging graphics that attract your target group to buy your sandwich wrap instead of your competitor's product. Additionally, you must find the right packaging to match the desired shelf life for your product.

Consumer research has documented that certain meats and/or cheeses are complemented by specific condiments, which are very important in determining taste and acceptance in sandwich wraps. Possible condiments include: Relish, mustard, traditional real mayonnaise, barbecue and taco sauce. Your group must decide which combination

of condiments and ingredients are optimum for taste, selling price, and nutrition. Three types of wrap bread are available for use: Traditional Whole-Wheat, Tomato and Basil, and Low-fat.

Your group's challenge: Using the meats, vegetables, condiments, cheeses, wrap breads, pricing and nutritional information provided, design a sandwich wrap to meet the needs of your defined target market.

Additional challenges include defining production methods and manufacturing costs, quality control requirements, distribution plan, and cost analysis. Remember, your group must be able to explain and discuss how your group would accomplish each of the elements necessary to put a new product on the market from concept to final product for sale.

NUTRITIONAL DATA SHEET FOR INGREDIENTS

ITEM	Serving Size	Calories	Protein (grams)	Fat (grams)	Saturated Fat (grams)	Cholesterol (milligrams)	Sodium (milligrams)	Carbohydrate (grams)	Dietary Fiber (grams)	Sugars (grams)
MEAT										
Pressed Ham	2 ounces	50	9.0	2.0	1.0	25	680	0.0	0.0	0.0
Turkey Breast	2 ounces	60	9.0	1.0	0.0	20	620	2.0	0.0	0.0
Cotto Salami	1 ounce	70	4.0	6.0	2.0	25	280	1.0	0.0	0.0
Smoked Roast Beef	2 ounces	96	11.0	6.0	2.0	45	816	1.0	0.0	1.0
VEGETABLES										
Jalapeno Peppers	1 ounce	5	0.0	0.0	0.0	0	300	0.0	0.4	0.0
Onion	1 ounce	11	0.5	0.0	0.0	0	1	2.0	0.5	0.0
Green Pepper	1 ounce	8	0.5	0.0	0.0	0	1	1.0	0.5	0.5
Iceberg Lettuce	1 ounce	5	0.0	0.0	0.0	0	3	1.0	0.5	0.5
Black Olive	1 ounce	49	0.5	5.0	0.0	0	207	1.0	1.0	0.0
CHEESE										
Provolone	1 ounce	100	7.0	8.0	4.0	20	150	1.0	0.0	0.0
Swiss	1 ounce	110	8.0	8.0	5.0	25	60	1.0	0.0	0.0
Cheddar	1 ounce	110	7.0	9.0	5.0	30	170	1.0	0.0	0.0
WRAPS										
Traditional Whole Wheat	2 ounces - 1 Wrap	170	4.0	4.0	1.0	0	390	29.0	2.0	2.0
Tomato and Basil	2 ounces - 1 Wrap	140	4.0	2.5	0.5	0	380	26.0	1.0	3.0
Low-fat	2 ounces - 1 Wrap	110	4.0	1.0	0.0	0	150	22.0	1.0	1.0
CONDIMENTS										
Mustard	1 tbsp (10g)	0	0.0	0.0	0.0	0	110	0.0	0.0	0.0
Relish	2 tbsp (9g)	12	0.0	0.0	0.0	0	70	3.0	0.0	2.0
Barbecue Sauce	1 tbsp (12g)	20	0.0	0.0	0.0	0	80	5.0	0.0	3.0
Mayonnaise	1 tbsp (12g)	90	0.0	9.0	5.0	10	190	0.0	0.0	0.0
Taco Sauce	1 tbsp (9g)	10	0.0	0.0	0.0	0	220	2.0	0.0	1.0

PRICING INFORMATION FOR FOOD INGREDIENTS AND PACKAGING MATERIALS

ITEM	UNIT COST
MEAT	
Pressed Ham	$0.22/ounce
Turkey Breast	$0.20/ounce
Cotto Salami	$0.15/ounce
Smoked Roast Beef	$0.20/ounce
VEGETABLES	
Jalapeno Peppers	$0.06/ounce
Onions	$0.06/ounce
Green Peppers	$0.08/ounce
Iceberg Lettuce	$0.05/ounce
Black Olives	$0.05/ounce
CHEESE	
Swiss	$0.27/ounce
Cheddar	$0.25/ounce
Provolone	$0.23/ounce
SANDWICH WRAP	
Whole Wheat	$0.15/piece
Tomato and Basil	$0.25/piece
Low-fat	$0.20/piece
CONDIMENTS	
Mustard	$0.01/tbsp.
Relish	$0.03/tbsp.
Barbecue	$0.02/tbsp.
Mayonnaise	$0.03/tbsp.
Taco Sauce	$0.02/tbsp.
PACKAGING	
Wax Paper	$0.02/piece
1 Day Shelf Life Plastic	$0.04/piece
3 Day Shelf Lift Plastic	$0.06/piece
Plastic Container	$0.10/piece

Marketing Scenario
Food Science Career Development Event – 2005

Memorandum

TO: Product Development Group
FROM: Marketing Research and Business Development
SUBJECT: Fresh Stir-Fry Entrée

TASK: Using the materials, ingredients, pricing, and nutritional information provided, design a "Fresh Stir-Fry Entrée"

Based on our company's latest marketing trends, data indicates that people are looking for fresh meals that can be easily made at home. Our potential customers want fast meals that are ready to cook, but that are fresh and not found in the frozen food section. As a result, we need to develop an innovative product not currently on the market. A vegetarian stir-fry entrée fills this need and more. The most recent results of our customer survey found that working-adults, people between their late twenties and early forties, have the buying power needed to rev up sales for this new product line. Customer groups that are worthy of our consideration include vegetarians and organic food consumers as there are few complete meal options marketed in grocery stores that are made with organic vegetables and/or without meat or meat products. Additionally, due to the nature of the product, certain ethnicity groups may naturally become primary consumers. Each of these groups of consumers are concerned about a product's shelf life, as well as the healthy ingredients and full compliment of nutrients that are found on the nutrition label.

Fast food companies such as McDonalds and Wendy's have spent millions of dollars developing the technology to market products that are fresh but shelf-stable.

Using such new techniques, these companies have experienced much success. By following in their footsteps, our company is seeking to develop a new entrée that can be found occupying more shelf space at our biggest grocery stores. Stir-Fry's that are already assembled take less time to prepare and are usually more nutritious. However, efficient distribution systems, packaging considerations, and a relatively short shelf life pose challenges when developing this product line.

Your group's course of action will need to include the most efficient means to package the product and extend its shelf life. Another priority is to make sure you develop a vegetarian stir-fry that will appeal to the broadest segment of your target population. Similar complete meals, such as those found in the frozen food section, are marketed on a single, two, or four serving basis. Research indicates that the customer groups outlined above would be most interested in single-serving meals with a total weight of 8-12 ounces. In order for the company to move forward with this project, you must be able to make a minimum profit of 20 percent and include at least 20-25% mark-up to account for production, marketing, and distributions costs. The marketing department has set a price ceiling of $3.75 for the finished product.

Your team's goal is to develop a vegetarian stir-fry entrée that is fresh and appeals to the targeted audience. Because the product will be fresh, it should occupy shelf space in the produce section. Taste tests by your research unit have indicated that certain vegetables served over rice or Bok Choy have received good marks from targeted groups of adults who participated in your consumer research. While preparation directions for serving the product over rice or Bok Choy would be different and require explanation on the package, tests indicate equal acceptance of either base ingredient. Vegetables that

have received good reviews during preliminary tests include pine nuts, carrots, snow peas, broccoli, mushrooms, bamboo shoots, tomatoes, zucchini, water chestnuts, onions, celery, and green peppers.

Well-documented consumer research has also proven that most stir-fry's are complemented by sauces, which are important in determining taste and acceptance of the complete product. Possible types include a teriyaki sauce, sweet and sour sauce, and a Hoisin sauce. Your group must decide which sauces will complement your fresh vegetarian stir-fry meal that will be optimum in taste, selling price, and nutrition.

It is critical that your group develops packaging graphics that attract your target group to buy your entrée instead of your competitor's product. Additionally, you must find the right packaging to match the desired shelf life for your product.

Your group's challenge: Using the vegetables, sauces, rice or Bok Choy, pricing and nutritional information provided, design a fresh Vegetarian Stir-Fry meal to meet the needs of your defined target audience.

Additional challenges include defining production methods and cost, quality control requirements, approach to distribution plan, and cost analysis. Remember your group must be able to explain and discuss how your group will accomplish each of the elements necessary to bring this new product from concept into the marketplace for sale.

NUTRITIONAL DATA SHEET FOR INGREDIENTS

ITEM	Serving Size	Calories	Fat	Saturated Fat	Trans Fat	Cholesterol	Sodium	Carbohydrate	Dietary Fiber	Sugars	Protein
			(grams)	(grams)	(grams)	(milligrams)	(milligrams)	(grams)	(grams)	(grams)	(grams)
VEGETABLES/ NUTS/SEEDS											
Cashews	1 ounce (~30g)	190	15	3	0	0	6	11	1	2	5
Peanuts	1 ounce (~30g)	195	17	2	0	0	2	7	3	2	8
Sunflower Seeds	1 ounce (~30g)	194	17	2	0	0	1	8	4	1	7
Pine Nuts	1 ounce (~30g)	200	18	4	0	0	15	4	2	1	5
Carrots	1 ounce (~30g)	10	0	0	0	0	15	3	1	2	0
Snow Peas	1 ounce (~30g)	10	0	0	0	0	0	3	0	1	0
Broccoli Florets	1 ounce (~30g)	10	0	0	0	0	10	1	1	0	1
Mushrooms	1 ounce (~30g)	5	0	0	0	0	0	1	0	0	1
Bamboo Shoots	1 ounce (~30g)	10	0	0	0	0	0	1	1	1	1
Cherry Tomatoes	1 ounce (~30g)	5	0	0	0	0	0	1	0	1	0
Zucchini	1 ounce (~30g)	5	0	0	0	0	0	1	0	0	0
Water Chestnuts	1 ounce (~30g)	25	0	0	0	0	0	7	1	1	0
Yellow Onions	1 ounce (~30g)	10	0	0	0	0	0	3	0	1	0
Celery	1 ounce (~30g)	5	0	0	0	0	25	1	1	0	0
Green Bell Pepper	1 ounce (~30g)	5	0	0	0	0	0	1	0	1	0
Red Bell Pepper	1 ounce (~30g)	5	0	0	0	0	0	2	0	0	0
Yellow Bell Pepper	1 ounce (~30g)	10	0	0	0	0	0	2	0	1	0
SAUCES											
Teriyaki Sauce	1 ounce (~30g)	25	0	0	0	0	400	5	0	4	0
Hoisin Sauce	1 ounce (~30g)	45	0	0	0	0	300	14	0	9	0
Peanut Sauce	1 ounce (~30g)	90	7	1.5	0	0	70	3	1	0	4
Sweet N Sour Sauce	1 ounce (~30g)	30	0	0	0	0	170	7	0	6	0
COMPLEMENTS											
White Rice Cooked	3 ounces (1/2 cup)	110	0	0	0	0	0	24	0	0	2
Bok Choy	3 ounces (1/2 cup)	10	0	0	0	0	55	2	1	1	1

PRICING INFORMATION FOR FOOD INGREDIENTS AND PACKAGING MATERIALS

ITEM	UNIT COST	
VEGETABLES/ NUTS/SEEDS		
Cashews	$0.25	/ounce
Peanuts	$0.15	/ounce
Sunflower Seeds	$0.30	/ounce
Pine Nuts	$0.40	/ounce
Carrots	$0.04	/ounce
Snow Peas	$0.10	/ounce
Broccoli Florets	$0.08	/ounce
Mushrooms	$0.24	/ounce
Bamboo Shoots	$0.08	/ounce
Cherry Tomatoes	$0.04	/ounce
Zucchini	$0.04	/ounce
Water Chestnuts	$0.10	/ounce
Yellow Onions	$0.03	/ounce
Celery	$0.02	/ounce
Green Bell Pepper	$0.05	/ounce
Red Bell Pepper	$0.10	/ounce
Yellow Bell Pepper	$0.10	/ounce
SAUCES		
Teriyaki Sauce	$0.10	/ounce
Hoisin Sauce	$0.15	/ounce
Peanut Sauce	$0.20	/ounce
Sweet N Sour Sauce	$0.10	/ounce
COMPLEMENTS		
White Rice	$0.04	/ounce
Bok Choy	$0.10	/ounce
PRIMARY PACKAGING		
Large	$0.20	/piece
Medium	$0.15	/piece
Small	$0.10	/piece

SECONDARY PACKAGING:		
Extra Large	$0.25	/piece
Clam Shell	$0.35	/piece

Marketing Scenario
Food Science Career Development Event – 2006

Memorandum

TO: Product Development Group
FROM: Market Research & Opportunity Group
SUBJECT: Meeting Market Needs for Health Concise Cereal

TASK: Using the materials, ingredients, pricing, and nutritional information provided, design an "Organic cereal, considering the Weight Watchers point criteria."

The cereal industry is an ever changing market with strategies of differentiations. Companies are always struggling to keep up with the consumer by producing a large range of name brand cereals aimed at different markets including kids, teenagers, adults, and the health conscious. Currently there are over 75 brand names on the cereal shelves today and the number of brands is increasing monthly as industries compete to offer new cereal to satisfy or create new consumer desires.

Studies have shown that it is important to consider the changing eating habits of individuals when creating new products. Over the past ten years awareness has increased among individuals about their health and weight. With this awareness people are changing their eating habits in order to change their self-image or self-perception. Since new diets are popping up daily and set the new trend for consumers eating habits, companies are aim to provide a product that doesn't sacrifice taste and will fit into their client's diet criteria.

The Weight Watchers diet is known as one of the most consistent weight loss programs in history. It allows consumers to follow a point system. Unlike other diets Weight Watchers doesn't tell individuals what to eat, but provide the information, tools, and motivation to help individuals make good eating decisions. Their program has helped thousands of people to lose weight, generally in a sensible way. Weight Watchers has continued to stay up-to-date offering more and more flexibility with their plans. No longer do they just run the "POINTS" system. Now with the Weight Watchers TurnAround program, individuals can choose from two plans: the Flexible *POINTS* Plan and the No Counting (or Core) Plan.

The Flexible Points Plan is a full range of food options using the *POINTS* system. In this plan individuals can choose any food as long as they control how much they eat. Using this plan individuals learn how to easily handle any food challenge - even when choices are limited. Weight Watcher has a complete database of POINT values, lets individuals calculate their own points, and gives clients a daily tracker to keep track of daily POINTS values.

Your group's task is to develop a new health conscious cereal that fits into the Weight Watchers POINTS system in the 1 to 3 point range. In order to do this, your group is going to have to calculate the Weight Watcher POINTS per serving by entering your final nutritional data into the following equation:

$$p = \left(\frac{c}{50}\right) + \left(\frac{f}{12}\right) - \left(\frac{\min\{r,4\}}{5}\right)$$

Where:

p = Points

c = Calories

f = Fat Grams

r = Dietary fiber Grams

(Note: **min{r, 4}** equals the number of grams of dietary fiber or 4, whichever is smaller. In other words, only the first 4 grams of fiber "count." In addition you will have to round your point value to the closest whole value.)

Consumers are becoming more selective on purchases and more informed on what they are eating. The cereal market needs to hit this targeted audience by developing a product that is distinctive, fits into consumer's criteria, and fits into the new organic trend that has hit the cereal market within the past 6 years and continues to double every four years. These new trends are becoming more and more popular everyday so you and your group need to develop a new health conscious cereal which is organically grown and fits into the Weight Watchers point scale.

In addition to this, it is critical that your group develops packaging graphics that attract your target audience to buy your cereal instead of your competitor's product.

Additionally, you must find the right packaging to match the desired appearance and cost for your product.

Your group's challenge: Using the ingredients, Weight Watchers TurnAround Points Plan, pricing and nutritional information provided, design an organic cereal that meets the needs of your defined target audience, and provides consumers with the Weight Watcher points applicable to the cereal. The final product must weigh between 12 to 16 ounces, fit in the gallon size bag provided, and if using a box, the cereal filled bag must fit inside the cereal box without crushing the cereal. The typical serving size for this type of cereal is around 1 oz. Your final product must contain at least two types of cereals and contain at least two additives.

In order for the company to move forward with this project, you and your group must be able to make a minimum profit of 25 percent and include at least 25%-30% mark-up to account for production, marketing, and distributions costs. Similar products in the marketplace are priced between $3.79 - $6.97 per package. The marketing department has set a price ceiling of $4.89 for the finished product.

Additional challenges include defining production methods and cost, quality control requirements, approach to distribution plan, and cost analysis. Remember your group must be able to explain and discuss how your group will accomplish each of the elements necessary to bring this new product from concept into the marketplace for sale.

			Per Ounce													
ITEM	Cost Per lb.	Serving Size	Calories	Fat (grams)	Saturated Fat (grams)	Trans Fat (grams)	Cholesterol (milligrams)	Sodium (milligrams)	Carbohydrates (grams)	Dietary Fiber (grams)	Sugars (grams)	Protein (grams)	Vitamin A (IU)	Vitamin C (milligrams)	Calcium (milligrams)	Iron (milligrams)
CEREAL																
Organic Toasted WG Wheat Flakes	$ 0.83	1 oz	100	1	0	0	0	190	22	3	4	3	700	5	20	10
Organic Toasted WG Corn Flakes	$ 0.88	1 oz	110	1	0	0	0	260	24	1	3	2	700	5	200	10
Organic WG Oats	$ 0.43	1 oz	110	2	1	0	0	0	19	3	1	3	0	0	0	10
Organic Honey Nut Clusters	$ 1.84	1 oz	110	3	0	0	0	150	24	2	9	2	0	5	0	5
Organic Crispy Rice	$ 0.59	1 oz	110	0	0	0	0	210	25	0	3	1	700	10	0	1
Organic Toasted Rice Chex	$ 1.13	1 oz	100	1	0	0	0	240	23	0	2	2	700	5	100	10
Organic Toasted Corn Chex	$ 0.81	1 oz	110	1	0	0	0	270	25	1	3	2	500	5	100	10
Organic Fiber Strands	$ 1.04	1 oz	60	1	0	0	0	105	25	14	0	2	0	5	100	5
ADDITIVES																
Organic Freeze Dried Strawberries	$ 14.47	1 oz	105	0	0	0	0	4	24	4	14	1	85	80	30	2
Organic Freeze Dried Blueberries	$ 15.43	1 oz	112	1	0	0	0	2	24	5	19	1	160	5	15	0
Chocolate Chips	$ 1.24	1 oz	141	7	4	0	4	19	19	1	18	1	20	0	10	1
Organic Walnuts	$ 2.74	1 oz	185	18	2	0	0	1	4	2	1	4	5	0	25	1
Organic Freeze Dried Apple Pieces	$ 3.75	1 oz	336	0	0	0	0	29	22	3	19	0	20	1	5	1
Organic Freeze Dried Bananas	$ 8.34	1 oz	114	1	0	0	0	1	29	3	16	1	65	2	5	0
Organic Raisins	$ 1.34	1 oz	84	0	0	0	0	3	22	1	17	1	0	1	10	1
Organic Almonds	$ 2.61	1 oz	164	14	1	0	0	0	6	3	1	6	1	0	70	1
COATINGS																
Cinnamon Sugar Topping	$ 0.36	1 oz	100	0	0	0	0	0	28	0	28	0	0	0	0	0
Cinnamon	$ 0.89	1 oz	73	1	0	0	0	7	22	15	1	1	75	5	330	10
Frosted Sugar Coating	$ 0.34	1 oz	117	5	1	0	0	52	19	0	18	0	0	0	1	0

	Cost per Each
Packaging	
Carton	$ 0.15
Press and Seal Liner (Ziploc)	$ 0.02
Zipper Lock Cereal Bag (Hefty)	$ 0.19
Bowl and Lid	$ 0.34

MARKETING SCENARIO
FOOD SCIENCE CAREER DEVELOPMENT EVENT- 2003

Memorandum

TO: Product Development Group
FROM: Marketing Research and Business Development
SUBJECT: "Heat and Eat Meal Microwave Meal"
TASK: Using the materials, ingredients, pricing, and nutritional information provided, design a "Heat and Eat Meal from the Microwave"

People are looking for meals that can be ready at home in 5 to 10 minutes. Our potential customers want fast meals, but do not want to eat fast food every night. A frozen "Heat and Eat Meal from the Microwave" fills this need and more. Besides working adults, these meals are becoming very attractive to retirees, and teenagers. Retirees cook for two people and like the smaller portions available in these meals. It appears to be a big hit for older retirees who suffer from arthritis. Parents think the meals are good for teenagers because of the healthy ingredients and full compliment of nutrients that are found on the nutritional label.

Grocery store chains in our region are looking to fill their shelves with more good choices in the "Heat and Eat Meal" category. Our company is seeking to develop a new entree to increase our exposure in the retail market, especially at grocery stores.

The working adult has the most buying power, but the demand for this type of product is dead-even for all three groups. Working adults and the retirees are concerned about their health, but both want as much good taste as can be mustered in one complete ready-to-eat microwave meal.

Our company's aim is to gain the biggest market share on a few high quality products. This implies that your research team can target developing a product for any of the three groups of consumers described above and one of the two daily meals, lunch or dinner.

Gross sales from "Heat and Eat Meals" broke through the billion dollar mark in 2002. Lloyd's, Hormel, and Tyson are major players in the Heat and Eat Meal market. Their products have really been nothing but a major entree (barbequed ribs, meat loaf, etc.) and not complete meals. Our company believes there is market share to be captured if we can offer consumers a product that is more of a complete meal. We need to focus on less preparation, more nutrition, and the product should be viewed as a "complete meal" by consumers. Efficient distribution systems, packing considerations, and product integrity pose challenges when developing the frozen "Heat and Eat Microwave Meal" product line. Also, the texture of this product will need to feel like it was cooked in a conventional oven. In order to do that, the product will need to be pre-cooked at our facility so that consumers will just place it in the microwave to have a meal that tastes as good as home cooked.

As a group you have decided that you want to develop a frozen "Heat and Eat Microwave Meal" that incorporates the best health aspects demanded by consumers along with the most efficient method to produce and package the product. We believe that Mexican food offers our company the best chance of developing a more complete meal as perceived by consumers.

You also need to satisfy the marketing department's finished product costs and sales projections by delivering a "Heat and Eat Microwave Meal" that will be purchased by one of the three target audiences: adults, retirees, or teenagers.

Our company has a respectable market share of the traditional ready-to-eat sandwich business on a regional level. However, "Heat and Eat Microwave Meals" offer additional sales and profit avenues. Taste tests by your research unit indicate that

Mexican meals along with different cheeses and vegetable toppings have received good marks from targeted groups of teenagers, adults, and retirees who participated in your consumer research. The teenagers have told our research group that they like Mexican meals that are chunky and meaty, adults like Mexican meals that are spicy, and retirees like meals that are easier to chew and digest. Mexican meals that have the most promise are enchiladas, breakfast burritos, and super burritos. Ingredients, which have received good reviews, include onion, green chilies, jalapeno peppers, olives, green peppers, pork sausage, ground beef, and chicken. Cheeses that have won favor include Cheddar, Mozzarella, and a Monterey Jack/Colby blend. Tortillas for the burritos, which were preferred by groups interviewed, include whole wheat, Italian/herb, basil/tomato, and no fat. Four types of wrap bread could be used: Traditional Whole-Wheat Wraps, Italian/herb Wraps, Tomato and Basil Wraps, and Spinach Wraps. All wrap breads provide equal amounts of nutrition, however, the whole-wheat wrap contains four grams of fiber while all other wraps contain two gram of fiber per wrap.

It is critical that your group develops packaging graphics that entice your target audience to buy your Mexican meal instead of your competitor's product. Additionally, your group needs to develop a type of packaging that not only preserves the product, but also is appealing to your targeted customer. Types of packaging material are aluminum foil, plastic films, printable plastic films, wax paper, boxes, and plastic bags. Retirees prefer something that is easy to open, teenagers prefer a simple type of packaging with little waste, and working adults prefer an attractive package.

Well-documented consumer research has proven that, certain Mexican foods are complemented by sauces, which are very important in determining taste and acceptance of Mexican food. Possible types include a green chilli sauce, red chilli sauce and a chunky tomato-based salsa. Traditional salsa is a hit with retirees while adults appear to like spicy sauces.

Your group must decide which sauce will complement your heat and eat meal from the microwave that will be the optimum in taste, selling price, and nutrition. You may also present additional concepts/flavors that you might use to extend your product offering or to make your product more appealing to the consumer.

Your group's challenge: Using the ingredients provided, design a frozen Mexican "Heat and Eat Microwave Meal" to meet the demands for nutrition and flavor for your defined target market.

Additional challenges are defining production methods and costs, quality control requirements, and approach to distribution and cost. Remember your group must be able to explain and discuss how your group would accomplish each of the elements necessary to put a new product on the market from concept to final product for sale.

PRICING INFORMATION FOR FOOD INGREDIENTS AND PACKAGING MATERIALS

ITEM	UNIT COST
PROTEIN	
Pork Sausage	$0.10/ounce
Ground Beef	$0.08/ounce
Chicken	$0.04/ounce
Egg	$0.07/egg
VEGETABLES	
Jalapeno Peppers	$0.03/ounce
Chilies	$0.04/ounce
Onions	$0.02/ounce
Green Peppers	$0.04/ounce
Black Olives	$0.05/ounce
Refried Beans	$0.04/ounce
Chopped Tomatoes	$0.01/ounce
CHEESE	
Cheddar	$0.20/ounce
Monterrey Jack/Colby	$0.17/ounce
Mozzarella	$0.17/ounce
SANDWICH WRAP	
Whole Wheat	$0.12/piece
Italian herb	$0.20/piece
Sundried Tomato	$0.20/piece
Spinach	$0.17/piece
SAUCES	
Green Chili Sauce	$0.10/ounce
Red Chili Sauce	$0.10/ounce
Salsa	$0.12/ounce
PACKAGING	
4 mil thick plastic	$0.08/piece
1 mil thick plastic	$0.04/piece
Dbl layer printed plastic	$0.12/piece
Aluminum Foil	$0.03/piece
wax paper	$0.02/piece
Cardboard Box	$0.10/piece

MARKETING SCENARIO
FOOD SCIENCE CAREER DEVELOPMENT EVENT ~ 2004

Memorandum

TO: Product Development Group
FROM: Marketing Research and Business Development
SUBJECT: "Dried fruit snack — Considering carbohydrates"
TASK: Using the materials, ingredients, pricing, and nutritional information provided, design a "Dried fruit snack ~ Considering carbohydrates"

The base of our company's clientele is people with an active lifestyle, without consideration of age. Thanks to your past development efforts, we have gained a market niche to satisfy our clientele's demand for fast and nutritious meals. Our most recent results of our customer survey have identified a new market niche in which our company can successfully compete. Our customers want something they can eat while driving down the road, during a break at work, after school, or while they take a hike on a weekend. The survey results also indicated that they want something light, easy to carry, and with a stable shelf-life. We believe that a Dried fruit snack fills this need, but we also want to address the new "craze" in diets ~ low carbohydrates. So, besides dried fruits which are high in natural fiber and nutrients, we want to offer a snack that provides for lower carbohydrate intake per volume of product and lowered or healthy carbohydrates for our customers.

Our goal is to develop a line of healthy snack products that appeal to the different segments of our customer base which includes working adults, active retirees, and teenagers. Another unique, but customer group worthy of our consideration is diabetics because many diabetics desire products with carbohydrates that are not metabolized at a high rate by the digestive system. Research has shown that abstaining from all refined sugar as well as processed grain products like white bread and white rice, which a human body quickly converts into sugar will slow down one's production of insulin.

The Glycemic Index (or GI), is a ranking of carbohydrates based on their immediate effect on blood glucose (blood sugar) levels. Carbohydrates that breakdown quickly have high GI values which results in a fast and high blood glucose response. Carbohydrates that break down slowly, releasing glucose gradually into the bloodstream, have a low GI. The GI value should be considered when developing a dried fruit snack for our customers that have low carbohydrate diets or are diabetic.

According to the University of Sydney in Australia, foods with GI values of 55 or less are considered low, foods between 55 - 69 medium, and food with a GI value of 70 or greater have a high GI. In addition, research has shown that a diet low in refined sugars, (these typically have lower GI values), will lower your cholesterol, increase one's energy and decrease your risk for diet-related health problems. The addition of natural fiber to a food portion that mainly consists of carbohydrates will also decrease the demand for insulin.

However, with all of good research acknowledged, our company seeks to build a product line that differentiates itself from plain old "raisins, dried plums, and dried apricots". Our marketing division's past experience tells us that our customers will grow tired of simple dried fruit snacks and soon after the introduction of our product line, sales will begin to plummet. So, other "healthy ingredients" needed to be added to create a new line of food products that will sustain sales over a long period of time. Other ingredients that could be added to the dried fruit combinations include a variety of nuts, whole grains, and legumes.

Our company's vision is to develop this line of new products that can be found occupying shelf space next to our successful line of "Heat and Eat" products at our biggest grocery store customers. The working adult has the most buying power, but preliminary data from our marketing group indicates that the demand for this type of product is dead-even for all four groups. The working adults, diabetics, retirees and teenagers are concerned about their health, but all four groups want as much good taste as can be mustered in one complete dried fruit snack type product.

Our company's aim is to gain the biggest market share on a few high quality products. This implies that your product development team can target any of the four groups of consumers listed above for a snack that is healthy, nutritious, tasty, and convenient.

Gross sales from "Dried Fruit Snacks" broke through the 100 million dollar mark in 2003. Del Monte, Mariana, and Diamond-Growers are major players in the Dried Fruit Snack market. Their products have really been nothing but a mixed basket of dried fruit (dried plums, apricots, and raisins, etc.). Our company believes there is market share to be captured if we can offer consumers a product that can be eaten more often by consumers on a weekly basis. We need to focus on lowered or healthy carbohydrates, more nutrition, and the product should be viewed as "convenient" by consumers.

Efficient distribution systems and packing considerations pose challenges when developing the "Dried Fruit Snacks with Carbohydrates Considered" product line. As a group you have decided that you want to develop a "Dried Fruit Snacks with Carbohydrates Considered" that incorporates the best health aspects demanded by the consumer groups mentioned above along with the most efficient method to package the product. Perishability of the product is not a problem, but a reduction in product quality (crushed nuts or small dried fruit components) should be taken into account.

You also need to satisfy the marketing department's finished product costs and sales projections by delivering a "Dried Fruit Snack with Carbohydrates Considered" that will be purchased by one of the four groups mentioned above: adults, retirees, teenagers, and diabetics.

Currently, our company has a respectable market share of the traditional ready-to-eat food business on a regional level. However, "Dried Fruit Snack with Carbohydrates Considered" offer additional sales and profit avenues. Taste tests by your research unit indicate that dried fruits along with different nuts, whole grains and legumes have received good marks from targeted groups of teenagers, adults, diabetics and retirees who participated in your consumer research. The teenagers have told our research group that they like snacks that are chunky and crunchy, adults like snacks that appear to be sweeter and chewier, while retirees and diabetics like meals that are easier to digest. Ingredients, which have received good reviews, include dried cranberries, dried plums, and dried blueberries. Nuts that have won favor include Pecan, Almond, and English Walnuts. Grains, which were preferred by groups interviewed, include whole wheat and oats. Peanuts were found to be the preferred legume.

It is critical that your group develops packaging graphics that attract your target group to buy your "Dried Fruit snack with Carbohydrates Considered" instead of your competitor's product. Additionally, you must find the right packaging to sustain the physical quality of the product. Similar products in the marketplace are priced between $1.69 - $2.49 per package. Our company's goal is to make a 20% profit from this new and exciting product launch.

Your group's challenge: Using the ingredients that include dried fruit, nuts, whole grains, and legumes and nutritional information provided, design a "Dried Fruit Snack with Carbohydrates Considered" to meet the needs of your defined target market. Additional challenges are defining production methods and costs, quality control

requirements, and approach to distribution and cost. Remember your group must be able to explain and discuss how to accomplish each of the elements necessary to bring this new product from concept to the marketplace.

NUTRITIONAL DATA SHEET FOR INGREDIENTS 2004

ITEM	Serving Size	Calories	Protein	Fat	Saturated Fat	Cholesterol	Sodium	Carbohydrate	Dietary Fiber	Sugars	GI Value
		(kcal)	(grams)	(grams)	(grams)	(milligrams)	(milligrams)	(grams)	(grams)	(grams)	
DEHYDRATED FRUITS											
Blueberries	1 ounce	100	1	0	0	0	22	25	4	19	50
Cranberries	1 ounce	93	0	0	0	0	0	24	1	19	54
Cherries	1 ounce	100	1	0	0	0	11	22	1	17	64
Raisins	1 ounce	93	2	1	0	0	14	55	1	21	78
Dates	1 ounce	86	1	0	0	0	0	22	2	17	96
NUTS											
Almonds	1 ounce	116	4	10	1	0	0	4	2	1	10
Walnuts	1 ounce	204	5	19	1	0	3	3	2	1	12
Cashews	1 ounce	164	4	13	3	0	5	9	1	2	22
Pecans	1 ounce	165	2	17	1	0	0	3	2	1	16
LEGUMES											
Peanuts	1 ounce	110	5	10	1	0	3	3	2	1	7
GRAINS/SEEDS											
Pumpkin Seeds	1 ounce	160	9	12	2	0	10	4	1	0	18
Oats	1 ounce	115	5	2	0	0	0	19	3	1	54
OTHER											
Wheat Bran	1 ounce	60	2	1	0	0	130	24	14	0	40
Rice Cake	1 ounce	105	3	0	0	0	0	21	1	2	87
Snack Sticks	1 ounce	150	2	9	2	0	250	14	1	1	92
Chocolate Chips	1 ounce	140	0	8	5	8	8	18	0	16	72

INGREDIENT AND PACKAGING COST SHEET – 2004

ITEM	Cost/Ounce ($)
DEHYDRATED FRUITS	
Blueberries	0.30
Cranberries	0.20
Cherries	0.25
Raisins	0.10
Dates	0.15
NUTS	
Almonds	0.25
Walnuts	0.30
Cashews	0.20
Pecans	0.35
LEGUMES	
Peanuts	0.10
GRAINS/SEEDS	
Pumpkin Seeds	0.30
Oats	0.10
OTHER	
Wheat Bran	0.20
Rice Cake Pieces	0.40
Snack Sticks	0.10
Chocolate Chips	0.15
PACKAGING	

Food Safety and Quality Practicums

1. **Customer Inquiry**
   Each participant will be given five scenarios representing general consumer inquiries. Participants must determine if the consumer inquiry reflects a quality or safety issue and determine if it is a biological, chemical or physical concern or hazard. (25 points)

2. **Food Safety/Sanitation**
   Each participant will be given ten situations (e.g., photos, videos, written scenarios, live demonstrations or a combination). A numbered list of problems will be provided at the beginning of this practicum segment. The list will contain concepts such as good manufacturing practices (GMP), sanitation, food handling/storage and other pre-requisite programs. Participants will identify if there is a violation presented in the situation. If participants decide that there is a violation, they will indicate the number of the violation from the list of problems provided. (25 points)

LIST OF POTENTIAL FOOD PROCESSING OPERATIONS
SANITATION & FOOD SAFETY PROBLEMS

1) Facilities, ingredients and packaging supplies, and processed foods shall be free of:
    a. Insects (such as flies, cockroaches, worms, etc), insect parts (in excess of allowable limits), and insect eggs
    b. Rodents (such as rats & mice)
    c. Birds
    d. Domestic Animals (such as Cats & Dogs)
    e. Fecal droppings or urinary discharges from any of the above
2) Weeds and trash shall be cleared within several inches of outside plant walls (as these harbor insects or rodents)
3) Hole in walls or window screens are not permitted (as they may allow entry of insects or rodents)
4) Cracks or spacings under doors or windows are not permitted
5) Open outside doors or windows without screens or air curtains are not permitted
6) Rodent control programs are required (including traps or baits)
7) Open-top trash containers (inside or outside) are required
8) Rust on processing equipment contacting foods is not allowed
9) Proper temperature control of processes throughout the facility is required, such as:
    a. Cooler storage temperatures
    b. Freezer storage temperatures
    c. Frozen ingredients may be thawed prior to use, but containers cannot be dripping moisture or other liquids prior to usage
10) Food supplies shall not be stored directly on floor (skids, pallets or racks required)
11) Equipment, facilities, walls and floors, and overhead utilities must be dirt, dust, mold, or other contamination-free
12) Equipment or utilities above the processing line shall not drop anything into the food line (such as grease, water, dust, or dirt on equipment or food)
13) Metal shavings from metal-to-metal contact on-line shall not get into foods
14) Equipment shall not use slotted screws or bolt heads (as they may harbor microorganisms)
15) Equipment shall be constructed without crevices (such as faulty welds or cracks) or without square corners (where microorganisms may grow)
16) All equipment and storage racks shall be a minimum of six inches off the floor, so the floor underneath can be cleaned with water and broom
17) All processing and storage room floors shall be sloped to assure drainage of water during clean-up
18) All parts of a disassembled processing equipment line shall be cleaned immediately after usage and stored on clean racks (off floor) when not in use (Any contact with floor shall be considered re-contamination)
19) All food contact surfaces shall be constructed of heavy stainless steel, or food-approved sanitary plastic or rubber
20) All overhead lights shall be shielded to avoid glass breakage and contamination of foods
21) All processing cooking vessels shall be covered whenever possible, to prevent contamination and control temperatures
22) All processing room walls shall be constructed of washable, waterproof materials
23) All finished food products must be properly labeled, including nutritional information when required

24) Deceptive food packaging or labeling is not permitted
25) All raw ingredients shall be sound and wholesome
26) Food handling employees must wear hairnets and/or beard nets
27) Food handling employees must wear clean clothing to handle foods
28) Food handling employees may not wear nor carry loose in pockets, any rings or other loose jewelry (such as watches, bracelets, necklaces, pins) which could drop into the food
29) Food handling employees must wash their hands prior to starting work, after picking up anything from the floor, and after every visit to the toilet
30) Food handling employees shall wear clean, impact-resistant, sanitary gloves made of impermeable plastic or rubber whenever in direct contact with foods, ingredients or containers for these foods and supplies
31) Adequate numbers and clean toilet facilities must be provided for food handling employees
32) All hand-wash sinks in food operation and toilet areas shall be clean and sanitary, with cold & hot water and proper temperature controls and mixing valves.
33) Adequate covered trash, containers must be available in food operation and toilet hand-wash sink areas
34) Clean containers for raw ingredients and processed foods must not be stored directly on the floor of the processing area (to prevent transfer of contamination to the foods from the bottom of the containers)
35) Processes creating excess steam and condensate on ceilings must be hooded and vented (to prevent dripping into foods)
36) All processed foods packages shall be properly date and lot coded
37) Product recall plans shall be written, tested and have all participating personnel appointed prior to a problem
38) Records of all processes shall be checked by a second party (supervisor) and kept for future reference
39) All retort-processed foods must be cooked under the supervision of an employee having attended a certified processing school
40) Swollen cans, wet packages, holes or leaks in containers, or rust on cans containing processed foods in storage is cause for rejection of this product
41) Loosely piled or non-shrinkwrapped pallets of foods stacked in storage in danger of falling over are a hazard (as they could topple and cause leaker containers)
42) Cartoned or palletized foods in storage should not be piled too high, so they could result in weight damage to seals or strength of individual food packages
43) Processed foods shall not contain any foreign materials (such as glass, metal, wood, insects or parts of insects, or toxic substances
44) Only government-approved chemicals may be used for cleaning the processing equipment and plant work areas
45) Only government-approved chemicals may be used for maintaining the food plant and storage areas from contamination by insects, rodents, birds, etc, and shall be applied by a certified pest control operator
46) Workers with open cuts, bruises, or wounds shall not handle foods or raw ingredients
47) Workers shall be disease-free
48) Uncooked foods and cooked foods shall be stored in separated areas with proper Identification
49) Imported foods shall be subject to the same sanitation, handling, processing and labeling regulations, and Good Manufacturing Practices as foods produced in the U.S.

50) All processed food products offered for public sale and consumption shall be sound and wholesome and free of adulterants.
51) Food plant buildings shall not have any walls with peeling paint or other toxic substances that could be exposed to any food ingredients or processing equipment.
52) Food processing plants shall be of sound and safe construction meeting regulatory guidelines, and shall be in good repair.
53) Hand wash sinks and equipment wash sinks shall not be used to store dirty or cleaned equipment, supplies, or packaging containers.
54) All plant stairways require a safety handrail and cleanable stair-step surfaces.
55) All walls, ceilings, floor, and equipment exposed to foods in the processing or storage areas shall be rust-free.
56) All packaging materials, equipment, or storage and delivery supplies must be free of dust, dirt, rust, or other possible contaminants.
57) All food ingredients to be added to foods and/or processed for human consumption must be clean and free from any contact with contaminated surfaces prior to usage.
58) Frozen or refrigerated food ingredients shall not be thawed outside the plant, with exposure to possible contamination by insects, rodents, birds, animals, or extreme high temperatures causing spoilage.
59) A 6 to 12 inch strip of cleared dirt or paved (i.e., concrete or asphalt) area shall be maintained around all outside perimeters of all food plant facilities to prevent contamination from rodents, insects, etc.
60) All food ingredients known to have potential allergic reactions by humans, must be included by name on the label ingredient phrase.
61) Knowledge of any spoiled canned food products due to swollen containers, putrefactive odors, or causing consumer illness, must be rapidly investigated for a potential serious public health problem.
62) Contamination of finished food products with rocks, glass, hair, or other similar objects require serious investigation of the problem to prevent further health problems (i.e., damaged teeth, cut mouth, infections, etc.) or legal actions against the processor.

Food Science and Technology CDE
Customer Inquiry Scorecard

Name: _____ **State:** _____

Participant #: _____

		Points Possible	Points Earned
Scenario # 1 This issue represented in this scenario is a: Food Quality Issue Food Safety Issue	_____ _____	2	
Is the concern or hazard primarily: Biological Chemical Physical	(Check only one) _____ _____ _____	3	
Scenario # 2 This issue represented in this scenario is a: Food Quality Issue Food Safety Issue	_____ _____	2	
Is the concern or hazard primarily: Biological Chemical Physical	(Check only one) _____ _____ _____	3	
Scenario # 3 This issue represented in this scenario is a: Food Quality Issue Food Safety Issue	_____ _____	2	
Is the concern or hazard primarily: Biological Chemical Physical	(Check only one) _____ _____ _____	3	
Scenario # 4 This issue represented in this scenario is a: Food Quality Issue Food Safety Issue	_____ _____	2	
Is the concern or hazard primarily: Biological Chemical Physical	(Check only one) _____ _____ _____	3	
Scenario # 5 This issue represented in this scenario is a: Food Quality Issue Food Safety Issue	_____ _____	2	
Is the concern or hazard primarily: Biological Chemical Physical	(Check only one) _____ _____ _____	3	
	TOTAL	**25**	

Food Science and Technology CDE
Food Safety and Sanitation Scorecard

Name: _____ **State:** _____

Participant #: _____

Situation # 1 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 1a) Yes _____ 1b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 1c) _____
Situation # 2 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 2a) Yes _____ 2b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 2c) _____
Situation # 3 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 3a) Yes _____ 3b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 3c) _____
Situation # 4 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 4a) Yes _____ 4b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 4c) _____
Situation # 5 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 5a) Yes _____ 5b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 5c) _____
Situation # 6 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 6a) Yes _____ 6b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 6c) _____
Situation # 7 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 7a) Yes _____ 7b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 7c) _____
Situation # 8 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 8a) Yes _____ 8b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 8c) _____
Situation # 9 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 9a) Yes _____ 9b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 9c) _____
Situation # 10 – The situation depicts a violation of GMP, sanitation and/or food handling/storage (1 point). 10a) Yes _____ 10b) No _____ If yes, list the item number that would best apply from the list of guidelines provided (1.5 points): 10c) _____
TOTAL: _____/ 25 Possible Points

Sensory Evaluation Practicums

1. **Triangle Tests**
   Three different triangle tests will be conducted. Participants are expected to identify the different samples through flavor, aroma, visual cues and/or textural differences. Answers will be given on the sheet provided. No list will be provided for this segment of the practicum. Each test is worth 5 points. (15 points)

2. **Flavor Identification**
   Three samples will be tasted. Participants will be expected to discern the flavor of each sample by taste. Flavors may include but are not limited to fruits, vegetables, florals, savory, sweeteners, etc. Each sample is worth 5 points. (15 points)

3. **Aromas**
   Each participant will be asked to identify four different aromas from vials provided at each station and record the answer on the sheet provided. A list of potential aromas will be provided to each person. Each sample is worth 5 points. (20 points)

Aromas

Cinnamon
Chocolate
Maple
Oregano
Basil
Lemon
Lime
Orange
Vanilla
Smoke (liquid)
Cherry
Pine
Onion
Butter
Menthol
Grape
Garlic
Peppermint
Clove
Nutmeg
Ginger
Molasses
Wintergreen
Banana
Coconut
Lilac
Raspberry
Strawberry
Licorice (anise)