

Food Science and Technology Career Development Event

OBJECTIVE TEST: INSTRUCTIONS

Welcome to the Food Science Career Development Event!

1. DO NOT TURN THIS PAGE UNTIL YOU GET INSTRUCTIONS FROM THE MONITOR
2. Enter all the required information on the scantron where it says the name, team name, team code
3. There are 50 questions, and you have 60 minutes total to complete the test
4. Check your test booklet has 50 questions
5. Darken the correct answer with a #2 pencil. Make sure you darken the bubble completely with the #2-pencil



Correct



Wrong



Wrong

6. If you finish early, please remain seated until the other participants finish. You will be dismissed as a group

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1. The pink pigment in meat that is created during the curing process is:
 - A. Nitrosohemochrome
 - B. Myoglobin
 - C. Metmyoglobin
 - D. Oxymyoglobin
 - E. Carboxymyoglobin
2. What is the predominant mineral present in blood?
 - A. Calcium
 - B. Iron
 - C. Protein
 - D. Copper
 - E. Nitrogen
3. The reduction is a process in which
 - A. An electron is gained
 - B. An electron is lost
 - C. No change in electron
 - D. Neutron is lost
 - E. Neutron is gained
4. Disease-causing microorganisms are called
 - A. Pathogens
 - B. Pests
 - C. Spoilage organism
 - D. All of the above
 - E. None of the above
5. The pancreas releases _____
 - A. Bile acids
 - B. Red blood cells
 - C. Insulin
 - D. Thyroid
 - E. Bolus
6. Name the protein present in milk
 - A. Myoglobin
 - B. Catalyst
 - C. Casein
 - D. Calcium
 - E. Calpines

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7. The amount of carbohydrates required to produce 88 calories of energy
- A. $88 \text{ calories} \div 4 \text{ calories} = 11 \text{ g carbohydrate}$
 - B. $88 \text{ calories} \times 4 \text{ calories} = 352 \text{ g carbohydrate}$
 - C. $88 \text{ calories} \div 4 \text{ calories} = 22 \text{ g carbohydrate}$
 - D. $88 \text{ calories} \times 9 \text{ calories} = 396 \text{ g carbohydrate}$
 - E. None of the above
8. Lack of which enzyme results in lactose intolerance
- A. Lactase
 - B. Lipase
 - C. Ligase
 - D. Lacteal
 - E. Lactose
9. _____ refers to the water pressure within cells that make vegetables crisp
- A. Turgor
 - B. Osmosis
 - C. Concentration
 - D. Vacuum
 - E. Lysis
10. Imagine you ate low-calorie pizza, which contained 1 g of fat, 1 g of carbohydrate, and 1 g of protein. What will be the total calories from this food?
- A. 36 kilocalories
 - B. 68 kilocalories
 - C. 108 kilocalories
 - D. 48 kilocalories
 - E. 17 kilocalories
11. The process in which a substance goes from a solid state to a gaseous state is called
- A. Evaporation
 - B. Radiation
 - C. Freezing
 - D. Sublimation
 - E. Condensation
12. Agar and carrageenan are derived from _____
- A. Collagen
 - B. Jello
 - C. Seaweed
 - D. Fungi
 - E. Plant gums

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13. A solution with a pH of ____ is considered acidic
- A. 12
 - B. 7
 - C. 10
 - D. 1**
 - E. 7.2
14. _____ organized the “poison squad.”
- A. Louis Pasteur
 - B. The Jungle
 - C. Rosa Parks
 - D. Theodore Roosevelt
 - E. Harvey Wiley**
15. The amino acids that body cannot synthesize and need to be obtained through diet
- A. Saturated amino acid
 - B. Unsaturated amino acids
 - C. Non-essential amino acids
 - D. Essential amino acids**
 - E. None of the above
16. The term 12D is associated with
- A. Pasteurization
 - B. Radiation
 - C. Canning**
 - D. Aerobic packaging
 - E. Microwave
17. What is the recommended pH of canned food?
- A. 4.6**
 - B. 2.0
 - C. 0.5
 - D. 7.0
 - E. 6.25
18. A non-nutritive substance/GRAS substance added intentionally to improve quality and shelf-life of food is called:
- A. Food safety
 - B. Food additives**
 - C. Food contaminant
 - D. Food technology

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19. _____ is the process of using heat to kill pathogenic organisms but does not destroy all spoilage microorganisms
- A. Homogenization
 - B. Sterilization
 - C. Pasteurization
 - D. Steaming
 - E. None of the above
20. FSMA is an acronym for:
- A. Food System and Maintenance Act
 - B. Food Safety Modernization Act
 - C. Food Safety and Microbiology Act
 - D. Food Safety and Meat Adulteration Act
 - E. None of the above
21. _____ (GMP) are procedures that have been developed to ensure safe and wholesome food production as well as a safe working environment
- A. Gross manufacturing production
 - B. Good Mass Production
 - C. Great Manufacturing Policy
 - D. Good Manufacturing Practices
 - E. All of the above
22. The fats that are generally solid and have no double bonds
- A. Unsaturated fatty acids
 - B. Saturated fatty acids
 - C. Essential fatty acids
 - D. Omega fatty acids
 - E. Polyunsaturated fatty acids
23. The red color of beef is due:
- A. Myosin
 - B. Myoglobin
 - C. Mitosis
 - D. Maltose
 - E. Lactose

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24. A _____ is the amount of energy equal to the quantity of heat necessary to raise the temperature of 1 gram of water to 1 °C
- A. Joule
 - B. Watt
 - C. Amp
 - D. Calorie**
 - E. None of the above
25. _____ are the building blocks of proteins
- A. Glucose
 - B. Fatty acids
 - C. Carbohydrates
 - D. Amino acids**
 - E. Lipids
26. Homogenization of milk is
- A. The process that reduces all pathogenic microorganisms in milk
 - B. The process that reduces fat globule size in milk**
 - C. The process that separates the cream from the skim milk
 - D. The process that adds fat to milk
 - E. None of the above
27. The final stage of the product planning and development process is:
- A. Concept stage
 - B. Commercialization stage**
 - C. Product development stage
 - D. Grading
 - E. Pilot study stage
28. COOL is an acronym related to:
- A. Cold products
 - B. Country of origin labeling of food products**
 - C. Food Ingredient
 - D. Coloring compound
 - E. Cooked food products
29. A green ham is _____
- A. Actually green in color
 - B. The turkey substitute for pork
 - C. Not yet cured**
 - D. All of the above
 - E. None of the above

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30. A humectant is:
- A. Limits lipid oxidation
 - B. Increase alkaline nature
 - C. Chelate metals
 - D. Retain moisture**
 - E. Acidulant
31. FDA food laws are found in which Title of the Code of Federal Regulations?
- A. Title 7
 - B. Title 8
 - C. Title 20
 - D. Title 21**
 - E. Title 22
32. Fruit sugar is _____
- A. Glucose
 - B. Fructose**
 - C. Lactose
 - D. Sucrose
 - E. Maltose
33. Tofu is made from
- A. Red beans
 - B. Lentils
 - C. Hummus
 - D. Soybean**
 - E. Navy bean
34. FSIS stands for:
- A. Food Safety and Inspection Administration
 - B. Food Safety and Inspection Service
 - C. Fiber Safety and Inspection Service**
 - D. Food And Drug Administration
 - E. Food Safety and Inspection Safety
35. The Delaney Clause passed in 1958 states that
- A. No hormones can be added to food
 - B. Pesticides must be regulated
 - C. Synthetic compounds can be added to food
 - D. A chemical additive that induces cancer should not be added to food**

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36. A synthetic hormone to increase milk production is _____
- A. BSA
 - B. BSE
 - C. BST
 - D. BBA
 - E. None of the above
37. Which type of microorganism is used to make wine, beer, and bread
- A. Bacteria
 - B. Yeast
 - C. Virus
 - D. Parasite
 - E. Prions
38. The USDA recommends safe minimum internal temperature for ground beef is
- A. 140 °F
 - B. 150 °F
 - C. 160 °F
 - D. 170 °F
 - E. 180 °F
39. Psychrophilic microorganisms will
- A. Grow like thermophiles
 - B. Grow at very high temperatures
 - C. Grow at low temperatures
 - D. Die at low temperatures
 - E. None of the above
40. Aspartame is a:
- A. Simple sugar
 - B. Natural sugar
 - C. High fructose corn syrup
 - D. Fatty acid
 - E. Non-calorigenic artificial sweetener
41. Major taste stimuli are:
- A. Sweet, sour, bitter, salty, umami
 - B. Sweet, sour, bitter, salty, astringent
 - C. Sweet, sour, flavor, salty, astringent
 - D. Sweet, bubbly, flavor, salty, astringent
 - E. Sweet, bitter, fizz, salty, umami

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42. An example of a polysaccharide would be
- A. Fatty acids
 - B. Starch**
 - C. Protein
 - D. Carboxylic acid
 - E. Glucose
43. Enzymatic browning is seen in:
- A. Freshly cut apple**
 - B. Freshly cut beef
 - C. Cooked steak
 - D. All of the above
 - E. None of the above
44. An emulsion is a stable mixture of _____ and _____
- A. Oil and water**
 - B. Water and water
 - C. Oil and gas
 - D. An emulsion is related to nutritional quality
 - E. None of the above
45. Total counts of microorganisms used as an indication of sanitary quality
- A. SPC – Standard Plate Count**
 - B. PPC – Potential Plate Count
 - C. SPC – Sanitary Plate Count
 - D. SCP – Standard Counts Plated
 - E. All of the above
46. Milk is fortified with
- A. Vitamin K
 - B. Vitamin E
 - C. Vitamin D**
 - D. Vitamin M
 - E. None of the above
47. Two factors that accelerate rancidity in food are
- A. Protein and carbohydrate content
 - B. Fat and exposure to oxygen**
 - C. Fat and lack of exposure to oxygen
 - D. Fat and absence of exposure to light source

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FOOD PRODUCT DEVELOPMENT SCENARIO

Instructions: This is a team event. Total time allotted for product development is 70 minutes.

Total time for oral presentation is 10 minutes and 10 minutes for questions and answers.

Scenario: Part of a healthy lifestyle includes 30 minutes of activity daily. Activity can consist of cardio or aerobic activity and strength training. Both activities can deplete energy and dehydrate. Therefore, replenishing energy stores while repairing muscle is important post-workout. A recent study shows there is an increased consumption of post-workout drinks. You and your team are in charge of creating a high-protein drink with an 8-ounce serving size for teenagers (age group 13-18 years old). The product should be refrigerated so it can be sold in grocery stores and gym vending machines. Additionally, it should be healthy to purchase and be attractive. Carefully consider the healthy lifestyle trend and how this product may be attractive to such a consumer.

The ideal considerations for this product are:

1. Healthy
2. High protein content
3. Attractiveness to teenagers

The currently available post-workout drinks don't have the ideal consideration, and these problems are mainly associated with the product formulation and the packaging. Consider this when developing your product.

Given this scenario, you should develop as a team:

1. High protein post-workout drink that is marketed towards families with teenagers between 13 and 18 years old. Take into account concerns about high sugar content and teenager's eagerness to consume an attractive product.
2. You need to select five ingredients from a total of given none ingredients, and you need to make a drink based on the selected five ingredients.
3. Consider A serving size to be 8 oz.
4. Create a front display (Label) and mock package (container) on the easel sheet provided.
5. Create a nutritional panel and an ingredient statement on the poster board provided. The nutritional panel should contain all of the relevant information. A spreadsheet of ingredient information is included in this packet.

The *approximate weight* of different given ingredients are: (select only **five** ingredients)

Whey protein: 28 g

Peanut butter: 28 g

Water: 56 g

Pea protein: 28 g

Strawberries: 28 g

Soy milk: 56 g

Collagen: 28 g

Bananas: 28 g

Whole milk: 56 g

Pricing Strategy

Pricing strategy is very important in the placement of our product. You need to demonstrate that this is a nutritional and quality product that is attractively priced to be competitive with other high-protein drinks. This means a price of around \$4-5. This target price does not include a standard store markup of 20%. After a financial analysis of the product, it determined the following base price for our product:

Product costs:	\$0.30
Distribution:	\$0.18
Promotion:	\$0.11
“Shelf” maintenance:	\$0.01

These cost estimates do not include ingredient costs or packaging costs. Each ingredient used will add to the cost of the product since the ingredients have to be purchased elsewhere and assembled into the final product. The ingredient costs per pound are listed in the information included in this packet. Potential packaging costs are included in this packet.

Good luck!!

NUTRITIONAL INFORMATION OF INGREDIENTS

ITEM	Cost per serving (\$)	Calories in one serving	Serving size (g)	Fat (g)	Saturated fat (g)	Carbohydrates (g)	Dietary fiber (g)	Sugar (g)	Proteins (g)	Cholesterol (mg)	Sodium (mg)	Vitamin D (mcg)	Vitamin C (mg)	Calcium (mg)	Iron (mg)
Whey protein	2	110	28	1	0.5	3	0	2	22	25	20	0	0	90	2
Collagen	1	40	10	0	0	0	0	0	9	0	65	0	0	0	0
Pea protein	1	100	26	20	0.5	2	1	1	20	0	200	0	0	43	7
Peanut butter	1	190	33	16	4	8	2	3	7	0	140	0	0	17	1
Bananas	1	112	126	1	0	29	3	15	2	0	1	0	11	6	1
Strawberries	2	35	100	1	0	7	2	5	1	0	10	0	56	12	1
Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soy milk	2	110	240	4.5	0.5	9	2	6	8	0	90	3	0	450	1.3
Whole milk	1	120	240	8	5	11	0	11	8	35	120	1	0	260	0

Packaging cost

Cardboard Carton	\$ 0.05
Hard Plastic Bottle	\$ 0.08
Plastic Printed Pouch	\$ 0.03

Conversions

1 oz = 28 grams (g)
1 lb = 16 oz = 454 grams (g)
1 gram = 1,000 milligrams (mg) = 1,000,000 micrograms (mcg)

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CUSTOMER INQUIRY

Please read each of the five customer inquiries. For each inquiry, you must indicate:

1. If the complaint is related to food safety or food quality problem (2 points)
2. If the hazard is primarily biological, chemical, or physical (3 points)
3. Please mark your answers in the scantron section "Customer Inquiry."
4. Each question carries 5 points. Total points for this section is 25

This is an individual event!! No talking allowed!

Scenario #1 QUALITY, CHEMICAL

To whom it may concern:

I am writing because I purchased a package of your whole grain bread at the grocery store in Somewhere, OK, on April 25, 2014. I consumed approximately half of the loaf when I found numerous pieces of black grease materials. I smelled it, and it had an oily odor. I didn't consume any remaining bread loaves for fear of my health. I find this to be a very serious problem and expect that you will correct it immediately. I saved the remainder of the product and would like a refund.

Thank you for your attention to this very important matter.

Sincerely
Hank Smith

Scenario #2 SAFETY, CHEMICAL

Dear Cookie Lady,

My daughter is highly allergic to almonds. We purchased a vegetable soup after carefully reading the label. The label said that the product did not contain almonds. However, when we opened the package, I noticed small pieces of almond. If my daughter had eaten them, I would have been afraid to think about the situation.

I hope you will not repeat this.

Upset Mom.

Scenario #3 QUALITY, CHEMICAL

Dear Customer Service,

We purchased your potato chips for our children. However, when the kids were enjoying them, we noticed that potato chips had a rancid smell. Interestingly those potato chips were still within the expiry date.

I am really disappointed with your product.

Sincerely,
Disappointed customer.

Scenario #4 SAFETY, BIOLOGICAL

Last month, I bought four 64 oz chubs of your Genoa Salami at Oklahoma Groceries in Oklahoma. After 2 days of storage in my refrigerator, I opened the salami packages, and on slicing the product, I noticed that three of the chubs had streaks/spots/slime of green discoloration on the inside of the chub. I was disappointed and discarded the discolored product in the domestic trash.

Angry Customer.

Scenario #5 SAFETY, BIOLOGICAL

Dear Mr. Apple,

We purchased a 32 oz container of your cinnamon applesauce with a best-by date of April 27, 2013. Unfortunately, when we popped the seal, we noticed black mold growing inside the container. I am upset that I wasn't able to enjoy my purchase.

Sincerely
Customer

Question 1



Question 2



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Food Safety Sanitation Report 80 points Team Activity Preparation 20 points

TEAM NAME

TEAM NUMBER

Instructions

1. As a team, you need to make two reports based on two pictures related to food safety and sanitation. Please use the chart to make the reports.
2. For the category, you can select one or more categories listed on this page.
3. Your team point will be based on the two reports and the teamwork.
4. Total points = 100 (report 80 points and teamwork 20 points)

CATEGORY AND OBSERVATION	Degree of Concern	Recommendation or Corrective Action
1. General maintenance of physical facilities. 2. Cleaning and sanitizing of equipment and utensils. 3. Storage and handling of clean equipment and utensils. 4. Pest control. 5. Proper use and storage of cleaning compounds, sanitizers, and pesticides. 6. Employee training. 7. Employee hygiene 8. Plant design. 9. Quality assurance assessment.	Critical, Major, Minor	What corrective action would you recommend for each scenario?

SAMPLE

CATEGORY (20 points; 10 points for each question)	Observation (20 points; 10 points for each question)	Degree of Concern (20 points; 10 points for each question)	Recommendation or Corrective Action (20 points; 10 points for each question)
<p>Question 1</p> <p>10 points if 6,7, and 2</p> <p>8 points if 6 and 7</p> <p>4 points if either 6 or 7</p> <p>2 points if 2</p>	<p>10 points if employee training, employee hygiene, and cleaning and sanitation of equipment and utensils.</p> <p>8 points for employee training and employee hygiene</p> <p>4 points if employee training or employee hygiene</p> <p>4 points if cleaning and sanitizing of equipment</p>	<p>Major – 10 points</p> <p>Minor – 5 points</p> <p>Major and minor – 10 points</p>	<p>10 points - Training, follow good manufacturing practices (GMP), and cleaning</p> <p>8 points - If they have only training and follow good manufacturing practices (GMP)</p> <p>4 points - If they have only training or follow good manufacturing practices (GMP)</p> <p>4 points if they mention about cleaning</p>

<p>Question 2</p> <p>10 points if 1, 2, 3, and 6</p> <p>8 points if 1, 2, and 3</p> <p>4 points if either 1, 2, or 3</p> <p>2 points if only one</p>	<p>10 points if they mention about general maintenance, cleaning, storage and handling of clean equipment</p>	<p>Major – 10 points</p> <p>Minor – 5 points</p> <p>Major and minor – 10 points</p>	<p>10 points - Training, follow good manufacturing practices (GMP), and cleaning</p> <p>8 points - If they have only training and follow good manufacturing practices (GMP)</p> <p>4 points - If they have only training or follow good manufacturing practices (GMP)</p> <p>4 points if they mention about cleaning</p>
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TEAM NAME:

TEAM NUMBER:

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PROBLEM-SOLVING/MATH PRACTICUM

Please mark your answers in the *scantron* section **Problem-Solving/ Math Practicum**.

The total point for this section is 25. ***This is an individual event! No talking!***

Math practicum #1

Consider you have a 10% salt solution. What will be the effective salt concentration if you dissolve 0.1 liters of 10% salt solution in 1 liter of water? ($C_1 \times V_1 = C_2 \times V_2$ – c = concentration; v – volume)

$$10\% \times 0.1 = 1 \times C_2$$

- A. 0.1%
- B. 1%**
- C. 10%
- D. 100%
- E. 20%

Math practicum #2

A food processor uses an automated salsa-filling machine. The capacity of each jar is 16 oz. The accuracy of filling the jar is ± 0.5 oz. If you want to ensure each jar is filling **14 oz**, what should be the set volume level for the machine?

- A. 14.0 oz
- B. 13.5 oz
- C. 14.5 oz**
- D. 15.0 oz
- E. 16.0 oz

Math practicum #3

Consider you added 6 g of sugar in 10 fluid ounces of the sweet tea mixture. What will be the percentage of sugar in 10 fluid ounces of sweet tea? [Consider one fluid ounce is 30 mL]

$$1\% \text{ --- } 1 \text{ g in } 100 \text{ mL}; 10 \text{ flu ounce --- } 10 \times 30 = 300 \text{ mL}; \text{ **6 g in 300 mL**}$$

- A. 2%**
- B. 6%
- C. 10%
- D. 60%
- E. 100%

Math practicum #4

The relationship between protein and nitrogen content is 6.25. So, for example, there will be 6.25 g of protein for each gram of nitrogen. Consider nitrogen content in 30 g of soy flour is 10 g. What will be the protein content in 30 g soy flour? (1 g nitrogen --- 6.25 g protein; 10 g nitrogen x 6.25

- A. 6.25 g
- B. 62.5 g
- C. 10.0 g
- D. 16.2 g
- E. 20.6 g

Math practicum #5

Overrun in ice is the amount of air incorporated into the ice cream mixture. Overrun is expressed in percentage, and it is calculated as $[(\text{final volume} - \text{initial volume}) \div \text{initial volume}] \times 100$. For example, consider the initial volume of the ice cream mixture was 100. After incorporating air, the volume was 150. What will be the overrun of the ice cream mixture? $(150-100) \div 100; 50/100$

- A. 1.25%
- B. 0.25%
- C. 25.0%
- D. 50.0%
- E. 125%

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PRODUCT SPECIFICATION COMPLIANCE

Please read each of the five product specification compliance and mark your answers in the *scantron section* **Product Specification Compliance**. Total points for this section is 25

This is an individual event! No talking!

Product specification compliance #1

A food processor makes canned salsa with the following ingredients: Tomato, acetic acid, bell peppers, black pepper, and garlic. The final pH of the salsa was 5 (<4.6). Since salsa contains acetic acid, the processor thinks he does not have to be concerned about pH. Do you think the food processor is in compliance with food safety laws?

- A. pH is not critical in this product
- B. Processor complies with food safety laws
- C. Processor is not in compliance with food safety laws**

Product specification compliance #2

A food processor makes cooked hamburger patties. The internal cooked temperature of the patties was 140 °F. The processor thinks that since they are freezing the patties, hence internal cooked temperature is not a critical control point. Do you think the food processor complies with food safety laws?

- A. Food safety compliance is not related to the current scenario
- B. Processor is in compliance with food safety laws
- C. Processor is not in compliance with food safety laws**

Product specification compliance #3

A food processor makes morning snacks. The weight printed on the packet was 8 oz. Just out of curiosity, you weighed the weight of the sample, and the weight was 6 oz (assuming your scale is accurate and calibrated the scale using standards). Do you think the food processor complies with product specifications?

- A. Product compliance is not related to the current scenario
- B. Processor complies with food laws
- C. Processor is not in compliance with food laws**

Product specification compliance #4

The nutritional label of chocolate chip cookies is indicated. Do you think the food processor is in compliance with food labeling laws?

- A. Food labeling compliance is not related to the current scenario
- B. The processor complies with food laws
- C. Processor is not in compliance with food laws**

Nutrition Facts			
Serving Size			
Servings per Container			
Amount per serving			
Calories		Calories from Fat	
% Daily value*			
Total Fat			
Saturated Fat			
Trans Fat			
Polyunsaturated Fat			
Monounsaturated Fat			
Cholesterol			
Sodium			
Total Carbohydrate			
Dietary Fiber			
Sugars			
Protein			
Vitamin A		Vitamin C	
Calcium		Iron	
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your caloric needs:			
	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat. Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrates		300g	375g
Dietary Fiber		25g	30g
Calories per gram:			
Fat 9 • Carbohydrate 4 • Protein 4			

Product specification compliance #5

A food manufacturer processes raw chicken and fresh green salad in two different buildings. Do you think the food processor complies with food safety laws?

- A. Food safety compliance is not related to the current scenario
- B. Processor complies with food safety laws**
- C. Processor is not in compliance with food safety laws

Recourses courtesy: Jason
Young and Dr. Muriana, FAPC,
Oklahoma State University

Examples of hazards

Food Safety Hazard

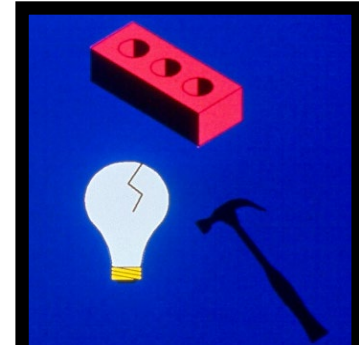
Definition of a 'Food Safety Hazard':

Any biological, chemical, or physical property that may cause a food to be unsafe for human consumption.

Food Safety Hazards

Types of Hazards:

1. Physical



2. Chemical

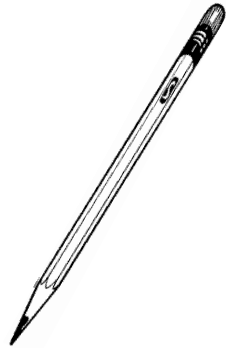


3. Microbiological



Physical Hazards

- Metal
- Glass
- Wood
- Stones
- Bones
- Paint chips
- Plastic (gloves, packaging)
- Pens, pencils
- Thermometers
- Tools, nuts and bolts, etc.
- Meat hooks, hard hats, tools...



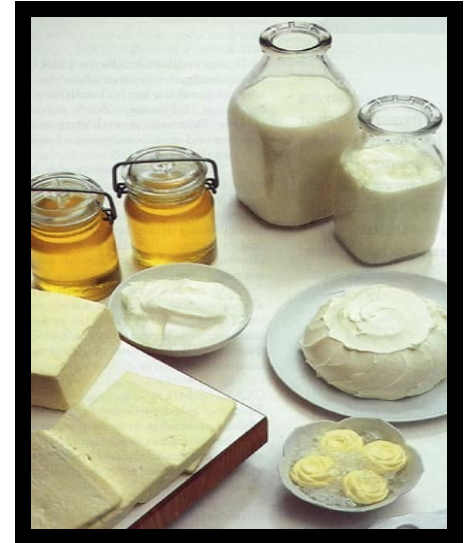
Chemical Hazards

- **Naturally occurring**

- Aflatoxin, mycotoxins (cereal grains)
- Allergens (when unlabeled)

- **Added chemicals**

- Pesticides, fertilizers, antibiotic residues, cleaners, sanitizers, grease..etc.



Hazardous Chemicals Used in Food Processing

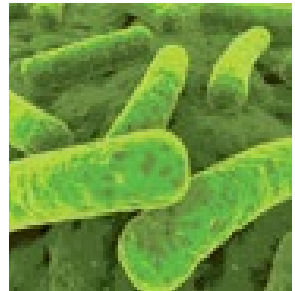
Point of Use:

Types of Chemicals:

- Growing crops → Pesticides, herbicides, defoliants
- Raising livestock → Growth hormones, antibiotics
- Production → Food additives, processing aids
- Plant maintenance → Lubricants, paints
- Plant sanitation → Cleaners, sanitizers, pesticides

Biological Hazards

- **Microorganisms:**
 - Organisms such as bacteria, parasites, viruses, yeasts, and molds
- **Foodborne Pathogens:**
 - A microorganism found in food that is capable of producing illness through ingestion of the organism and/or its toxin.
 - Infection
 - Intoxication
 - Toxicoinfection



Preventive Measures:

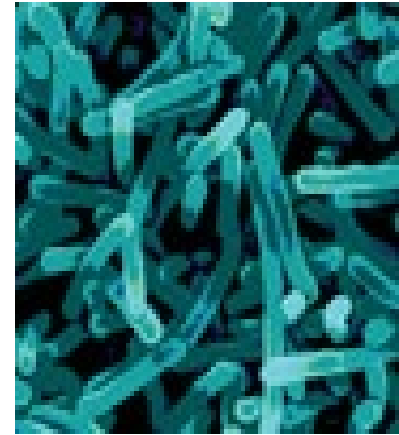
- Physical, chemical, or other factors that can control an identified health hazard
- More than one preventive measure may be required
- More than one hazard may be controlled by one preventive measure
- Listing of the hazards and preventive measures helps to determine Critical Control Points

Biological Hazards & Their Sources

Microorganisms are Everywhere!

All pathogens are hazards!

- **Raw materials**
 - Raw plant and animal food
 - Contaminated processed food
- **Environment**
 - Air, water, food processing equipment
- **Employees**



Chemical Hazards & Their Sources

Raw materials:

- Pesticides** ⇒ plant materials
- Antibiotics** ⇒ improper withdrawal time in meat and dairy livestock
- Hazardous chemicals** ⇒ improper processing, environmental contamination

Processing:

- Direct food additives** ⇒ excessive quantities used in formations
- Processing aids** ⇒ improper use and quantities

Building / Equipment Maintenance

- Paints** ⇒ chipping from poor maintenance of building or equipment
- Coatings** ⇒ chipping from poor maintenance, removal from friction
- Lubricants** ⇒ excessive use, lack of drip pans, improper cleaning

Sanitation

- Pesticides** ⇒ improper use, rodents
- Cleaners** ⇒ inadequate rinsing procedures
- Sanitizers** ⇒ improper use and quantities, improper time after sanitation

Chemical Hazard Control Measures

- **Source Control**

- Vendor certification
- Raw material testing

- **Production Control**

- Proper use & application of food additives
 - Approved chemicals
 - Proper formulation and quantities used
 - Proper handling and storage

- **Labeling Control**

- Finished product properly labeled with ingredients & known allergens

Physical Hazards & Their Sources:

- Metal** ⇒ bolts, nuts, screws, screens/sieves, steel wool, metal
- Glass** ⇒ light bulbs, watch crystals, thermometers, insect bulbs
- Wood** ⇒ crates, pallets, equipment bracing, overhead structures
- Insects** ⇒ environment, bug lights, incoming ingredients
- Hair** ⇒ meat ingredients, employees, clothing, rodents
- Mold** ⇒ inadequate cleaning of equipment
- Rodent droppings** ⇒ inadequate cleaning of equipment
- Gum, wrappers** ⇒ poor employee practices

Physical Hazards & Their Sources:

- Dirt, rocks** ⇒ raw materials, poor employee practices
- Paint flakes** ⇒ equipment, overhead structures
- Jewelry, buttons** ⇒ poor employee practices
- Carcass tags** ⇒ slaughter house
- Hypodermic needles** ⇒ veterinarian
- Bullets/shot/BBs** ⇒ animals shot in fields
- Feathers** ⇒ poor sanitation
- Grease** ⇒ poor equipment maintenance program
- Gasket materials** ⇒ inadequate equipment preventive maintenance