



Food Science and Technology

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.

Objectives

The food science and technology career development event provides the opportunity for the participant to:

- Gain an awareness of career and professional opportunities in the field of food science and technology.
- Experience group participation and leadership responsibilities in a competitive food science and technology program.
- Develop technical competence and personal initiative in a food science and technology occupation.

Event Rules

- Team makeup — The team will consist of four members with all four members' scores being totaled for the team score.
- It is highly recommended that participants wear FFA Official Dress for this event.
- Teams and/or individuals will not be permitted to use electronic media during the event, unless provided by national FFA.
- This includes, but is not limited to, cell phones, smart watches/fitness bands, cameras, etc.
- Any participant in possession of an unauthorized electronic device, except a calculator, in the event area is subject to disqualification.

Each participant must provide these items:

- A clipboard that is clean and free of notes.
- Two sharpened No. 2 pencils.
- Electronic calculator — Calculators used in this event must 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 can be used during the event including cell phones.

Allergy Information: Food products used in this event may contain or come in contact with potential allergens. Any participant in need of a reasonable ADA accommodation(s) for their participation in the Food Science and Technology CDE should complete the online [Request for Accommodation Form \(ADA and other\)](#). This form must be received 30 business days prior to the start of the event. All requests will remain confidential, and the participant will be contacted by a national FFA staff member to gather additional information and/or discuss the reasonable accommodation(s) or assistance being requested. For questions regarding the ADA and/or other Accommodation Process, please email ryan.inman2@tn.gov. The event committee will make all reasonable efforts to accommodate students with food allergies.

TEAM ACTIVITIES

Team Product Development Project (400 points possible per team)

Two weeks before the event date, 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 to develop a presentation:

- Cost of goods sold
- Nutrition
- Target audience
- Quality control
- Marketing and sales
- Product
- Processing
- Packaging
- Food safety
- Formulation concepts
- Quality of presentation

After this time period, each team member will contribute to a 10-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 10-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 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 categories, platforms and markets listed below.

CATEGORIES

- Cereal
- Snacks
- Meals
- Side dishes
- Beverages
- Supplements
- Condiments
- Desserts

PLATFORM

- Frozen
- Refrigerated
- Shelf-stable
- Convenience
- Ready to eat
- Heat and serve

MARKET (DOMESTIC AND INTERNATIONAL)

- Retail
- Wholesale
- Food service
- Convenience store

ONLY THE TOP 10 TEAMS WILL PRESENT THE TEAM ACTIVITY. However, all teams should prepare the product development project before arriving at convention. The top 10 teams will be determined by the individual practicums.

EXAMPLE OF SCENARIO PRODUCT FROM PAST EVENTS:

Category	Platform	Market	Actual Product
Side dish	Ready to prepare	Retail or big box	Whole grain, low-sodium side dish
Beverage	Shelf-stable	Retail	Shelf-stable specialty coffee
Side dish	Refrigerated	Retail	Side salad for baby boomers
Snack	Shelf-stable	Retail	Non-nut snack bar
Breakfast	Ready to eat	Retail	Single-serve cereal for kids

Evaluation criteria and points for team product development activity can be found on the Team Product Development Project Scorecard.

INDIVIDUAL ACTIVITIES*Objective Test (150 points possible per individual)*

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 created using the textbooks and websites specified in the reference section.

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 one point, for a total of 50 points. The test will come from the previous five year's National Food Science Objectives tests which can be found on FFA.org. A test bank will be maintained on the downloads page of tnffa.org and updated annually.

PRACTICUMS*Problem Solving/Math Practicum (25 points possible per individual)*

- Participants will answer a series of five mathematical calculations based on common food science themes. Questions may include nutrition calculations, ingredient quantity, cost benefit analysis, estimation of cost/margin of goods sold, conversions, processing conditions, etc.
- Example Question: The perfect glass of sweet tea is 20 percent sugar. Jim is making a one-gallon container of sweet tea. How many cups of sugar should he add?
 - 2.4 cups
 - 3.2 cups
 - 3.4 cups
 - 4 cups

Food Safety and Quality Practicums (50 points)

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 (two points per scenario) and determine if it is a biological, chemical or physical concern or hazard (three points per scenario). This is for a total of 25 points.

PRODUCT SPECIFICATION COMPLIANCE

- Students will be given sample sets (actual products and/or data sets) and will be responsible for determining compliance with the provided specification requirements. This may include, but is not limited to, determining if the products are within the net weight standards, product sizing requirements, pH, color analysis, viscosity measurement, fill level tolerances, packaging specification compliance, etc. Participants will be asked five questions regarding potential compliance violations presented within the sample set. (25 points)

Sensory Evaluation Practicums (40 points)

Triangle Tests

- Four 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 five points.

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)

- | | | |
|---------------|----------------------|--------------------|
| 10. Apple | 21. Ginger | 32. Peach |
| 11. Banana | 22. Grape | 33. Peppermint |
| 12. Basil | 23. Lemon | 34. Raspberry |
| 13. Butter | 24. Licorice (anise) | 35. Sage |
| 14. Cherry | 25. Lime | 36. Smoke (liquid) |
| 15. Chocolate | 26. Maple | 37. Strawberry |
| 16. Cinnamon | 27. Molasses | 38. Vanilla |
| 17. Clove | 28. Nutmeg | 39. Watermelon |
| 18. Coconut | 29. Onion | 40. Wintergreen |
| 19. Coffee | 30. Orange | |
| 20. Garlic | 31. Oregano | |

Scoring

Activities	Individual Points	Team Points
Team product development project		400
Team food safety/sanitation		80
Math/Problem solving	25	100
Food safety and quality	50	200
Sensory evaluation	40	160
Objective test	50	200
MAXIMUM POINTS POSSIBLE	165	1,140

TIEBREAKERS

Team:

1. Team product development
2. Individual test (combined score)

Individual:

1. Written exam
3. Food safety and quality
4. Sensory evaluation

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. Make sure to use discretion when selecting website references by only using reputable, proven sites. The following list contains references that may prove helpful during event preparation. The most current edition of resources will be used.

- Past CDE materials and other resources are available by logging in at FFA.org.

EXAM REFERENCES

- Principles of Food Science. 4th edition. 2015. Janet Ward and Larry Ward. The Goodheart-Willcox Company, INC.
- 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>

US Food and Drug Administration, <http://www.FDA.gov>

MATH/ PROBLEM SOLVING REFERENCE

The event will utilize the USDA Food Safety Inspection Service Processing Inspectors' Calculations Handbook (revised 1995) as the resource for the development of problem-solving problems relating to the following sections: Conversions (e.g., metric, US equivalents, grams, ounces, percent, ppm, Celsius, Fahrenheit); Pearson's Square; Percent of an ingredient in a formula; Yield; Shrink loss; Volume of a container; Calorie calculations; Total energy calculations. The resource can be found at this link:

https://www.fsis.usda.gov/sites/default/files/media_file/2020-07/7620.3.pdf

GENERAL REFERENCES

- Penn State Kitchen Chemistry: Experiments, resources and materials for educators and students, <http://foodscience.psu.edu/public/kitchen-chemistry>
- Food Safety Education, <https://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/teach-others/download-materials/for-kids-and-teens/for-kids-and-teens>
- Partnership for Food Safety Education, <http://www.fightbac.org>
- FoodSafety.gov, <http://www.foodsafety.gov>
- Good Manufacturing Practices, <https://www.fda.gov/food/current-good-manufacturing-practices-cgmps/good-manufacturing-practices-gmps-21st-century-food-processing>
- Inspection Service Processing Inspectors' Calculations Handbook (revised 1995): <http://www.aamp.com/foodsafety/documents/Directive7620-3.pdf>
- The New and Improved Nutrition Facts Label - Key Changes, <https://www.fda.gov/media/99331/download>
- USDA Food Safety Inspection Service Processing Inspectors' Calculations Handbook (revised 1995) the collection of sample calculations for food processing relating to the following sections: Conversions (e.g., metric, US equivalents, grams, ounces, percent, ppm, Celsius, Fahrenheit); Pearson's Square; Percent of an ingredient in a formula; Yield; Shrink loss; Volume of a container; Calorie calculations; Total energy calculations. https://www.fsis.usda.gov/sites/default/files/media_file/2020-07/7620.3.pdf

Team Product Development Project Scorecard

400 POINTS

Chapter	State	Team Number	
		Possible Score	Team Score
Package Display Components			
Use and development of nutrition label			
• Required information present		10	
• Correct calculations		10	
• Correct organization		10	
Use and development of the ingredient statement			
• Present		10	
• Correct order and all ingredients included		10	
• Location on package		10	
Use of principle display panel to convey information			
• All required components		15	
• Correct information		15	
• Location on package		10	
		<i>Package Design Subtotal</i>	100
Product Development Oral Presentation			
Cost of goods sold			
• Costing		20	
• Accuracy			
Nutrition			
• Communicate nutritional quality of product		20	
• Apply nutritional quality to health benefits			
Target audience			
• Identification of key consumer		20	
Quality control			
• Key quality attribute of consistent product		20	
• Examples: flavor, color, texture, net weight, size, etc.			
Marketing and sales			
• Communicated with future users		20	
• Promotions			
• Market location			
Product			
• Appearance		20	
• Texture			
• Shelf-life			
• Interaction of ingredients			
• Creativity			
Processing			
• Description of how to make product		20	
• Equipment			
• Flow diagram, unit operations			
• People			
Packaging			
• Materials used		20	
• Appropriate for use of product			
• Creativity			

	Possible Score	Team Score
Food Safety		
<ul style="list-style-type: none"> Discussed potential hazards/concerns associated with products 	20	
Formulation concepts		
<ul style="list-style-type: none"> How well did product match concept/product development scenario? 	30	
<ul style="list-style-type: none"> Category 	5	
<ul style="list-style-type: none"> Platform 	5	
Quality of presentation		
<ul style="list-style-type: none"> Equitable participation of team members 	5	
<ul style="list-style-type: none"> Organization 	5	
<ul style="list-style-type: none"> Use of time allowed 	5	
<ul style="list-style-type: none"> Professionalism 	5	
<ul style="list-style-type: none"> Presence and enthusiasm 	5	
<ul style="list-style-type: none"> Mannerisms 	5	
<i>Product Development Oral Presentation Subtotal</i>	250	
Response to judges' questions		
Team participation in question response		
<ul style="list-style-type: none"> All team members contributed 	25	
Quality of response		
<ul style="list-style-type: none"> Accuracy Ability to answer Originality Knowledge 	25	
<i>Response to Judges' Questions Subtotal</i>	50	
TOTAL POINTS	400	

Team Activity Preparation Rubric

20 POINTS

Chapter		State		Team Number	
Indicator	Very strong evidence of skill 5-4 points	Moderate evidence of skill 3-2 points	Weak evidence of skill 1-0 points	Points Earned	Total Score
Effective listening	Clearly evident that all team members are listening.	Listening occurs but distraction is evident.	Not listening to each other and/or talking over each other.		
Oral communication	Clearly evident that all team members are discussing the topic.	Communication occurs but side conversations are occurring or two to three are members dominating.	One member dominating conversation.		
Demonstrated cooperation	All team members clearly completing tasks, sharing written and oral solutions. All team members clearly respected the input of other team members.	Tasks primarily completed by two to three members, other members assist occasionally. Most team members respected the input of other team members.	Tasks primarily completed by one member, other members contributing only slightly. The team members did not respect the input of other team members.		
Participated in the team preparation	Clearly all team members are engaged, attentive, and making notes. Clearly all team members demonstrate efficient use of his/her time in comprising the plan.	Members are engaged and attentive with two to three making notes, participation fades over time. Most team members demonstrate efficient use of his/her time in comprising the plan.	One to two members form the primary team, other members occasionally participate early on but fade over time. One to two team members demonstrate efficient use of his/her time in comprising the plan.		
				TOTAL	

Customer Inquiry Rubric

25 POINTS

Chapter	State	Team Number	Points Possible	Points Earned
Scenario # 1: This issue represented in this scenario is a:			2	
<input type="checkbox"/> Food Quality Issue <input type="checkbox"/> Food Safety Issue				
Is the concern or hazard primarily (<i>Check only one</i>):			3	
<input type="checkbox"/> Biological <input type="checkbox"/> Chemical <input type="checkbox"/> Physical				
Scenario # 2: This issue represented in this scenario is a:			2	
<input type="checkbox"/> Food Quality Issue <input type="checkbox"/> Food Safety Issue				
Is the concern or hazard primarily (<i>Check only one</i>):			3	
<input type="checkbox"/> Biological <input type="checkbox"/> Chemical <input type="checkbox"/> Physical				
Scenario # 3: This issue represented in this scenario is a:			2	
<input type="checkbox"/> Food Quality Issue <input type="checkbox"/> Food Safety Issue				
Is the concern or hazard primarily (<i>Check only one</i>):			3	
<input type="checkbox"/> Biological <input type="checkbox"/> Chemical <input type="checkbox"/> Physical				
Scenario # 4: This issue represented in this scenario is a:			2	
<input type="checkbox"/> Food Quality Issue <input type="checkbox"/> Food Safety Issue				
Is the concern or hazard primarily (<i>Check only one</i>):			3	
<input type="checkbox"/> Biological <input type="checkbox"/> Chemical <input type="checkbox"/> Physical				
Scenario # 5: This issue represented in this scenario is a:			2	
<input type="checkbox"/> Food Quality Issue <input type="checkbox"/> Food Safety Issue				
Is the concern or hazard primarily (<i>Check only one</i>):			3	
<input type="checkbox"/> Biological <input type="checkbox"/> Chemical <input type="checkbox"/> Physical				
TOTAL			25	

