



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 food science and technology opportunities.
- 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.
- FFA official dress is required for this event.

Each participant must provide these items:

- A clean 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 smartphones.

Allergy Information: Food products used in this event may contain or come in contact with potential allergens. Any participant needing reasonable ADA accommodation(s) for participation in the Food Science and Technology CDE should complete the online [Reasonable ADA and/or Special Request for Accommodation form](#). This form must be received 30 business days before the start of the event. All requests will remain confidential, and a national FFA staff member will contact the participant 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)

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.

Each team will be provided with packaging materials, ingredients and necessary ingredient information to develop, label and package a product. The team will have 60 minutes to respond to the product development scenario, reformulate and create a product, calculate a nutritional label, develop the ingredient statement and information panel, and develop the front or principal display panel to reflect the new product.

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 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 time involved for each team will be 80 minutes. The 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 (50 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 three points, for a total of 50 points. The test will come from the previous five years National FFA Food Science objectives test.

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 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?
 - a. 2.4 cups
 - b. 3.2 cups
 - c. 3.4 cups
 - d. 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 must 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 | 20. Garlic | 30. Orange |
| 11. Banana | 21. Ginger | 31. Oregano |
| 12. Basil | 22. Grape | 32. Peach |
| 13. Butter | 23. Lemon | 33. Peppermint |
| 14. Cherry | 24. Licorice (anise) | 34. Raspberry |
| 15. Chocolate | 25. Lime | 35. Sage |
| 16. Cinnamon | 26. Maple | 36. Smoke (liquid) |
| 17. Clove | 27. Molasses | 37. Strawberry |
| 18. Coconut | 28. Nutmeg | 38. Vanilla |
| 19. Coffee | 29. Onion | 39. Watermelon |
| | | 40. Wintergreen |

Scoring

| Activities | Individual Points | Team Points |
|----------------------------------|-------------------|-------------|
| Team product development project | | 400 |
| Math/Problem solving | 25 | 100 |
| Food safety and quality | 50 | 200 |
| Sensory evaluation | 40 | 160 |
| Objective test | 50 | 200 |
| MAXIMUM POINTS POSSIBLE | 165 | 1,060 |

TIEBREAKERS

Team:

1. Team product development (for those in top 10 only)
2. Individual Sensory Evaluation (combined score)
3. Individual math practicum (combined score)
4. Individual test (combined score)

Individual:

1. Written exam
2. Sensory Evaluation
3. Math practicum

References

This list of references is not intended to be all-inclusive. Other sources may be utilized, and teachers are encouraged to use the best instructional materials available. Make sure to use discretion when selecting website references 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 on 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 the use of the 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 the 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 | |

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 | |