Food Science

Senior Division

FFA

Overview

Revised:11/24

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.

Eligibility

This event is open to all high school FFA chapters and FFA members in good standing. Members that have participated in a previous national event or previous state winning teams in this area are ineligible.

This event will be held during the **June CDE Week**.

Event Procedure

1. The team will consist of up to **four members** with all four members' scores being totaled for the team score.
2. Dress for the event will be an **FFA T-shirt, long pants, and close toed shoes**.
3. The event will consist of five activities: a team product development scenario, a team food safety audit activity, an objective test, a food safety and quality practicum and a sensory evaluation practicum.
4. All team members will participate in all of the activities. There will be a possible **1,440 total points** per team. The team product development project will be worth 400 points per team, the safety audit team activity will be worth 80 points per team, the objective test will be worth 150 points per individual and each of the two practicums will be worth 90 points per individual.
5. **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.
6. Observers will not be permitted in the event area while the event is in progress.
7. All participants will be given an identification number by which they will be designated throughout the event.
8. Each participant must provide:
   a. A clipboard that is clean and free of notes.
   b. Two sharpened No. 2 pencils.

c. Non-programmable calculator
9. Teams and/or individuals will not be permitted to use electronic media during the event. This includes but is not limited to laptops, cell phones, smart watches, cameras, etc.
10. Participants will not be allowed to possess any personal electronic devices (i.e. cell phones, smart watches, air pods, etc.) other than those approved by event officials. Participants who possess personal electronic devices without prior approval are subject to disqualification.

Event Format

Team Activities

1. Team Product Development Project *(400 points possible per team)*
   a. 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.
   b. The team will have **60 minutes** to respond to the product development scenario, reformulate and design 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.
   c. Students will be provided with the necessary materials to develop a poster which can be referenced during their team activity presentation. Students will NOT be asked to create an actual food/packaged product.
   d. Students will be given up to **10 minutes** to present their product, and up to an additional **5 minutes** of judges questions for a total of **15 minutes per team.**
   e. Team Product Development scenarios will be selected from the past 5 years National FFA examples
   f. Evaluation criteria and points for team activity can be found on the team product development project scorecard at the end of this handbook.
2. Food Safety Audit Team Activity *(80 points possible per team)*
   a. Teams will be given **4-8 situations** (e.g., photos, videos, written scenarios, live demonstrations) to observe. They will also be given policies to outline the food safety requirements of the location or facility.
   b. After evaluating the policies and situations provided, the team will complete the safety audit form. The sections of the form will include:
      i. List the reason(s) or what the issue is in the situation provided.
      ii. List the action to correct the situation.
      iii. Choose the related policy or policies that it violates, i.e. Facility, Sanitation, Pest Control, GMPs, Allergens, or Foreign Material. If more than one policy is violated the team will list it in the second column.
      iv. Choose the risk type that the situation created, i.e. Biological, Chemical or Physical Situation (Picture Video, Written Scenario, Live Demonstration)
   c. Teams will be given **30 minutes** to view and respond to the audit scenarios

Individual Activities

1. Objective Test *(150 points possible per individual)*

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 created using the past three years National FFA exams, available at www.ffa.org
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 three points, for a total of **150 points**.

2. Practicums—Each team member will complete all parts of individual practicums, except for those noted as odd/even year events.
   a. **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)*
   b. **Product Specification Compliance** (ODD YEARS) - Students will be given sample sets (actual products and/or data sets) and will be responsible for determining compliance with the provide specification requirements. This may include, but is not limited to determining if the product is 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)*
   c. **Problem Solving/Math Practicum** (EVEN YEARS) - Participants will answer a series of five mathematical calculations based on com mon food science themes. Questions may include nutrition calculations, ingredient quantity, cost benefit analysis, estimation of cost/margin of goods sold, conversions, processing conditions, etc.
      i. *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?
      ii. a. 2.4 cups **b. 3.2 cups** c. 3.4 cups d. 4 cups
   d. **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 5 points. *(20 points)*
   e. **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

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

SCORING

1. Participants will be ranked in numerical order on the basis of the final score to be determined by each judge without consultation. The judge's ranking of each participant then shall be added, and the winner will be that participant whose total ranking is the lowest. Other placings will be determined in the same manner (low point method of selection). Weighted rank scoring will be implemented to maintain point value emphasis between individual and team events. The criteria and points can be found on the scorecards.

Event	Points	Points total
Team Events		**480 Points possible**
Team Product Development		400 Points possible
Team Safety Audit		80 Points possible
Individual Events		**240 Points possible**
Customer Inquiry	25 Points/Student	100 Points possible
Math Practicum (ODD YEARS) or Product Spec. (EVEN YEARS)	25 Points/Student	100 Points possible
Triangle Tests	20 Points/Student	80 Points possible
Aromas	20 Points/Student	80 Points possible
Objective Test	150 Points/Student	600 Points possible
		1,440 Total Team Points possible

Tie Breaker

1. **Team:**
   a. Team product development
   b. Team food safety audit

c. Individual test *(combined score)*

2. **Individuals:**
    1. Written exam
    2. Food safety and quality practicums *(combined score)*
    3. Sensory evaluation practicums *(combined score)*

Awards

Awards will be presented to individuals and/or teams based upon their rankings at the State Fair FFA Awards Breakfast. The first place team will represent Delaware at National Convention. The second place team will represent Delaware at the Big E.

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:

1. Past CDE materials and other resources are available by logging in at www.ffa.org
2. Exam References
    a. Principles of Food Science. 4th edition. 2015. Janet Ward and Larry Ward. The Goodheart-Willcox Company, INC.
    b. Principles of Food Sanitation. 5th Edition. 2006. Norman G. Marriott and Robert B. Gravani, Springer Science + Business Media, Inc.
    c. Institute of Food Technology website, http://www.ift.org
    d. USDA Food Safety and Inspection Service website, http://www.fsis.usda.gov
    e. US Food and Drug Administration, http://www.fda.gov
3. Math Problem Solving References
    a. 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
4. General References
    a. Penn State Kitchen Chemistry: Experiments, resources and materials for educators and students, http://foodscience.psu.edu/public/kitchen-chemistry
    b. 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
    c. Partnership for Food Safety Education, http://www.fightbac.org
    d. FoodSafety.gov, http://www.foodsafety.gov
    e. Good Manufacturing Practices, https://www.fda.gov/food/current-good-manufacturing-practices-cgmps/good-manufacturing-practices-gmps-21st-century-food-processing
    f. Inspection Service Processing Inspectors' Calculations Handbook (revised 1995): http://www.aamp.com/foodsafety/documents/Directive7620-3.pdf

g. The New and Improved Nutrition Facts Label - Key Changes, https://www.fda.gov/media/99331/download
h. 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	
Package Design Subtotal	100	
Product Development Oral Presentation		
Cost of goods sold · Costing · Accuracy	20	
Nutrition · Communicate nutritional quality of product · Apply nutritional quality to health benefits	20	
Target audience · Identification of key consumer	20	
Quality control • Key quality attribute of consistent product · Examples: flavor, color, texture, net weight, size, etc.	20	
Marketing and sales · Communicated with future users · Promotions · Market location	20	
Product · Appearance • Texture • Shelf-life • Interaction of ingredients · Creativity •	20	

	Possible Score	Team Score
Processing · Description of how to make product · Equipment · Flow diagram, unit operations · People	20	
Packaging · Materials used · Appropriate for the use of the product · Creativity	20	
Food Safety · Discussed potential hazards/concerns associated with products	20	
Formulation concepts · How well did the product match concept/product development scenario?	30	
· Category	5	
· Platform	5	
· Equitable participation of team members		
· Organization	5	
· Use of time allowed	5	
· Professionalism	5	
· Presence and enthusiasm	5	
· Mannerisms	5	
	5	
Product Development Oral Presentation Subtotal	250	
Response to judges' questions		
Team participation in question response · All team members contributed	25	
Quality of response · Accuracy · Ability to answer · Originality · Knowledge	25	
Response to Judges' Questions Subtotal	50	
TOTAL POINTS	400	

Food Safety Audit Report Form

80 POINTS

Plant _____ Date _____

Location _____

Inspection Team Members' State _____ Team Number _____

Plant Contact _____

Contact Information _____

Situation (Picture Video, Written Scenario, Live Demonstration *4-8 situations to observe with policies to outline the food safety requirements*	*Food Safety Observation or Concern* *List reasons or explain what the issue is*	*Corrective Action* *List the action to correct this situation*	*Related Policies 1* *Facility, Sanitation, Pest Control, GMPS, Allergens, Foreign Material Use #2 only if violates more than one policy*	*Related Policies 2* *Facility, Sanitation, Pest Control, GMPS, Allergens, Foreign Material Use #2 only if violates more than one policy*	*Risk Type* *Biological, Chemical, or Physical*	*Total Points* *80*
Photo # 1						
Photo # 2						
Photo # 3						
Photo # 4						
Photo # 5						
Photo # 6						
Photo # 7						
Photo # 8						
Point Value	40%	45%	10%		5%	

Inspection Team Representative Signature _____

Customer Inquiry Rubric

25 POINTS

Chapter _____ State _____ Team Number _____

	Points Possible	Points Earned
Scenario # 1: This issue represented in this scenario is a:	2	
☐ Food Quality Issue ☐ Food Safety Issue		
Is the concern or hazard primarily *(Check only one):*	3	
☐ Biological ☐ Chemical ☐ Physical		
Scenario # 2: This issue represented in this scenario is a:	2	
☐ Food Quality Issue ☐ Food Safety Issue		
Is the concern or hazard primarily *(Check only one):*	3	
☐ Biological ☐ Chemical ☐ Physical		
Scenario # 3: This issue represented in this scenario is a:	2	
☐ Food Quality Issue ☐ Food Safety Issue		
Is the concern or hazard primarily *(Check only one):*	3	
☐ Biological ☐ Chemical ☐ Physical		
Scenario # 4: This issue represented in this scenario is a:	2	
☐ Food Quality Issue ☐ Food Safety Issue		
Is the concern or hazard primarily *(Check only one):*	3	
☐ Biological ☐ Chemical ☐ Physical		
Scenario # 5: This issue represented in this scenario is a:	2	
☐ Food Quality Issue ☐ Food Safety Issue		
Is the concern or hazard primarily *(Check only one):*	3	
☐ Biological ☐ Chemical ☐ Physical		
TOTAL	25	

Food Science - Form #713-3

Incorrect Marks Correct Mark

Team Name

This sheet is for demonstration and practice only. You must use a real scan sheet for actual competition.

Team #

Code

Last Name

First Name

Objective Test

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

Sensory Evaluation Practicum

Triangle Tests

	1	2	3	4
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				

Aromas

	1	2	3	4	5	6	7	8	9	10
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Problem Solving / Math Practicum

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5					

Food Safety and Quality Practicum

Customer Inquiry

Scenario	The issue represented in this scenario is a: Food Quality Issue	The issue represented in this scenario is a: Food Safety Issue	Is the concern or hazard primarily: Chemical	Is the concern or hazard primarily: Physical
1	Q	S	B C	P
2	Q	S	B C	P
3	Q	S	B C	P
4	Q	S	B C	P
5	Q	S	B C	P

Product Specification Compliance

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5					E