

Food Science and Technology

Curriculum Guide: *Food Science and Technology*

Unit: I. Principles of Food Preservation

Unit Objective:

Students will demonstrate an understanding of food preservation by researching food preservation techniques and presenting their findings to the class in an oral report.

Show-Me Standards: 2.1, CA6

References:

The Council. Accessed December 3, 2003, from <http://www.agedhq.org/councilindex.cfm>.

Exploring Agriculture in America. University of Missouri-Columbia, Instructional Materials Laboratory, 2000.

Food and Nutrition Information Center. U.S. Department of Agriculture and Agricultural Research Service. Accessed December 11, 2003, from <http://www.nal.usda.gov/fnic/>.

Food and Nutrition Publications. MU Extension. University of Missouri-Columbia. Accessed January 13, 2004, from <http://muextension.missouri.edu/explore/hesguide/foodnut/index.htm>.

Food Science and Technology. University of Missouri-Columbia, Instructional Materials Laboratory, 1994.

Institute of Food Technologists (IFT). Accessed December 3, 2003, from <http://www.ift.org/cms/>.

Kimchee. Bottle Biology. Accessed December 3, 2003, from http://www.bottlebiology.org/investigations/kimchee_main.html.

Students will use additional outside sources to complete this activity.

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Instructional Strategies/Activities:

- Students will engage in study questions in lessons 1 and 2.
- Students will complete AS 1.1, Effects of Packaging Material in Maintaining Meat Quality.
- Additional activities that relate to the unit objective can be found under the heading “Other Activities” in the following locations: p. I-6 and p. I-21.

Performance-Based Assessment:

Students will be divided into eight groups and each group will research a different technique of food preservation: heat, cold, drying, irradiation, packaging, additives, fermentation, and canning. Each group’s findings should include various methods of the technique, the process of each method, and three different product examples. Students will report their findings to the class in an oral presentation. The presentation should be approximately 10 minutes in length and all group members should participate in some way. As part of the presentation, the group should use visual aids such as posters, illustrations, charts, or transparencies. Students will also be encouraged to actually perform the preservation technique, if possible.

Assessment will be based on the overall content and presentation of the report. Spelling, grammar, punctuation, and capitalization will also be factors in the assessment.

Unit I—Principles of Food Preservation Instructor Guide

The instructor should assign the performance-based assessment activity at the beginning of the unit. Students will work toward completing the activity as they progress through the unit lessons. The assessment activity will be due at the completion of the unit.

1. Divide the class into eight groups and assign each group one of the following food preservation techniques:
 - Heat
 - Cold
 - Drying
 - Irradiation
 - Packaging
 - Additives
 - Fermentation
 - Canning
2. Each group will research the food preservation technique and find the following information:
 - The various methods of the technique
 - The process of each method
 - Three different product examples
3. Students will report their findings to the class in the form of a presentation (minimum 10 minutes in length).
 - a. Students should incorporate visual aids into their presentation such as posters, illustrations, charts, or transparencies.
 - b. If feasible, have students actually perform the food preservation technique as part of their presentation. If not doing an actual demonstration, have students show one physical example of a product that was preserved using the technique.
 - c. Have each group prepare a detailed outline of the report that will be turned in after the presentation.
 - d. Each group member should play an active part in the presentation.
4. Students may use material found in the unit or discussed in class as well as additional outside material to complete their report. Useful web sites are listed under the references section in this assessment activity.
5. Students may not use the source material word for word and must provide a complete bibliography of their sources following their report.

6. The final assessment score will be based on the overall content and presentation of the report. The written aspects of the report will also be assessed for spelling, grammar, punctuation, and capitalization errors.

Unit I—Principles of Food Preservation Student Handout

1. The instructor will divide the class into eight groups and assign your group one of the following food preservation techniques:
 - Heat
 - Cold
 - Drying
 - Irradiation
 - Packaging
 - Additives
 - Fermentation
 - Canning

2. Your group will research the food preservation technique and find the following information:
 - The various methods of the technique
 - The process of each method
 - Three different product examples

3. Your group will report its findings to the class in the form of a presentation (minimum 10 minutes in length).
 - a. You should incorporate visual aids into your presentation such as posters, illustrations, charts, or transparencies.
 - b. With permission from the instructor, your group can actually perform the food preservation technique as part of the presentation. If not doing an actual demonstration, your group should show one physical example of a product that was preserved using the technique.
 - c. Your group will prepare a detailed outline of the report that will be turned in after the presentation.
 - d. Each member of your group should play an active part in the presentation.

4. You may use material found in the unit and discussed in class as well as additional outside material to complete your report.

5. You may not use the source material word for word and must provide a complete bibliography of your sources following your report.

6. Your final assessment score will be based on the overall content and presentation of the report. The written aspects of the report will also be assessed for spelling, grammar, punctuation, and capitalization errors.

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Unit I—Principles of Food Preservation Scoring Guide

Name _____

Assessment Area	Criteria	0 Points	1 Point	2 Points	3 Points	4 Points	Weight	Total
Content of Report	<input type="checkbox"/> Includes all the required elements <input type="checkbox"/> Facts are accurate <input type="checkbox"/> Visual aids emphasize and clarify key points <input type="checkbox"/> Well organized	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 15	
Presentation of Report	<input type="checkbox"/> Holds audience interest <input type="checkbox"/> Speaks clearly and uses correct grammar <input type="checkbox"/> Maintains good posture <input type="checkbox"/> All members participated	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 7.5	
Technical Considerations (Written Aspects)	<input type="checkbox"/> Spelling <input type="checkbox"/> Grammar <input type="checkbox"/> Punctuation <input type="checkbox"/> Capitalization	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 2.5	
TOTAL								

Final Assessment Total _____/100 pts.

Comments:

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Unit: II. Food Processing

Unit Objective:

Students will demonstrate an understanding of the food processing industry by creating and describing a food product, in outline form, that will appeal to today's consumers and designing the packaging materials to effectively market the product.

Show-Me Standards: 2.1, FA1

References:

"Agricultural Sales." *National FFA Career Development Events Handbook*. Accessed April 13, 2004, from http://www.ffa.org/programs/cde/html/cde_events.htm#agsales.

Food for America. National FFA Organization. Accessed April 13, 2004, from http://www.ffa.org/ageducators/lps/documents/lps_foodforamerica.pdf.

"Food Science and Technology." *National FFA Career Development Events Handbook*. Accessed December 10, 2003, from http://www.ffa.org/programs/cde/html/cde_events.htm#food.

Food Science and Technology. University of Missouri-Columbia, Instructional Materials Laboratory, 1994.

Students may use additional outside sources to complete this activity.

Instructional Strategies/Activities:

- Students will engage in study questions in lessons 1 through 12.
- Students will complete AS 2.1, Soy Milk; AS 9.1, Soybean Processing; AS 9.2, Corn Sweeteners; AS 10.1, Processing Wheat; and AS 11.1, Making Nut Butter.
- Additional activities that relate to the unit objective can be found under the heading "Other Activities" in the following location: p. II-125.

Performance-Based Assessment:

Students will work in pairs or individually to develop a food product idea, create the product's packaging, and describe the product in outline form. Examples of products could include ready-to-eat cereal, breakfast bars, candy, beverages (soda, sports drinks, etc.), pizza, processed fruit snacks, stir-fried vegetables, or ready-to-eat sandwiches. Students will describe their product in an outline that should include the group of consumers that the product appeals to, how the product appeals to and meets the needs of the target group, why the packaging design was chosen, and reasons behind the various design elements of the packaging. Students also will create a full sketch of the product logo and a sketch of the packaging, which will show all sides of the packaging. The packaging sketch should include nutritional information, ingredients, product description, and any preparation instructions.

Assessment will be based on the overall quality of the content of the outline and the design and content of the logo and packaging sketches. Spelling, grammar, punctuation, and capitalization also will be assessed.

Unit II—Food Processing Instructor Guide

The instructor should assign the performance-based assessment activity at the beginning of the unit. Students will work toward completing the activity as they progress through the unit lessons. The assessment activity will be due at the completion of the unit.

1. Students will be working individually or in pairs to design a food product, draw a sketch of the product's packaging, and write a description of the product in outline form.
2. Have students think of a food product idea that will appeal to consumers and fulfill a need. Encourage students to be creative and innovative. Examples of products could include, but are not limited to, the following:
 - Ready-to-eat cereal
 - Breakfast bars
 - Candy
 - Beverages (soda, sports drinks, etc.)
 - Pizza
 - Processed fruit snacks
 - Stir-fried vegetables
 - Ready-to-eat sandwiches
3. Students will prepare sketches for their product that will include the following:
 - Full sketch of the product logo
 - Product packaging that shows all sides and includes the following elements:
 - Nutritional information
 - Ingredients
 - Product description
 - Any directions to prepare the product for consumption
4. Have students prepare an outline that answers the following questions about their product.
 - What is the product?
 - What group of consumers does the product appeal to?
 - How does the product appeal to and meet the needs of the target group?
 - Why was this packaging design chosen?
 - What are the reasons behind the various design elements used in the packaging?

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5. The final assessment score will be based on the overall quality of the content of the outline and the design and content of the logo and packaging sketches. Spelling, grammar, punctuation, and capitalization will also be factors in the assessment.

**Unit II—Food Processing
Student Handout**

1. You will be working individually or with another student to design a food product, draw a sketch of the product's packaging, and write a description of the product in outline form.
2. Develop a creative and innovative food product idea that will be appealing to consumers and fulfill a need. Examples of products could include, but are not limited to, the following:
 - Ready-to-eat cereal
 - Breakfast bars
 - Candy
 - Beverages (soda, sports drinks, etc.)
 - Pizza
 - Processed fruit snacks
 - Stir-fried vegetables
 - Ready-to-eat sandwiches
3. Prepare sketches for your product that will include the following:
 - Full sketch of the product logo
 - Product packaging that shows all sides and includes the following elements:
 - Nutritional information
 - Ingredients
 - Product description
 - Any directions to prepare the product for consumption
4. In outline form, answer the following questions about your product.
 - What is the product?
 - What group of consumers does the product appeal to?
 - How does the product appeal to and meet the needs of the target group?
 - Why was this packaging design chosen?
 - What are the reasons behind the various design elements used in the packaging?
5. Your final assessment score will be based on the overall quality of the content of the outline and the design and content of the logo and packaging sketches. Spelling, grammar, punctuation, and capitalization will also be factors in the assessment.

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Unit II—Food Processing Scoring Guide

Name _____

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Assessment Area	Criteria	0 Points	1 Point	2 Points	3 Points	4 Points	Weight	Total
Content of Product Outline	<ul style="list-style-type: none"> <input type="checkbox"/> Product idea is creative and innovative <input type="checkbox"/> Establishes need for the product in a specific market <input type="checkbox"/> Includes all the required elements <input type="checkbox"/> Well organized 	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 12.5	
Design and Content of Product Sketches (Logo and Packaging)	<ul style="list-style-type: none"> <input type="checkbox"/> Well organized <input type="checkbox"/> Creative design <input type="checkbox"/> Includes all the required elements <input type="checkbox"/> Eye-catching and appealing to consumers 	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 10	
Technical Considerations (Written Aspects)	<ul style="list-style-type: none"> <input type="checkbox"/> Spelling <input type="checkbox"/> Grammar <input type="checkbox"/> Punctuation <input type="checkbox"/> Capitalization 	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 2.5	
TOTAL								

Final Assessment Total _____/100 pts.

Comments:

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Unit: III. The Biochemistry of Foods

Unit Objective:

Students will demonstrate an understanding of biochemistry of foods by creating a poster about a commodity, product, or application that has been created or made better by the influence of biochemistry and giving an oral report to the class based on their poster.

Show-Me Standards: 1.8, CA6

References:

Food and Nutrition Information Center. U.S. Department of Agriculture and Agricultural Research Service. Accessed December 11, 2003, from <http://www.nal.usda.gov/fnic/>.

Food Science and Technology. University of Missouri-Columbia, Instructional Materials Laboratory, 1994.

Monsanto Company. Accessed November 3, 2003, from <http://www.monsanto.com/monsanto/layout/default.asp>.

Weidner, K. "Science in Your Shopping Cart." *Penn State Agriculture* (magazine), Fall 2002/Winter 2003. Accessed November 3, 2003, from <http://www.aginfo.psu.edu/psa/fw2003/gmo.html>.

Students will use additional outside sources to complete this activity.

Instructional Strategies/Activities:

- Students will engage in study questions in lessons 1 through 5.
- Students will complete AS 5.1, A Bioengineered Food Product.
- Additional activities that relate to the unit objective can be found under the heading "Other Activities" in the following locations: p. III-5 and pp. III-52-III-53.

Performance-Based Assessment:

Each student will create a poster that describes a commodity, product, or application that has been created or made better by biochemistry. The poster will include who developed the commodity, product, or application; a summary of the process; a picture of the commodity, product, or application; a short summary of how biochemistry has affected the commodity, product, or application; and what makes this commodity, product, or application different than its predecessor, if applicable. They will present their findings to the class in a presentation (5 minutes minimum in length) while using their poster as a visual aid.

Assessment will be based on the overall quality of the content of the poster and outline and the presentation of the report. The written portions of the project will also be assessed for spelling, grammar, punctuation, and capitalization.

**Unit III—The Biochemistry of Foods
Instructor Guide**

The instructor should assign the performance-based assessment activity at the beginning of the unit. Students will work toward completing the activity as they progress through the unit lessons. The assessment activity will be due at the completion of the unit.

1. Have each student choose a commodity, product, or application that has been created or improved by biochemistry. NOTE: If the class size is large or if time is limited, divide students into small groups. Students may select one of the following examples or find one on their own.
 - Provit A corn (enhanced)
 - Roundup Ready wheat, canola, corn, cotton, or soybeans
 - Yieldgard corn
 - Bollgard cotton
 - Yieldgard Plus corn
 - Bollgard/Roundup Ready cotton
 - StarLink corn
 - Hothouse tomatoes
 - Animal cloning for any purpose
2. After making a selection, students will research the topic and create a poster that illustrates their findings. The poster should include the following information:
 - Who developed the commodity, product, or application
 - How the commodity, product, or application is produced (steps involved in the biochemical process)
 - What the commodity, product, or application looks like (Find a picture.)
 - How biochemistry has affected the commodity, product, or application
 - How this commodity, product, or application is different from its predecessor, if applicable
3. Students may use material found in the unit or discussed in class as well as additional outside material to complete their poster. Useful web sites are listed under the references section in this assessment activity.
4. Students may not use the source material word for word and must provide a complete bibliography of their sources.

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5. Students will present their findings to the class in an oral report while using their poster as a visual aid.
 - a. Have students prepare a detailed outline of their presentation to turn in after the report.
 - b. The presentation should be at least 5 minutes in length.
6. The final assessment score will be based on the overall quality of the content of the poster and outline and the presentation of the report. The written aspects of the report will also be assessed for spelling, grammar, punctuation, and capitalization errors.

Unit III—The Biochemistry of Foods
Student Handout

1. You will choose a commodity, product, or application that has been created or improved by biochemistry. You may select one of the following examples or find one on your own.
 - Provit A corn (enhanced)
 - Roundup Ready wheat, canola, corn, cotton, or soybeans
 - Yieldgard corn
 - Bollgard cotton
 - Yieldgard Plus corn
 - Bollgard/Roundup Ready cotton
 - StarLink corn
 - Hothouse tomatoes
 - Animal cloning for any purpose

2. After making a selection, you will research the topic and create a poster that illustrates your findings. The poster should include the following information:
 - Who developed the commodity, product, or application
 - How the commodity, product, or application is produced (steps involved in the biochemical process)
 - What the commodity, product, or application looks like (Find a picture.)
 - How biochemistry has affected the commodity, product, or application
 - How this commodity, product, or application is different from its predecessor, if applicable

3. You may use material found in the unit or discussed in class as well as additional outside material to complete your poster.

4. You may not use the source material word for word and must provide a complete bibliography of your sources.

5. You will present your findings to the class in an oral report while using your poster as a visual aid.
 - a. You will prepare a detailed outline of your presentation to turn in after the report.
 - b. Your presentation should be at least 5 minutes in length.

6. Your final assessment score will be based on the overall quality of the content of the poster and outline and the presentation of the report. The written aspects of the report will also be assessed for spelling, grammar, punctuation, and capitalization errors.

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Unit III—The Biochemistry of Foods Scoring Guide

Name _____

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Assessment Area	Criteria	0 Points	1 Point	2 Points	3 Points	4 Points	Weight	Total
Content of Poster and Outline	<input type="checkbox"/> Includes all the required elements <input type="checkbox"/> Facts are accurate <input type="checkbox"/> Poster emphasizes and clarifies key points <input type="checkbox"/> Well organized	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 15	
Presentation of Report	<input type="checkbox"/> Holds audience interest <input type="checkbox"/> Speaks clearly and uses correct grammar <input type="checkbox"/> Maintains good posture <input type="checkbox"/> Easy to follow	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 7.5	
Technical Considerations (Written Portions)	<input type="checkbox"/> Spelling <input type="checkbox"/> Grammar <input type="checkbox"/> Punctuation <input type="checkbox"/> Capitalization	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 2.5	
TOTAL								

Final Assessment Total _____/100 pts.

Comments:

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Unit: IV. Food Selection and Consumer Health

Unit Objective:

Students will demonstrate an understanding of the nutritional facts on food labels and the nutritional requirements of a healthy diet by creating a chart where they will keep track of the foods they consume and writing a summary of their results.

Show-Me Standards: 1.8, HP5

References:

Food and Nutrition Information Center. U.S. Department of Agriculture and Agricultural Research Service. Accessed December 11, 2003, from <http://www.nal.usda.gov/fnic/>.

Food and Nutrition Publications. MU Extension. University of Missouri-Columbia. Accessed January 13, 2004, from <http://muextension.missouri.edu/explore/hesguide/foodnut/index.htm>.

Food Science and Technology. University of Missouri-Columbia, Instructional Materials Laboratory, 1994.

Nutrition and Health. University of Missouri Outreach & Extension. Accessed December 11, 2003, from <http://outreach.missouri.edu/main/nutrition/>.

Instructional Strategies/Activities:

- Students will engage in study questions in lessons 1 through 4.
- Students will complete AS 1.1, Comparing Snack Foods; AS 2.1, Nutritional Status; and AS 3.1, A Test for Vitamin C.
- Additional activities that relate to the unit objective can be found under the heading "Other Activities" in the following locations: p. IV-5, p. IV-14, and pp. IV-36-IV-37.

Performance-Based Assessment:

Students will work individually on their assignment. They will record what they eat and drink for 3 days (72 hr) in a chart they create. Each day they will provide totals for the nutrients (in grams) and vitamins and minerals (percentages) that they consume. Taking into account the totals, students will write a summary that evaluates whether they are meeting the daily

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nutritional requirements in each category and that provides recommendations on how they can improve their diet (e.g., eat more foods high in iron like peas or take a calcium supplement to meet the calcium requirement).

Assessment will be based on the overall quality of the summary and chart content. Spelling, grammar, punctuation, and capitalization also will be assessed.

Unit IV—Food Selection and Consumer Health Instructor Guide

The instructor should assign the performance-based assessment activity at the beginning of the unit. Students will work toward completing the activity as they progress through the unit lessons. The assessment activity will be due at the completion of the unit.

1. Working individually, students will keep track of what they eat for 3 days (72 hr). NOTE: This time period may be adjusted to your preference and teaching calendar. Three days is suggested so that students may have a better understanding of the types of food they eat.
2. For each food students eat and drink, they will need to record the following information:
 - Daily nutritional information totals (in grams)
 - Calories
 - Fat
 - Cholesterol
 - Sodium
 - Carbohydrates
 - Sugar
 - Protein
 - Daily vitamin and mineral totals (percentages)
 - Vitamin A
 - Vitamin C
 - Calcium
 - Iron
3. Students should keep their records in chart form to make it easier to read and track. They can either draw their chart or create the chart in a computer program like Excel.
4. After the chart is complete, students will write a summary (maximum of 1 page) that answers the following questions:
 - How healthy is my diet?
 - What needs to change about my diet?
 - Does my diet meet the recommended percentages of vitamins A and C, calcium, and iron? If not, what foods should be added to my diet to increase the percentages?

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5. The final assessment score will be based on the overall quality of the summary and chart content. Spelling, grammar, punctuation, and capitalization will also be factors in the assessment.

**Unit IV—Food Selection and Consumer Health
Student Handout**

1. Working individually, you will keep track of what you eat for a time period specified by your instructor. For each food you eat and drink, you will need to record the following information:
 - Daily nutritional information totals (in grams)
 - Calories
 - Fat
 - Cholesterol
 - Sodium
 - Carbohydrates
 - Sugar
 - Protein
 - Daily vitamin and mineral totals (percentages)
 - Vitamin A
 - Vitamin C
 - Calcium
 - Iron
2. Keep your records in chart form to make it easier to read and track. You can either draw the chart or create the chart in a computer program like Excel.
3. After the chart is complete, write a summary (maximum of 1 page) that answers the following questions:
 - How healthy is my diet?
 - What needs to change about my diet?
 - Does my diet meet the recommended percentages of vitamins A and C, calcium, and iron? If not, what foods should be added to my diet to increase the percentages?
4. Your final assessment score will be based on the overall quality of your summary and chart content. Spelling, grammar, punctuation, and capitalization will also be factors in the assessment.

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Unit IV—Food Selection and Consumer Health Scoring Guide

Name _____

Assessment Area	Criteria	0 Points	1 Point	2 Points	3 Points	4 Points	Weight	Total
Content of Summary	<input type="checkbox"/> Addresses all questions <input type="checkbox"/> Facts are accurate <input type="checkbox"/> Suggestions for diet changes are valid <input type="checkbox"/> Well organized	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 10.0	
Content of Chart	<input type="checkbox"/> Well organized <input type="checkbox"/> Covers time period specified <input type="checkbox"/> Includes all the elements required <input type="checkbox"/> Neat and easy to read	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 12.5	
Technical Considerations (Written Aspects)	<input type="checkbox"/> Spelling <input type="checkbox"/> Grammar <input type="checkbox"/> Punctuation <input type="checkbox"/> Capitalization	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 2.5	
TOTAL								

Final Assessment Total _____/100 pts.

Comments:

