Food Science

Agriculture

Grade(s) 10th - 12th, Duration 1 Year, 1 Credit
Elective Course

Course Overview

This course includes the areas of food chemistry and nutrition, food additives, food packaging and labeling, evaluation of foods, food microbiology, food processing, food fermentation, principles of sanitation and quality control.

Scope And Sequence

Timeframe	Unit	Instructional Topics
30 Period(s)	Food Preservation and Packaging	1. Thermal Preservation: Hot and Cold Processing 2. Dehydration and Concentration: Controlling Water Activity 3. Current Trends in Food Preservation: Irradiation, Packaging, and Biotechnology
15 Period(s)	Kitchen Basics and Safety	1. Basic Knife Skills and Cutting Techniques 2. Measuring and Unit Conversions 3. Kitchen Safety
60 Period(s)	Meat Science	1. Legislation and History 2. Animal Care and Handling 3. Meat Nutrition 4. Purchasing Meat 5. Storage 6. Cookery 7. Processed Meat 8. Food Safety
20 Period(s)	Dairy Foods	1. Milk Processing 2. Processing Dairy Products

Prerequisites

Ag Science II

Course Details

Unit: Food Preservation and Packaging

Duration: 30 Period(s)

Unit Description

This unit will look at processing and packaging methods used to preserve today's food supply.

Enduring Understandings (Knowledge & Skills)

Students will perform various food preservation techniques.

Academic Vocabulary

- shelf life
- cold point
- thermal death curve
- retort
- headspace
- hydrostatic cooker and cooler
- aseptic
- cold-pack method
- hot-pack method
- water-bath processing
- pressure processing
- humidity
- respiration
- sharp freezing
- blast freezer
- refrigerant
- cryogenic liquid
- dehydration
- case hardening
- sulfiting
- sulfuring
- dehydrofreezing
- concentration
- concentrate
- intermediate-moisture food
- food irradiation

- free radical
- radiolytic product
- rad
- gray
- kilogray
- hermetic
- copolymer
- ionomer
- cellophane
- permeable
- laminate
- reduced oxygen packaging (ROP)
- controlled atmosphere packaging (CAP)
- modified atmosphere packaging (MAP)
- desiccant
- nanotechnology
- biotechnology
- genetic engineering (GE)
- transgenic organism

Summative Assessment

Food Preservation Labs and Topic Quizzes.

Topic: Thermal Preservation: Hot and Cold Processing **Duration:** 10 Period(s)

Topic Description (short)

This topic discusses thermal preservation or the changing temperature or heat energy of a food.

Learning Targets

1. Identify the four degrees of heat preservation.
2. Explain factors a food producer must consider before choosing a heat-preservation method.
3. Describe commercial heat-processing methods.
4. Determine which processing method should be used for various foods canned at home.
5. List variables that must be controlled to maintain the quality of refrigerated foods.
6. Contrast the various methods used for commercial freezing.

Formative Assessment

- Chapter Review Questions
- Experiment 19A: Comparing Canned and Frozen Foods
- Experiment 19B: Canning Food and pH Levels
- Experiment 19C: Blanching Vegetables

Materials and Resources

- 500-mL beaker
- wax pencil
- white or clear serving dish
- serving spoon
- 1 plate per student
- 1 fork per student
- 400 mL assigned fruit juice
- 1 90-mL (3-ounce) paper cup per student
- 1 package assigned peas or pasta product
- electronic balance
- blender
- 2 250-mL beakers
- pH meter or pH paper
- thermometer
- thermometer holder
- beaker tongs
- 1 fresh fruit sample per lab group
- 1 fresh vegetable sample per group
- 20 mL distilled water
- 3 freezer containers or 1-pint resealable plastic freezer bags
- 1,000-mL or 1=quart saucepan
- beaker tongs
- colander
- large mixing bowl
- masking tape
- 750 mL (3 cups) assigned fresh vegetable

- 530 mL (2 cups plus 2 tablespoons) water
- 1,000 mL (4 cups) ice water
- plastic wrap

Learning Targets
Students will describe the processes involved in hot and cold processing.

Learning Targets linked to Priority Standard =

Topic: Dehydration and Concentration: Controlling Water Activity **Duration:** 10 Period(s)

Topic Description (short)
This topic explores dehydration as a food preservation method.

Learning Targets
1. Explain the relationship between water activity levels and food preservation.
2. Identify factors that affect the quality of dried foods
3. List the methods of commercial and home dehydration.
4. Contrast the benefits and problems associated with food concentrates.
5. Describe the role of intermediate-moisture foods in modern food processing.

Formative Assessment
- Chapter Review Questions
- Vocabulary Code
- Experiment 20A: Dehydrating Meat
- Experiment 20B: Concentrating Soup Stock
- Experiment 20C: Backpacker's Dehydrated Soup

Materials and Resources
- chef's or utility knife
- cutting board
- electronic balance
- 100-mL graduated cylinder
- mixing bowl
- thermostatically controlled dehydrator
- round, rump, or sirloin roast or London broil
- waxed paper
- 50 mL (1/4 cup) soy sauce
- 50 mL (1/4 cupt) Worcestershire sauce
- 3 mL (3/4 teaspoon hickory smoke flavoring
- 250-mL beaker
- small ladle
- small bowl or custard cup
- beaker tongs
- spoons (1 per lab group member)
- 150 mL (2/3 cup) canned chicken, beef, or vegetable stock
- mixing spoon
- metric measuring spoons
- saucepan
- assigned vegetable or grain product
- 2 mL (1/2 teaspoon) herbs (basil, bay leaf, garlic powder, marjoram, oregano, rosemary, thyme)
- 1 mL (1/4 teaspoon) spices (cumin, curry, paprika, pepper)
- 2 mL (1/2 teaspoon) salt
- 5 mL (1 teaspoon) bouillon granules (use low-sodium bouillon or omit salt)
- water

Learning Targets
Students will learn the processes of food dehydration.

Learning Targets linked to Priority Standard =

Topic: Current Trends in Food Preservation: Irradiation, Packaging, and Biotechnology **Duration:** 10 Period(s)

Topic Description (short)
This topic explores modern commercial food preservation practices.

Learning Targets
1. Describe the chemical and nutrient changes irradiation causes in food products.
2. Analyze the advantages and disadvantages of food irradiation as a preservation method.
3. Compare reduced oxygen packaging with other food packaging methods.
4. Identify food industry applications for nanotechnology.

5. Explain how biotechnology is used in the food industry.

Formative Assessment
- Chapter review questions
- Preservation Trends Vocabulary Puzzle
- Spot the Technology Puzzle
- Experiment 21A: Simulating Irradiation
- Experiment 21B: Packaging to Prevent Oxidative Rancidity
- Experiment 21C: The Permeability of Plastic

Materials and Resources
- wax pencil
- UV light source
- 6 disposable petri dishes with nutrient agar
- *Serratia marscens* or *Bacillus subtilis* bacteria
- 6 cotton swabs or inoculating loops
- 2 1-qt resealable plastic freezer bags
- 45 potato chips or high-fat crackers
- aluminum foil
- masking tape
- chef's knife
- cutting board
- 6 saucers
- wax pencil
- 25-mL graduated cylinder
- fresh fruit or vegetable that is in season and freezes well
- 1 resealable plastic bag
- 1 resealable plastic freezer bag
- 1 resealable plastic vegetable bag
- aluminum foil
- freezer paper
- masking tape

Learning Targets
Students will describe current trends such as irradiation, packaging, and biotechnology on food preservation.

Learning Targets linked to Priority Standard = ✠

Unit: Kitchen Basics and Safety

Duration: 15 Period(s)

Unit Description
This unit will explore the basics and safety behind common kitchen task.

Enduring Understandings (Knowledge & Skills)
- Knife Skills
- Unit Conversions
- Measuring Techniques
- Sanitation
- Kitchen tool identification

Summative Assessment
Unit Exam

Topic: Basic Knife Skills and Cutting Techniques

Duration: 3 Period(s)

Topic Description (short)
This topic will explore how to safely sharpen and use knives in the kitchen.

Learning Targets
1. Identify a paring, serrated bread knife, and a chef's knife
2. Understand, identify and demonstrate 6 common types of cutting techniques using a knife and play dough as well as through written examples.
3. Explain the importance of knife safety and why it is crucial to use the correct knife
4. Sharpen a chef's knife.

Formative Assessment
Knife activity

Materials and Resources
- Playdough
- Cutting board

- Onions
- Potatoes
- Carrots
- Chef's knife
- paring knife
- bread knife
- knife sharpener

Learning Targets
Students will demonstrate correct knife skills and cutting techniques.

Learning Targets linked to Priority Standard = ✙

Topic: Measuring and Unit Conversions **Duration:** 10 Day(s)

Topic Description (short)
This unit teaches students to convert between common units used in the food science laboratory and how to properly use measuring utensils.

Learning Targets
Students will demonstrate correct measuring and unit conversions techniques.

Learning Targets linked to Priority Standard = ✙

Topic: Kitchen Safety **Duration:** 4 Day(s)

Topic Description (short)
This topic teaches students how to safely work in a kitchen.

Learning Targets
Students will demonstrate safety in the food science laboratory.
Students will learn how to safely interact with a kitchen.

Learning Targets linked to Priority Standard = ✙

Unit: Meat Science **Duration:** 60 Period(s)

Unit Description
This units explores the meat industry in the unit states. Topics include; legislation and history, animal care and handling, nutrition, purchasing, storage and handling, cooking, additives and processed meats, food safety practices and causes of foodborne illnesses.

Enduring Understandings (Knowledge & Skills)
Students will:

- explore legislation and history in relation to the meats industry
- study animal care and handling techniques
- identify the nutritional content and benefits of meat.
- consider consumer options when purchasing meat.
- describe meat storage and handling practices.
- understand meat cooking methods.
- study meat additives and processed meats.
- analyze food safety practices and causes of foodborne illnesses.

Summative Assessment
Unit Exam

Topic: Legislation and History **Duration:** 2 Period(s)

Topic Description (short)
This topic explores the legislation and history of the meats industry.

Learning Targets
1. Identify important legislation and its affect on the meats industry
2. Explain the role the Meat Inspection Act of 1906 had on the meats industry
3. Explain the role of various government bodies on the regulation of the meat industry.
4. Explain how the Uniform retail Meat Identity Standards unified the meats industry.
5. Explain various religious practices used in some meat processing facilities.
6. Identify the 7 characteristics of all Hazard Analysis Critical Control Point programs.

Formative Assessment
Topic Quiz

Learning Targets
Students will learn the history and legislation that affects the meat industry.

Learning Targets linked to Priority Standard = ✙

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Topic: Animal Care and Handling **Duration:** 2 Day(s)

Topic Description (short)
This topic covers the basics of animal care and handling as it relates to the meats industry.

Learning Targets
Students will identify the factors that affect meat safety based on animal handling techniques.

Learning Targets linked to Priority Standard = ✙

Topic: Meat Nutrition **Duration:** 2 Day(s)

Topic Description (short)
This unit covers the basics of meat nutrition.

Learning Targets
Students will identify the nutritional benefits of meat in their diets.

Learning Targets linked to Priority Standard = ✙

Topic: Purchasing Meat **Duration:** 2 Day(s)

Topic Description (short)
This topic teaches the importance of meat grading as it relates to the purchasing of meat.

Learning Targets
Students will describe the factors that affect the consumer choice of meat.

Learning Targets linked to Priority Standard = ✙

Topic: Storage **Duration:** 2 Day(s)

Topic Description (short)
This topic teaches the importance of proper storage of meat products.

Learning Targets
Students will identify the factors that affect meat safety and quality and problems resulting from meat deterioration from improper storage.

Learning Targets linked to Priority Standard = ✙

Topic: Cookery **Duration:** 12 Day(s)

Topic Description (short)
This topic teaches the various cookery techniques involved in preparing meat.

Learning Targets
Students will learn the different processing techniques and their affects on the nutritional value of meat.

Learning Targets linked to Priority Standard = ✙

Topic: Processed Meat **Duration:** 6 Day(s)

Topic Description (short)
This topic covers the processes and advantages of processing meats for human consumption.

Learning Targets
Students will describe the different techniques involved in processing meat.
Students will describe the different techniques involved in processing meat.

Learning Targets linked to Priority Standard = ✙

Topic: Food Safety **Duration:** 4 Day(s)

Topic Description (short)
This topic covers the safe practices involved in handling meat.

Learning Targets
Students will learn how to safely handle meat during preparation.

Learning Targets linked to Priority Standard = ✙

Unit: Dairy Foods

Duration: 20 Period(s)

Unit Description
This unit will explore how milk is processed and utilized in our food system.

Enduring Understandings (Knowledge & Skills)
Milk Processing

Milk Products

Summative Assessment

Unit Exam

Topic: Milk Processing

Duration: 1 Period(s)

Topic Description (short)

The student will be able to identify products produced from different grades of raw milk.

Learning Targets

1. What are the quality grades of milk?
2. What major products can be produced from raw milk?
3. What by-products result from milk processing?
4. What factors affect milk taste and composition?

Formative Assessment

Topic exam.

Learning Targets

Students will identify different products made from dairy.

Learning Targets linked to Priority Standard = ✣

Topic: Processing Dairy Products

Duration: 1 Period(s)

Topic Description (short)

The student will be able to summarize how dairy products are processed and packaged.

Learning Targets

1. What techniques are used to process raw milk?
2. Why is raw milk pasteurized and homogenized?
3. How are major dairy products processed?
4. Why should milk and dairy products be packaged?
5. How is the dairy processing industry organized?

Formative Assessment

Topic Quiz.

Learning Targets

Students will learn the complexity involved in processing dairy.

Learning Targets linked to Priority Standard = ✣