<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Objectives</th>
</tr>
</thead>
</table>
| 19      | Food Safety & Storage | - Identify the causes of food borne illness.  
- Explain the importance of cleanliness in the kitchen.  
- Summarize ways to cook, thaw, and serve food safely.  
- Describe safe food storage practices.  
- Summarize methods for safely preserving food at home.  
- Describe the roles of government agencies in protecting the food supply. |
| 20      | Kitchen Accidents | - Preventing List six ways to prevent accidents in the kitchen.  
- Explain why keeping a kitchen clean can prevent a kitchen fire.  
- List five things to remember when using household chemicals.  
- Explain why it is important to follow safety guidelines when cooking outdoors.  
- Summarize five precautions to make kitchens safe for children.  
- Describe two first aid procedures you should know to prepare you to respond to kitchen emergencies. |
| 21      | Equipping the Kitchen | - Explain the items that make up a work triangle.  
- Describe factors to consider when selecting kitchen components.  
- Contrast a warranty and a service contract.  
- List three large kitchen appliances and nine small kitchen appliances.  
- Describe seven common types of cookware. |
| 22      | Conserving Resources | - Explain how conservation benefits people and the environment.  
- Describe how to use large kitchen appliances efficiently.  
- List eight ways to conserve water in the kitchen.  
- Summarize two guidelines for reducing trash.  
- Explain how population growth is affecting the world’s resources. |
Understanding Brackets, Letters, and Ability Levels in the Teacher Wraparound Edition

**Brackets**  Brackets on the reduced student edition page correspond to teaching strategies and activities in the Teacher Wraparound Edition. As you teach the lesson, the brackets show you exactly where to use the activities.

**Letters**  The letters on the reduced student edition page identify the type of strategy or activity.

**Ability Levels**  Teaching strategies that appear throughout the chapters have been identified by one of three codes to give you an idea of their suitability for students of varying learning styles and abilities.

**Resources**  Key program resources are listed in each chapter. Icons indicate the format of resources.

---

**KEY TO LETTERS**

- **D** Develop Concepts activities help teachers gauge and plan for students’ concept development.
- **R** Reading Strategy activities help you teach reading skills and vocabulary.
- **S** Skill Practice provides leveled instruction for meeting individual needs and learning styles.
- **W** Writing Support activities provide writing opportunities to help students comprehend the text.
- **C** Critical Thinking strategies help students apply and extend what they have learned.
- **U** Universal Access activities provide differentiated instruction for English language learners, and suggestions for teaching various types of learners.
- **N** No Child Left Behind activities help students practice and improve their abilities in academic subjects.

---

**KEY TO ABILITY LEVELS**

- **L1** Strategies should be within the ability range of all students. Often full class participation is required.
- **L2** Strategies are for average to above-average students or for small groups. Some teacher direction is necessary.
- **L3** Strategies are designed for students able and willing to work independently. Minimal teacher direction is necessary.

---

**KEY TO RESOURCE ICONS**

- 📖 Print Material
- 🎥 CD or DVD Resources
- 🌐 Online Learning Center (OLC)

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**MINI CLIP VIDEO LIBRARY**

Targeted professional development is correlated throughout Food for Today. The McGraw-Hill Professional Development Mini Clip Video Library provides teaching strategies to strengthen academic and learning skills. Log on to glencoe.com.

In this unit, you will find these Mini Clips:

- **Reading**  Exploring the Big Idea, p. 281
- **Reading**  Fluency Development, p. 284
- **Math**  Real-Life Connections - Proportions, p. 288
- **Reading**  Understanding English Language Learners, p. 289
- **Reading**  English Language Success, p. 305
- **Reading**  Student Involvement, p. 309
- **Math**  Multiple Representation in Mathematics, p. 319
- **Reading**  Extending the Big Idea, p. 324
- **Reading**  Another Point of View, pp. 328, 346
- **ELL**  Words and Pictures, p. 330
- **Math**  Introducing Multiple-Step Equations, p. 342
### National Standards Correlations

<table>
<thead>
<tr>
<th>Standards</th>
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<tr>
<td>9.1 Analyze career paths within food science, food technology, dietetics, and nutrition industries.</td>
<td>290, 346</td>
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<tr>
<td>9.2 Apply risk management procedures to food safety, food testing, and sanitation.</td>
<td>278-313, 332, 334-335, 340-351</td>
</tr>
<tr>
<td>9.3 Evaluate nutrition principles, food plans, preparation techniques and specialized dietary plans.</td>
<td>298, 310, 336, 348</td>
</tr>
<tr>
<td>9.5 Demonstrate use of current technology in food product development and marketing.</td>
<td>278-301, 302-313, 314-339, 340-351</td>
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<table>
<thead>
<tr>
<th>Standards</th>
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<tr>
<td>9.6 Demonstrate food science, dietetics, and nutrition management principles and practices.</td>
<td>278-301, 314-351</td>
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<tr>
<td>14.1 Analyze factors that influence nutrition and wellness practices across the life span.</td>
<td>295-298</td>
</tr>
<tr>
<td>14.4 Evaluate factors that affect food safety from production through consumption.</td>
<td>278-301, 308, 322, 333-334</td>
</tr>
<tr>
<td>14.5 Evaluate the influence of science and technology on food composition, safety, and other issues.</td>
<td>278-301</td>
</tr>
</tbody>
</table>

**NOTE:** See page TM29 for the complete text of the Standards.
NO CHILD LEFT BEHIND  
NCLB activities, information, and skills practice will help your students attain NCLB proficiency. Students will improve their abilities in the following academic standards areas:

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Standard</th>
<th>Feature/Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>English Language Arts</strong></td>
<td>NCTE 5  Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.</td>
<td>Academic Skills p. 313</td>
</tr>
<tr>
<td></td>
<td>NCTE 7  Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.</td>
<td>Academic Skills p. 351</td>
</tr>
<tr>
<td></td>
<td>NCTE 12 Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).</td>
<td>Academic Skills p. 301</td>
</tr>
<tr>
<td><strong>Math</strong></td>
<td>Number and Operations  Understand numbers, ways of representing numbers, relationships among numbers, and number systems.</td>
<td>Kitchen Math p. 342</td>
</tr>
<tr>
<td></td>
<td>Geometry Use visualization, spatial reasoning, and geometric modeling to solve problems.</td>
<td>Academic Skills p. 301</td>
</tr>
<tr>
<td></td>
<td>Measurement  Apply appropriate techniques, tools, and formulas to determine measurements.</td>
<td>Academic Skills p. 339</td>
</tr>
<tr>
<td></td>
<td>Data Analysis and Probability  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.</td>
<td>Academic Skills p. 313</td>
</tr>
<tr>
<td></td>
<td>Problem Solving  Solve problems that arise in mathematics and in other contexts.</td>
<td>Academic Skills p. 351</td>
</tr>
<tr>
<td><strong>Science</strong></td>
<td>Content Standard B  Students should develop an understanding of the structure of atoms, structure and properties of matter, chemical reactions, motions and forces, conservation of energy and increase in disorder, and interactions of energy and matter.</td>
<td>Science in Action, Academic Skills p. 287, p. 301, p. 313, p. 339</td>
</tr>
<tr>
<td></td>
<td>Content Standard C  Students should develop understanding of the cell; molecular basis of heredity; biological evolution; interdependence of organisms; matter, energy, and organization in living systems; and behavior of organisms.</td>
<td>Science in Action, Academic Skills p. 306, p. 351</td>
</tr>
<tr>
<td><strong>Social Studies</strong></td>
<td>NCSS I A Culture  Analyze and explain the ways groups, societies, and cultures address human needs and concerns.</td>
<td>Technology for Tomorrow p. 347</td>
</tr>
<tr>
<td></td>
<td>NCSS VIII A Science, Technology, and Society  Identify and describe both current and historical examples of the interaction and interdependence of science, technology, and society in a variety of cultural settings.</td>
<td>Technology for Tomorrow p. 291, p. 331</td>
</tr>
<tr>
<td></td>
<td>NCSS VIII B Science, Technology, and Society  Make judgments about how science and technology have transformed the physical world and human society and our understanding of time, space, place, and human-environment interactions.</td>
<td>Technology for Tomorrow p. 310</td>
</tr>
</tbody>
</table>

**Note:** See page TM26 for the complete text of the Standards.
Unit Overview
Introduce the Unit
Describe the main concepts of each chapter in the unit.

Unit 5
While studying this unit, students will learn that there are many things that can be done to help ensure the foods they prepare are safe to eat and to help ensure the safety of those working in the kitchen. They will also learn how to be efficient and conserve resources in the kitchen.

Chapter 19 discusses how to handle, store, and preserve foods safely to maximize nutrition and enjoyment and prevent food borne illness.

Chapter 20 addresses good safety habits that can prevent accidents and protect against a variety of hazards in the kitchen.

Chapter 21 describes how to design and equip a kitchen.

Chapter 22 covers ways to conserve resources to save money, improve efficiency in the kitchen, and help future generations to enjoy a healthy environment.

Activate Prior Knowledge
Explore the Photo
Proper food storage is important in helping to prevent foodborne illnesses. Have you ever contracted a foodborne illness?

Discussion
Ask students to predict how proper food storage might prevent food borne illnesses. (Proper storage helps prevent food from spoiling or getting contaminated.)

Explore the Photo Caption Answer
Ask students who have had a food borne illness to describe how they got it and what happened to them.
After completing this unit, you will learn that there are many things that can be done to help ensure the foods you prepare are safe to eat. In your unit thematic project, you will create a safety manual for your kitchen.

**Keeping Food Safe**
Write a journal entry about one of the topics below. This will help you prepare for the unit project at the end of the unit.
- Identify ways to identify safety concerns in your kitchen.
- Describe practical ways to avoid accidents in the kitchen.
- Explain how to safely react to an accident if one occurs.

**Home Kitchen Safety and Sanitation**
Students select a topic to write a journal entry about. The journal entry should relate to the subject of the thematic project: investigating food safety. The purpose of the journal entry is to prepare students for the project at the end of the unit. (Students should accurately respond to the topic and provide sound safety advice. You may wish to encourage them to research for information.)
How to Keep a Clean Kitchen

Why is kitchen cleanliness important? What steps should a person take to keep their kitchen clean? What supplies will they need in order to complete the steps? Write a How-To paper for a person who is moving into his or her own apartment.

Writing Tips

Follow these steps to write a How-To Paper:

- Discuss the steps required to complete the task.
- Identify the supplies you will need to complete the task.
- Include an introduction and conclusion.

Food Safety & Storage

CHAPTER 19

CLASSROOM Solutions

Print Resources

- Student Edition
- Teacher Wraparound Edition
- Student Activity Workbook
- Student Activity Workbook Teacher Annotated Edition

Technology Resources

Presentation Plus! provides visual teaching aids for every section.

Online Learning Center includes resources and activities for students and teachers.

TeacherWorks Plus is an electronic lesson planner that provides instant access to complete teacher resources in one convenient package.
Point out to students that, in addition to preventing foodborne illness, learning how to properly prepare, store, and preserve foods, can maximize the nutrition and quality of foods you eat.

**Academic Vocabulary**
- tolerant
- reserve
- sugar-pack method
- syrup-pack method
- tray-pack method
- hot-pack method
- boiling-water bath
- rehydrate

**Graphic Organizer**
Use a graphic organizer like the one below to take notes about the four methods of freezing fruit.

<table>
<thead>
<tr>
<th>Sugar Pack</th>
<th>Syrup-Pack</th>
<th>Tray-Pack</th>
<th>Dry-Pack</th>
</tr>
</thead>
</table>

**Graphic Organizer** Go to this book's Online Learning Center at glencoe.com to print out this graphic organizer.

**Main Idea** Prepare, store, and preserve foods safely to maximize nutrition and enjoyment and prevent foodborne illness.

**Content Vocabulary**
- contaminant
- foodborne illness
- microorganism
- toxin
- spore
- food safety
- sanitation
- personal hygiene
- 20-second scrub
- cross-contamination
- internal temperature
- rancidity
- freezer burn
- preserve
- sugar-pack method

**Academic Standards**

**English Language Arts**
- NCTE 12 Use language to accomplish individual purposes.

**Mathematics**
- NCTM Geometry Use visualization, spatial reasoning, and geometric modeling to solve problems.

**Science**
- NSES B Develop an understanding of the structures and properties of matter.

**Social Studies**
- NSES VIII A Science, Technology, and Society Identify and describe both current and historical examples of the interaction and interdependence of science, technology, and society in a variety of cultural settings.

**Bell Ringer Activity**
**What Is Foodborne Illness?**
Have students brainstorm foodborne illnesses that they have heard of. Ask them if they know the causes of the illnesses. Are they caused by a bacteria or virus? A parasite? Do they spread through contaminated food or contaminated water? Do you know the common symptoms of these foodborne illnesses? Explain.

**Preteaching Vocabulary**
- tolerate
- reserve

**Graphic Organizer**
- The graphic organizer is also on the TeacherWorks CD.

(The graphic organizer should have four columns. Each column should deal with one of the four methods: sugar-pack, syrup-pack, tray-pack, and dry-pack. The sugar-pack method is freezing fruit after coating it in sugar to retain its color and texture and form syrup when defrosted. The syrup-pack method is storing fruit in containers and covering it with chilled sugar water. The tray-pack method involves freezing fruit whole on a tray, leaving space between pieces, and then transferring them to containers just after they are frozen. The dry-pack method involves freezing small whole fruits directly in containers.)
Foodborne Illness

Contaminants in food cause over 76 million illnesses and 5,000 deaths in the United States each year. A contaminant is a substance, such as a chemical or organism, that makes food unsafe to eat.

Sickness caused by eating food that contains a contaminant is known as foodborne illness. Fever, headache, and digestive troubles are symptoms of foodborne illness. Children, pregnant women, older adults, and chronically ill people are most at risk.

Roots of Foodborne Illness

Most foodborne illness is caused by microorganisms. A microorganism is a living thing so small that it can only be seen through a microscope. Bacteria are single-celled microorganisms that cause most cases of foodborne illness. Thousands of species of bacteria are present in the human body. Many bacteria are harmless. Some bacteria, like those that aid in food digestion, are essential for health.

A few bacteria are dangerous to human health. These bacteria produce a toxin, or poison, that can cause illness. Some bacteria also produce spores. A spore is a protected cell that develops into a bacterium when it has the right conditions of food, warmth, and moisture. Figure 19.1 lists some of the bacteria that cause foodborne illness and where they might be found.

Bacteria cannot travel far by themselves. They are carried on people, animals, insects, and objects. Harmful bacteria are sometimes already in food when you buy it. More often, bacteria multiply through careless handling. In just a few hours, one bacterium can multiply into thousands—yet the food may look, taste, and smell completely safe to eat. A healthy human body can tolerate, or allow, small amounts of harmful bacteria. Large amounts of harmful bacteria are a health hazard.

You can help prevent foodborne illness through food safety, keeping food safe to eat by following proper food handling and cooking practices. The basic food safety rules are:

- Keep yourself and your kitchen clean.
- Do not cross-contaminate. Store and handle uncooked meat, poultry, seafood, and eggs separately from other foods.
- Cook food thoroughly.
- Refrigerate food promptly.

Identify What are the symptoms of foodborne illness?
**Selected Bacteria that Cause Foodborne Illness**

<table>
<thead>
<tr>
<th>Bacteria and Disease</th>
<th>Common Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campylobacter jejuni (disease: campylobacteriosis)</td>
<td>Contaminated water; unpasteurized milk; undercooked meat, poultry, and seafood.</td>
</tr>
<tr>
<td>Clostridium botulinum (disease: botulism, which can be fatal)</td>
<td>Improperly processed, home-canned and commercially canned foods; garlic in oils; vacuum-packed or tightly wrapped food.</td>
</tr>
<tr>
<td>Clostridium perfringens (disease: perfringens food poisoning)</td>
<td>Environments where there is little or no oxygen. Sometimes called the “cafeeteria germ” because it is often found in food served in quantity and left for long periods on a steam table or at room temperature.</td>
</tr>
<tr>
<td>Escherichia coli (disease: hemorrhagic colitis)</td>
<td>Unchlorinated water; raw or rare ground beef; raw alfalfa sprouts; unwashed produce; unpasteurized milk or apple cider.</td>
</tr>
<tr>
<td>Listeria monocytogenes (disease: listeriosis)</td>
<td>Raw or undercooked meat, poultry, or fish; unwashed produce; soft cheeses; unpasteurized milk; ready-to-eat foods, such as hot dogs, cold cuts, dry sausages, and deli-style meats and poultry.</td>
</tr>
<tr>
<td>Salmonella (disease: salmonellosis)</td>
<td>Raw or undercooked poultry, eggs, meat, and seafood; unpasteurized milk.</td>
</tr>
<tr>
<td>Staphylococcus aureus (disease: staphylococcal food poisoning)</td>
<td>Prepared foods left too long at room temperature. Typical sources are meat, poultry, egg products, and such mixtures as tuna, chicken, potato, and egg salad; cream-filled pastries.</td>
</tr>
</tbody>
</table>

**Cleanliness in the Kitchen**

A clean kitchen plays an important role in sanitation, the prevention of illness through cleanliness. Habits of cleanliness help to ensure food safety and make your kitchen a more pleasant place to work.

**Personal Hygiene**

Bacteria on your body can contaminate work surfaces, utensils, and food. By practicing personal hygiene, thoroughly washing your body, face, and hands, you help to avoid transferring harmful bacteria when handling food.

Your hands come in frequent contact with food, so keeping them clean is the single most effective way to prevent the transfer of bacteria. Make a habit of the **20-second scrub**, using soap and warm water to scrub your hands for 20 seconds. Use a brush to clean underneath your fingernails. Keep your nails trimmed.

Do a 20-second scrub before working in the kitchen. Scrub your hands right after handling raw meat, poultry, fish, shellfish, and eggs. Scrub your hands immediately after you use the toilet, blow your nose, handle pets, or touch your face, hair, or any other part of your body.

Bacteria get into food by other routes as well, such as sneezing or coughing. Bacteria can even grow in spots and stains, so wear clean clothes covered with a clean apron. Remove dangling jewelry and roll up long sleeves. Tie back your hair if it is long. Cover any wounds on your hands with rubber or plastic gloves, and wash gloved hands as often as bare ones.

**Discussion**

Ask students to discuss the causes of foodborne illness in Figure 19.1. Ask students: Why might you choose to avoid a potato salad that has been out all afternoon at a picnic? (Harmful bacteria is sometimes found in foods that are left out too long at room temperature.)
A Clean Kitchen

A clean kitchen also helps to limit the growth of bacteria. Practice these kitchen routines until they become habits:

- Wash work surfaces and utensils in hot, sudsy water before you prepare food.
- Wash the tops of cans before opening them.
- If you use a clean spoon to taste food during cooking.
- Change dish towels often. Use separate towels for wiping hands, wiping dishes, and any other purposes.
- At the end of the day, put the dishcloth in the laundry and replace it with a clean one; wash sponges and let them air-dry overnight and keep pets out of the kitchen to avoid pet hairs, which carry bacteria.

Clean-up

Thorough clean-up is essential for food safety. Wash all the work areas and tools you have used, and wipe down all appliances. As you work, rinse your dishcloth or sponge often in hot, sudsy water.

Washing Dishes

If your kitchen has a dishwasher, use it according to the owner’s manual. You can also wash dishes thoroughly by hand by following these steps:

- Scrape and rinse soiled dishes and place them to one side of the sink.
- Group dishes. Put glasses closest to the sink, then flatware, plates and bowls, kitchen tools, serving pieces and containers, and cookware. Keep sharp knives separate.
- Presoak any cookware that has food stuck to it. Pour in a little detergent, add hot water, and let it stand while you wash the other dishes.

Pest Control

Insects can bring harmful bacteria into the kitchen. Clean up crumbs and food spills from floors, counters, and tables that might attract insects. Take garbage to an outside, covered can at least once a day. Wash garbage cans regularly.

Chemical insecticides can be hazardous to people and the environment. Try prevention first. Repair holes in walls and screens where pests get in. Caulk cracks and crevices. Sprinkle chili powder, paprika, or dried peppermint across ant trails. If you must use a commercial insecticide, follow the label directions carefully, and do not let the spray get onto dishes, countertops, or food.
Avoid Cross-Contamination

Cross-contamination is the spread of harmful bacteria from one food to another. Cross-contamination can occur with any food, raw or cooked, but it is most common with raw meat, poultry, seafood, and eggs. Keep these foods separate in your shopping cart and grocery bags. Store them in the refrigerator in sealed containers or plastic bags.

When you prepare raw meat, poultry, or seafood, wash every surface the food touched with hot, soapy water. Wash plates, tools, and utensils, as well as your hands. Always put cooked food on a clean plate, not a plate that held the raw food.

Wash the dining table before and after eating. Always handle cooked foods with clean utensils, never by hand. Place a serving utensil in every serving dish so that people are not tempted to use their own utensils. Do not refill a used serving dish. Instead, get a clean dish.

Cutting Boards

Cutting boards are a common source of cross-contamination. Keep two cutting boards and always use the same one for meat, poultry, and seafood. Reserve the other cutting board for foods other than meat. To reserve means to set aside.

Keep cutting boards clean by washing them in hot, sudsy water after each use. Rinse and air-dry the boards, or dry them with a clean towel. Some plastic boards can be washed in a dishwasher. Discard boards with hard-to-clean cuts and grooves. Microorganisms are easier to wash from plastic than from wood, so consider choosing plastic cutting boards instead of wood.

Conscientious Clean-Up

Remove kitchen garbage to an outside garbage can at least once a day to prevent pest infestations and reduce germs and odors. What are the drawbacks of using insecticides to manage pests?

Explore the Photo

Caption Answer

Insecticides are toxic chemicals. They can harm people and pets and may even get onto dishes or into food.

Discussion

Ask students: What can you do to help keep pests away without using chemical insecticides? (Answers may include: It is best to try prevention first. Clean up crumbs and food spills from floors, counters, and tables, take garbage out once a day, wash garbage cans regularly, and repair holes in walls and screens, or fill cracks and crevices, where pests get in.)

Skill Practice

Guided Practice

List Ask students to list three methods to avoid cross-contamination. (Answers will vary, but may include: keep raw meat, poultry, seafood, and eggs separate, wash every surface and handle cooked foods with clean utensils.)

Create Have students create a graphic organizer that explains how cross-contamination can occur and how to avoid it. (Graphic organizers will vary.)

Apply Have students imagine that they are a chef at a local eatery. In one paragraph, ask students to describe the precautions they would take while shopping, preparing, and serving foods to avoid cross-contamination. (Paragraphs will vary, but students may include any precautions to avoid cross-contamination.)

Writing Support

Write an Essay

Wood or Plastic? Research on the safety of wood and plastic cutting boards is constantly being updated. Ask students to research current debate on the safety of wood and plastic cutting boards, and to write a one-page essay on their findings, citing their sources. (Many sources will show that composite and plastic boards are safer than wood. However, there has been a recent study that wood may actually be safer.)

Reading Check

Explain To prevent cross-contamination, use one cutting board for meat, poultry and seafood, and another cutting board for foods other than meat.
Cooking Food Safely

Food temperature affects how quickly bacteria grow. The danger zone is the temperature range in which bacteria grow fastest: 40°F to 140°F (4°C to 60°C). See Figure 19.2. The less time food spends at room temperature, the more slowly bacteria will multiply.

High temperatures during cooking kill most bacteria, but spores and some toxins can survive. Bacteria grow more slowly when food is in the refrigerator and freezer, but some bacteria can survive freezing. When food warms up, the bacteria start to grow again. No amount of heating or chilling, however, will make food safe to eat if it has been improperly stored.

How do you know when meat and poultry have been cooked thoroughly enough to kill bacteria? You cannot tell by appearance alone whether the meat has reached the proper temperature. Use a food thermometer to check the internal temperature, the temperature deep inside the thickest part of the food. The internal temperature must reach at least 160°F for most foods. Upcoming chapters give safe internal temperatures for meat, poultry, and other specific foods. To help prevent the growth of harmful bacteria, follow these guidelines when you cook:

- Taste foods containing ingredients from animal sources only after they are fully cooked.
- Never partially cook food and then wait to finish the cooking later.
- When microwaving, stir or rotate foods to cook evenly; reheat food to an internal temperature of 165° or higher.

**Figure 19.2 Temperature Danger Zone**

Danger Zone: Bacteria die when foods are thoroughly cooked at high temperatures.

Do bacteria die when food is frozen?

- Whole poultry: 180°F
- Poultry breasts: 170°F
- Stuffing, ground poultry, leftovers, casseroles: 165°F
- Meats (medium), egg dishes, pork, ground meats: 160°F
- Beef steaks, roasts, veal, lamb (medium rare), seafood: 145°F
- Keep hot foods at this temperature: 140°F

Refrigerator temperature: 40°F
Freezer temperature: 0°F

Caption Answer: Some bacteria can survive freezing.

Discussion: Point out to students that temperature has a strong impact on bacterial growth in foods. Ask students: What are the suggested cooking temperatures for poultry? Why do you think the safe cooking temperature for ground poultry is different than the safe cooking temperature for both poultry breasts and whole poultry? (Suggested cooking temps for poultry include: ground poultry, 165°; poultry breasts, 170°; and whole poultry, 180°. Students may say that the temperatures differ due to the size of the poultry parts. A whole bird would take longer to cook than a breast or ground meat.)
• When microwaving, cover the food and stir or rotate it. Some foods cook unevenly in a microwave oven, and cool spots may remain where bacteria can survive.
• When reheating food that has been refrigerated, bring it to an internal temperature of 165°F or higher.

### Thawing Food

Bacteria can multiply when food is thawing, so you should never defrost frozen food at room temperature. By the time the inside is thawed, millions of bacteria will have grown on the outside. Instead, put the food into a container in the refrigerator. The container prevents the frozen food from leaking onto other foods as it thaws. The cold temperature slows bacterial growth.

For faster thawing, you can put the food into a watertight plastic bag and submerge it in a bowl or sink filled with cold water. Change the water every 30 minutes to keep it cold. You can also defrost food in the microwave according to the manufacturer’s directions. Defrosting in the microwave starts the cooking process, so do this only if you plan to cook the food right away.

You can also skip the thawing step altogether. Just cook the food longer and make sure it reaches the proper internal temperature.

### Serving Food

When serving food, remember these three rules:

1. **Keep hot foods hot.** Keep hot foods at a temperature higher than 140°F. Keep extra quantities of food hot on the range, on a warming tray, or in an electrical serving dish.
2. **Keep cold foods cold.** Refrigerate cold foods until serving time.
3. **Follow the two-hour rule.** Perishable foods that contain meat, poultry, fish, eggs, or dairy products should not sit at room temperature longer than two hours. If the air temperature is higher than 90°F, the limit is one hour.

---

**Reading Check** Is it safe to defrost food at room temperature?

### Storing Food Safely

Food that is stored improperly or for too long loses quality and nutrients, and eventually spoils. Some types of spoilage cause foodborne illness. Protect your health by using proper storage techniques.

### Identifying Spoiled Food

Why does food spoil? Dirt, heat, and moisture promote the growth of harmful bacteria, yeasts, and molds. Dry air wilts some fresh foods and causes staleness in others. Air and light can destroy nutrients. Heat speeds the action of enzymes in food, which trigger chemical changes that lessen food quality.

Food spoilage is often obvious. Fresh produce may look wilted, wrinkled, bruised, or brown. Meats may become slimy. Spots of mold and a foul taste or smell are also sure signs that food has gone bad.

Food packages can also warn of spoiled contents. Damaged packaging makes the food inside more likely to spoil. Bulging cans, liquids that spurt when you open a container, and cloudy fluids that should be clear all indicate bacterial action.

What should you do if you think food is spoiled? Throw it away—do not taste it first. If the food is moldy, prevent the spread of spores by gently wrapping the food in a bag before discarding it. Examine other foods that may have been in contact with the moldy item. If you suspect that mold is spreading to other foods, wash out the refrigerator.

### Food-Storage Guidelines

Proper storage prevents spoilage and preserves food’s nutrients, flavor, texture, and appearance. Follow these guidelines to protect quality in stored food:

- Follow package directions for storing food.
- Follow the principle of “first in, first out.” Store newly purchased food behind older food of the same kind so that you use the older items first.
- If containers have no sell-by or use-by dates, write the purchase date on them before storing. Use canned food within a year.

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**Skill Practice**

**Guided Practice**

**Explain** Ask students to explain why you should never thaw frozen food at room temperature. (Answers will vary, but may include: You should not thaw frozen food at room temperature because millions of bacteria will grow on food by the time it is defrosted.)

**Describe** Ask students to explain why you should never thaw food at room temperature and describe the proper way to thaw frozen food.

(Answers will vary, but may include: You should not thaw frozen food at room temperature because millions of bacteria will grow on food by the time it is defrosted. To defrost food properly, put the food into a container in the refrigerator. The cold temperature slows bacterial growth and the container prevents the food from cross-contaminating other foods as it thaws.)

**Apply** Have students imagine that they do not have time to wait for a frozen food to thaw in the refrigerator. In one paragraph, ask students to describe how they would thaw a frozen food faster. (Paragraphs will vary, but may include: To thaw foods faster, put the frozen food into a watertight plastic bag and submerge it in a bowl or sink filled with cold water. Change the water every 30 minutes to keep it cold. Students may also say that you can defrost food in the microwave, but you should be careful because defrosting food in the microwave starts the cooking process. If you plan to thaw food in the microwave, it is best to cook the food right away. Have students share their paragraphs with the class.)

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**Mini Clip**

**Reading: Fluency Development**

A teacher uses three different instructional strategies to develop students’ reading fluency.
Room Temperature Storage

Shelf-stable foods can be stored at normal room temperatures, generally below 85°F and above freezing, 32°F. Shelf-stable foods include unopened canned foods, dry beans and peas, oils and shortening, and many grain products except whole grains, which should be refrigerated. Most fruits and vegetables should not be stored at room temperature.

Storage cabinets should be clean and dry, with doors to keep out light, dirt, and pests. They should not be near heat sources, such as a range, radiator, toaster, or refrigerator coils. Do not store food in damp areas such as under the sink.

Keep stored food away from household chemicals, such as cleaners. Keep chemicals in their original packages, never in empty food packages or other food storage containers. Someone might mistake a poisonous chemical for food.

After you open canned goods, store the leftovers in a glass or plastic container in the refrigerator. Dry goods and bulk foods such as dry beans and cereal can stay in the cabinet at room temperature. Reseal the package as much as possible to keep out dirt and insects, or move the food to a storage container with a tight-fitting cover.

Refrigerator Storage

Bacteria thrive at room temperature, so it is important to refrigerate food promptly. Put away any perishable food you are not using in the refrigerator or freezer.

Keep the temperature inside your refrigerator under 40°F but above 32°F to avoid freezing liquids. If you see frost or ice forming, the temperature is too low. Read the owner’s manual to learn how to set the temperature control on your refrigerator. It is a good idea to keep a thermometer in the refrigerator to monitor the temperature.

Help air circulate to all parts of the refrigerator by not overloading the fridge. Be sure that foods are tightly covered, too. This keeps them

Explore the Photo

Caption Answer  Throw spoiled food away wrapped in a bag to prevent the spread of spores.

Discussion  Ask students: What might a food’s foul smell indicate? (Answers will vary, but may include: When foods have a foul smell, it is usually because of bacteria. A bad odor may indicate that the food is spoiled, old, or may have been stored improperly.)

Nutrition Check

Killing Bacteria…and Nutrients

When handled properly, the process of canning destroys many harmful bacteria. Unfortunately, it can also destroy valuable nutrients. When foods are subjected to high temperatures and immersed in water, they lose between 80 and 80 percent of their valuable vitamins, enzymes, and other nutrients. Nutrients are also lost when the excess liquid is poured off of simmered and canned foods. Instead of discarding this liquid, try using it in soups, stews, or sauces.

Think About It  Nora says, “One raw apricot contains 15 percent of the daily value for vitamin A. I eat a jar of 7 canned apricots every day, so I know I’m meeting 100% of my daily needs for vitamin A.” Is she correct? Explain.

Answer  Nora may not be correct. While 7 raw apricots would provide her with 105% of the DV for Vitamin A, canned apricots will have suffered some nutrient loss and are unlikely to provide the DV for Vitamin A.
from drying out or picking up odors from other foods. Storage areas in the door are exposed to warm air every time you open the fridge, so save that space for soft drinks and other less perishable items.

These foods need refrigeration
- Foods that are refrigerated in the store, including dairy products, eggs, and deli items.
- Most fresh fruits and vegetables. Exceptions are onions, garlic, potatoes, and sweet potatoes, which should be kept in a cool, dry place. Wash produce before storing it only if you need to remove dirt. Dry fruits and vegetables before storing.
- Whole-grain products, seeds, and nuts. Their high oil content makes them prone to rancidity, or spoilage due to the breakdown of fats. Rancid foods have a stale, bitter flavor.
- Baked products with fruit or cream fillings.
- Any food with a label that says “refrigerate after opening.”

Refrigerating Cooked Food
Refrigerate or freeze leftovers immediately. Do not wait for them to cool to room temperature first. To ensure quick chilling, put leftovers in tightly closed, shallow containers. Cut large chunks of food into smaller pieces. Label containers with the date you stored them. Eat leftovers within three or four days, or freeze them for longer storage. You may want to keep all leftovers on the same refrigerator shelf so it is easy to see them all at a glance. Throw away perishable food that has been left at room temperature for too long.

Freezer Storage
Frozen food keeps longer than refrigerated food. At temperatures of 0°F or below, foods keep from one month to a year, depending on the type of food and its packaging. Figures 19.3 and 19.4 on pages 288–289 give a general timetable for storing perishable foods in the refrigerator freezer.

A full refrigerator works poorly, but a fairly full freezer functions best. Frozen items act like ice blocks, keeping each other cold.

When you buy frozen food, put it in the freezer right away. You can also freeze other foods to lengthen their shelf life. You can freeze tofu, meat, poultry, and seafood; baked products; and home-prepared meals and leftovers.

Foods with high water content, such as salad greens and celery, do not freeze well. As the water freezes, it expands and explodes the food’s cells, making it soft and soggy when thawed.

Thickened sauces, gravies, fillings, yogurt, and sour cream tend to separate in the freezer. Custards and cream fillings, meat and poultry stuffing, and raw or cooked whole eggs also do not freeze well.

Packaging Foods for Freezing
Foods that are sold frozen are specially packaged to preserve quality. Foods that you freeze at home need special protection to avoid freezer burn. Freezer burn is moisture loss caused by improper packaging or overly long storage in the freezer. Cold air gets into the package, damaging the food’s quality. Food with freezer burn may have tough, grayish-brown spots and a stale taste and aroma.

Containers for freezing food should be airtight and should resist vapor and moisture.

Science in Action

From Firm to Floppy

Not all foods look or taste as good after freezing as they do before it. Foods with high water content, such as spinach and celery, do not freeze well. Because water molecules expand when they freeze, they stretch and explode foods’ cells. Consequently, frozen foods that contain a lot of water become soft and soggy when thawed. Textural changes due to freezing are not as apparent in products that are cooed before freezing because cooking softens the cell walls.

Procedure Imagine this scenario: A busy restaurant prepares its cucumber salad side dishes in advance and stores them in the freezer.

Analysis What might customers complain about? What will be the cause of their complaints?

NSES B Develop an understanding of the structures and properties of matter.

Activity correlated to Science standard.

Science in Action

Answer Customers might complain that their salads are soft, mushy, or soggy. Cucumbers contain a lot of water, and do not freeze well. The water in the cucumbers will expand when frozen, leaving the salads with an unappealing texture when thawed.

N1CB

Guided Practice

List Ask students to list three foods that need refrigeration. (Answers will vary, but may include: foods that were refrigerated in the store, including dairy products, eggs, and deli items; most fresh fruits and vegetables; or baked products with fruit or cream fillings.)

Create Have students create a graphic organizer that explains what shoppers need to know about refrigeration when purchasing perishable items. (Organizers will vary, but may include: refrigerator perishable food promptly; keep the temperature inside your refrigerator under 40°F but above 32°F; do not overload the fridge; be sure that foods are tightly covered; and keep less perishable items in the storage areas in the door. Students may also include information about foods that need refrigeration.)

Apply Have students imagine that they have purchased a large amount of whole-grain products, seeds, and nuts by the bulk to cut down on food costs this month. In one paragraph, ask students to describe why they would need to ensure proper storage and refrigeration for these items. (Paragraphs will vary, but students may say that you need to ensure that the whole-grain products, seeds, and nuts are stored in the refrigerator because their high oil content makes them prone to rancidity, or spoilage due to the breakdown of fats. If they are not refrigerated, the foods will be stale, and bitter to taste. Have students share their paragraphs with the class.)
Good choices include plastic containers with tight-fitting lids, heavy-duty plastic freezer bags, and heavy-duty foil and freezer wrap. Regular refrigerator storage bags and plastic margarine or yogurt tubs do not give enough protection. The lightweight store wrap on fresh meat, poultry, and seafood also needs added layers for freezing.

To freeze meat, wrap it tightly and seal the package with freezer tape. When filling a container, leave enough space for food to expand as it freezes, about 1 inch of space per quart. Then seal the container tightly. Label all items with the contents, amount or number of servings, the date frozen, and any special instructions.

For best quality, freeze food quickly. Spread packages out in one layer so they touch the cooling coils or sides of the freezer. Leave enough space between packages for air to circulate. Give the food at least 24 hours to freeze, then stack similar items together. Keep an inventory of the food in the freezer. List the food, date frozen, and quantity. Update the inventory as you use food so that you know how much is left.

### Figure 19.3  Cold Storage of Meats, Poultry, and Fish

**Clean, Cold, Covered** Both cooked and uncooked meats keep for only a few days in the refrigerator. Cured meats keep longer. *Which kind of meat keeps the longest in the refrigerator? The shortest?*

<table>
<thead>
<tr>
<th>Food</th>
<th>Refrigerator Storage 40°F</th>
<th>Freezer Storage 0°F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uncooked</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beef, lamb, pork, or veal chops; steaks; roast</td>
<td>3–5 days</td>
<td>4–12 mos.</td>
</tr>
<tr>
<td>Chicken or turkey, whole</td>
<td>1–2 days</td>
<td>1 yr.</td>
</tr>
<tr>
<td>Chicken or turkey, pieces</td>
<td>1–2 days</td>
<td>9 mos.</td>
</tr>
<tr>
<td>Ground meats or poultry</td>
<td>1–2 days</td>
<td>3–4 mos.</td>
</tr>
<tr>
<td>Lean fish (cod)</td>
<td>1–2 days</td>
<td>6 mos.</td>
</tr>
<tr>
<td>Fatty fish (salmon)</td>
<td>1–2 days</td>
<td>2–3 mos.</td>
</tr>
<tr>
<td>Shellfish (shrimp)</td>
<td>1–2 days</td>
<td>3–6 mos.</td>
</tr>
<tr>
<td><strong>Cooked/Leftover</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooked meats; meat dishes</td>
<td>3–4 days</td>
<td>2–3 mos.</td>
</tr>
<tr>
<td>Fried chicken</td>
<td>3–4 days</td>
<td>4 mos.</td>
</tr>
<tr>
<td>Poultry, in broth</td>
<td>3–4 days</td>
<td>6 mos.</td>
</tr>
<tr>
<td>Fish stews, soups (not creamed)</td>
<td>3–4 days</td>
<td>4–6 mos.</td>
</tr>
<tr>
<td><strong>Cured Meats</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot dogs, opened</td>
<td>1 wk.</td>
<td>1–2 mos.</td>
</tr>
<tr>
<td>Lunch meats, opened</td>
<td>3–5 days</td>
<td>1–2 mos.</td>
</tr>
<tr>
<td>Hot dogs, lunch meats, unopened</td>
<td>2 wks.</td>
<td>1–2 mos.</td>
</tr>
<tr>
<td>Bacon</td>
<td>7 days</td>
<td>1 mo.</td>
</tr>
<tr>
<td>Smoked sausage (beef, pork, turkey)</td>
<td>7 days</td>
<td>1–2 mos.</td>
</tr>
<tr>
<td>Hard sausage (pepperoni)</td>
<td>2–3 wks.</td>
<td>1–2 mos.</td>
</tr>
<tr>
<td>Ham, canned, unopened</td>
<td>2–3 wks.</td>
<td>*</td>
</tr>
<tr>
<td>Ham, fully cooked, whole</td>
<td>7 days</td>
<td>1–2 mos.</td>
</tr>
<tr>
<td>Ham, fully cooked, half or slices</td>
<td>3–5 days</td>
<td>1–2 mos.</td>
</tr>
</tbody>
</table>

*Food should not be stored here.*

Good choices include plastic containers with tight-fitting lids, heavy-duty plastic freezer bags, and heavy-duty foil and freezer wrap. Regular refrigerator storage bags and plastic margarine or yogurt tubs do not give enough protection. The lightweight store wrap on fresh meat, poultry, and seafood also needs added layers for freezing.

To freeze meat, wrap it tightly and seal the package with freezer tape. When filling a container, leave enough space for food to expand as it freezes, about 1 inch of space per quart. Then seal the container tightly. Label all items with the contents, amount or number of servings, the date frozen, and any special instructions.

For best quality, freeze food quickly. Spread packages out in one layer so they touch the cooling coils or sides of the freezer. Leave enough space between packages for air to circulate. Give the food at least 24 hours to freeze, then stack similar items together. Keep an inventory of the food in the freezer. List the food, date frozen, and quantity. Update the inventory as you use food so that you know how much is left.

### Figure 19.3  Cold Temperature Storage of Meats, Poultry, and Fish

**Caption Answer** Unopened canned ham keeps the longest: six to nine months. Uncooked chicken, turkey, ground meat, and fish keep only one to two days.

**Discussion** Ask students: When freezing meat, why is it important to wrap it tightly and seal the package with freezer tape? *(Answers will vary, but may include: to prevent moisture loss and avoid freezer burn.)*
When the Power Goes Off

If the power goes off or the refrigerator-freezer breaks down, chilled food can spoil. Carry the frozen foods to another refrigerator or freezer in coolers or heavily wrapped in paper or plastic. If you cannot move the food, keep the freezer or refrigerator door closed to help keep the temperature down.

After losing power, a full freezer should keep food frozen for about two days. A half-full freezer may keep food frozen for only one day. If the freezer is not full, quickly stack packages closely together so they will stay cold. Separate frozen raw meat, poultry, and seafood from other foods to avoid any cross-contamination if they start to thaw.

If the power will be off longer than two days, you can nest foods in the freezer in bags of ice cubes from the store. Place a blanket or several layers of newspaper on the outside of the freezer to insulate it. You can also use dry ice (frozen carbon dioxide), but be very careful. Never touch dry ice with your bare hands or breathe its vapors in an enclosed area. Carbon dioxide gas in high concentration is poisonous.

Figure 19.4 Cold Storage of Dairy Products and Other Foods

<table>
<thead>
<tr>
<th>Food</th>
<th>Refrigerator Storage 40°F</th>
<th>Freezer Storage 0°F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dairy Products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh milk, cream</td>
<td>7 days</td>
<td>3 mos.</td>
</tr>
<tr>
<td>Butter, margarine</td>
<td>1–3 mos.</td>
<td>6–9 mos.</td>
</tr>
<tr>
<td>Buttermilk</td>
<td>2 wks.</td>
<td>3 mos.</td>
</tr>
<tr>
<td>Sour cream</td>
<td>1–3 wks.</td>
<td>*</td>
</tr>
<tr>
<td>Yogurt, plain or flavored</td>
<td>1–2 wks.</td>
<td>1–12 mos.</td>
</tr>
<tr>
<td>Cottage cheese</td>
<td>1 wk.</td>
<td>*</td>
</tr>
<tr>
<td>Hard cheese, opened</td>
<td>3–4 wks.</td>
<td>6 mos.</td>
</tr>
<tr>
<td>Hard cheese, unopened</td>
<td>6 mos.</td>
<td>6 mos.</td>
</tr>
<tr>
<td>Ice cream, sherbet</td>
<td>*</td>
<td>2–4 mos.</td>
</tr>
<tr>
<td><strong>Miscellaneous Foods</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td>7–14 days</td>
<td>3 mos.</td>
</tr>
<tr>
<td>Cakes, pies (not cream-filled)</td>
<td>7 days</td>
<td>2–3 mos.</td>
</tr>
<tr>
<td>Cream pies</td>
<td>1–2 days</td>
<td>*</td>
</tr>
<tr>
<td>Fresh eggs, in shell</td>
<td>3 wks.</td>
<td>*</td>
</tr>
<tr>
<td>Raw yolks, whites</td>
<td>2–4 days</td>
<td>1 yr.</td>
</tr>
<tr>
<td>Hard-cooked eggs</td>
<td>1 wk.</td>
<td>*</td>
</tr>
<tr>
<td>Egg substitutes, opened</td>
<td>3 days</td>
<td>*</td>
</tr>
<tr>
<td>Egg substitutes, unopened</td>
<td>10 days</td>
<td>*</td>
</tr>
<tr>
<td>Mayonnaise, opened</td>
<td>2 mos.</td>
<td>*</td>
</tr>
<tr>
<td>Salad dressing, opened</td>
<td>3 mos.</td>
<td>*</td>
</tr>
<tr>
<td>Salsa, opened</td>
<td>3 mos.</td>
<td>*</td>
</tr>
<tr>
<td>Cookies</td>
<td>2 mos.</td>
<td>8–12 mos.</td>
</tr>
</tbody>
</table>

*Food should not be stored here.

Critical Thinking

Power Outage  Tell students: Imagine that a storm has caused a power outage at your home. Your sister wants to throw out all the food in the refrigerator and freezer even though the power has only been out for four hours. Ask students: Do you agree? How would you respond? (Responses will vary, but may include that depending on how full the freezer is, food can keep for at least a day or two. If it is out longer than that, you can nest foods in bags of ice to keep them from thawing or spoiling. Foods in the refrigerator will keep from four to six hours. Placing bags of ice in the refrigerator can help to keep foods cold. In the meantime, keep the refrigerator and freezer door shut to keep the temperature down.)

Caption Answer Raw yolks and whites (separated, and not in the shell) are the only egg products that can be stored in the freezer.

Discussion Ask students: Why should food items in the freezer be packed close together? (Answers will vary, but may include: When frozen items are packed together, they act like blocks of ice, keeping each other cold.)

Ruben Zepeda, EdD, discusses the issues teachers must address when they have English learners in their classrooms.
Once the freezer is back in service, use the coldest setting to quickly refreeze any salvageable items. A food is safe to refreeze if ice crystals are visible, though it may have lost quality. Use these foods as soon as possible. Food that has thawed but is still cold can be refrigerated and used as soon as possible. Raw meat, poultry, and seafood can be refrozen after cooking. Throw out any food that has a strange odor.

Food will usually keep in a nonworking refrigerator for four to six hours, depending on the temperature of the room and how often you open the door. If the power will be out for a long time, try to keep foods cold by placing a large bag of ice cubes in the refrigerator.

When the power returns, check all foods for signs of spoilage, especially butter, margarine, and fresh produce. Clean up any food spills and wipe surfaces dry. If odors remain, wash surfaces with a solution of 2 tablespoons of baking soda dissolved in 1 quart of warm water. Put an open box of baking soda in the refrigerator to absorb odors.

Respond How soon should you eat leftovers after refrigerating them?

Eat refrigerated leftovers within three or four days.
**Preserving Food Safely**

Canning, freezing, and drying have long been used as safe methods for food preservation. To preserve is to prepare food in a way that allows it to be safely stored for later use. Many people still preserve food, especially vegetables and fruits, by canning, freezing, or drying. Preserving saves money and can be satisfying.

Some people preserve foods they raise themselves. They enjoy the seasonal fruits, vegetables, and herbs they grow themselves all year long. Use correct techniques to ensure the quality and the safety of the food.

Preserving food can be a fun family activity and a way to preserve traditions. A recipe for an unusual family favorite like red pepper jam might be handed down for generations. A store of preserved jam jars is good to have on hand.

Preserving food at home can also give you more control over what you eat. You can choose high-quality food and decide whether it will contain salt, sugar, or other additives. You can create your own delicious recipes and give them as gifts to friends and family. To avoid foodborne illness, it is important to follow safety rules when preserving food.

**Preparing to Preserve**

Get off to a good start by doing some planning first.

- Decide what foods to preserve, how much, and by what method. Buy only as much as you can prepare in the time available.
- Select foods to preserve based on what is in season. Selecting foods that are in season also allows you to get great value for your money.
- Be sure that all supplies are in usable condition.
- Always use high-quality food: ripe, firm fruit and young, tender vegetables.
- Follow recipes exactly. Do not take short-cuts or experiment.
- Wash food carefully and prepare it according to recipe directions.
- Have all equipment and supplies ready before you begin to work with the food.
- Follow all food-safety rules.

**Freezing Fruits and Vegetables**

Freezing preserves food at a temperature of 0°F or below. Freezing is the most convenient way to preserve produce, except for fruits and vegetables with a high water content, such as salad greens and celery. Frozen tomatoes and citrus fruits are fine for juice or sauce but not appealing raw.

Freeze foods quickly. Slow freezing allows large ice crystals to form, damaging food texture. To promote quick and even chilling, freeze foods in small containers and small batches.

**Freeze Fruits**

Prepare fruit the way you plan to use it—sliced or peeled, for example. Some fruits need to be treated with ascorbic acid (vitamin C) to disable their enzymes. Follow the directions on the package. Certain fruits, like apples, apricots, peaches, and nectarines, particularly need this treatment.

**Unsafe Preservation Methods**

The open kettle method was once a standard way to preserve foods. Foods were simply cooked and then sealed in jars with no further treatment. This technique is now recognized as unsafe because the food never gets hot enough to kill all microorganisms. In more recent years, some people have misused technology by processing canned foods by heating them in a conventional or microwave oven. This method is also unsafe, because the foods cannot reach temperatures higher than the boiling point of water, and the jars could explode. Today’s pressure canners are an example of how smart technology can be appropriately used to increase food safety.

**TECHNOLOGY FOR TOMORROW**

**Answer** Findings may vary slightly. Modern pressure canners are lightweight metal kettles with lids. They have removable racks and a steam vent. To operate a pressure canner, place jars on the racks and add water according to the product instructions. While the water boils, the steam pushes all the air out of the vent, leaving the jars in a space filled with just steam and boiling water. The temperature inside the canner reaches 240°F. Since there is no air, the heat reaches all sides of the jars evenly.
Freeze the fruit with one of these methods:

**Sugar-Pack Method**: The sugar-pack method is the technique of freezing fruit coated in sugar. Toss the fruit in sugar until it is well coated, then pack it into freezer-safe containers. The sugar helps retain the fruit’s color and texture and combines with the juice to form a syrup when defrosted.

**Syrup-Pack Method**: The syrup-pack method is the technique of freezing fruit in sugar water. Make a syrup by dissolving sugar in water. Pack fruit in freezer-safe containers and cover it with the chilled syrup. Keep the fruit under the syrup with a small piece of crumpled wax paper on top of the fruit.

**Tray-Pack Method**: The tray-pack method is the technique of freezing fruit whole on a tray. This method works well with blackberries, blueberries, cranberries, and other small fruits. Place the fruit on a tray or baking sheet, leaving space between pieces. Cover tightly with aluminum foil and freeze just until frozen. Then pack the pieces into freezer-safe containers.

**Dry-pack method**: The dry-pack method is the technique of freezing fruit directly in freezer containers. This method works best for small whole fruits.

### Freezing Vegetables

All vegetables except tomatoes require blanching, or brief cooking in boiling water, before freezing. Blanching neutralizes enzymes. To blanch vegetables, use 1 gallon of boiling water in a large pot for 1 pound of vegetables. Place the prepared vegetables in a large strainer and immerse them in the water. A blanching chart shows how long to blanch different vegetables. Another clue that vegetables are done is their color. Look for an intensified color change.

When the time is up, remove the vegetables and plunge them into a large pot of ice water until cool. Add ice cubes as needed to keep the water ice-cold. Drain the vegetables on clean, dry towels. Pat them dry to prevent ice crystals from forming as they freeze. Pack them into freezer-safe containers.

Do not use a microwave oven for blanching. Microwaves do not cook evenly, so they do not blanch evenly.

### Packing and Freezing

When you pack foods in containers to freeze, leave a 1-inch of headspace between the food and the lid of the container. **Headspace** is room left in a container for food to expand. If you are freezing food in plastic bags, squeeze out as much air as possible before sealing. Wipe containers clean and label them with the date, contents, and amount.

Freeze foods as soon as they are packed. Arrange containers in a single layer with plenty of space between them. This promotes air circulation and rapid, even freezing. Do not place food in the freezer door, because the door is warmer than the rest of the compartment.

### Canning Fruits and Vegetables

Canning is the process of cooking and preserving food in glass jars. You need to follow specific instructions and use special equipment to can food safely. The time, effort, and expense are worth the result.

### Jars and Lids

Canning jars are strong, reusable glass jars with a flat rim and a threaded neck that creates an airtight seal with the lid. The airtight seal prevents harmful microorganisms from getting into the jar. Jars from mayonnaise, peanut butter, and other commercial products do not work for canning, because they lack these features. Only use canning jars in perfect condition. Inspect the jar’s rim for chips or nicks. Discard any jars with tiny cracks that could fracture when heated.

Canning lids have two metal pieces, a top and a screw band. The flat top is rimmed with a rubber compound that molds to the jar. The screw band holds the top in place. **Figure 19.5** shows what these parts look like. Bands can be reused as long as they remain in good condition, but tops are used only once. Do not use older, porcelain-lined lids or one-piece lids with separate rubber rings.

Just before canning, wash the jars and lids in hot, sudsy water or in the dishwasher. Rinse the jars well. Keep them immersed in clean, hot water until you are ready to use them.

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**Guided Practice**

**Define** Ask students to define blanching. *(Answers will vary, but may include: Blanching is brief cooking in boiling water before freezing. After boiling, the food is plunged into ice water until cool. Drain and dry the food is plunged into ice water until cool.)*

**Describe** Ask students to describe how to blanch vegetables. What vegetable does not require blanching before freezing? *(Answers will vary, but may include: Tomatoes, blueberries, cranberries, and other small fruits.)*

**Apply** Ask students to write a paragraph in which they describe how to prepare vegetables for freezing and explain why a microwave should not be used for blanching. *(Paragraphs will vary, but may include: Before freezing most vegetables, you must blanch them. To blanch vegetables, cook them briefly in the boiling water. Then plunge them into a large pot of ice water until cool. Drain and dry the vegetables and pack them into freezer-safe containers.)*

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**Reading Strategy**

**Freezing Fruit** Ask students to use a graphic organizer to illustrate the following freezing methods: sugar-packed method, syrup-pack method, tray-pack method, and dry-pack method. *(Organizers will vary, but should illustrate the similarities and differences between the packing methods, such as: the sugar-pack method freezes fruit coated in sugar; the syrup-pack method freezes fruit in sugar water; the tray-pack method freezes fruit whole on a tray; and the dry-pack method freezes fruit directly in freezer containers.)*
Packing Methods

Pack food into jars with either the raw-pack method or the hot-pack method.

Raw-Pack Method The raw-pack method is the technique of canning raw foods. Put the prepared raw food into the jars. Pour in a hot liquid, such as syrup, water, or juice. Raw packing helps delicate foods retain their shape and texture.

Hot-Pack Method The hot-pack method is the technique of canning simmered foods. Simmer the food briefly, then place it and some of the liquid into the jars. Light cooking “preshrinks” foods. They fit together more closely, leaving less air in the jar. This increases the vacuum effect.

When you pack jars, leave about ½ to 1 inch of headspace for the food to expand. Run a spatula between the food and the jar to remove any air bubbles. Wipe the jar top clean. Apply the lid and screw on the band until just tight. A lid that’s too tight might not allow air to escape during processing.

Some microorganisms may survive the heat of blanching and packing. It is very important to boil the jars after canning, as described in the next section.

Processing Methods

For home canning, foods are divided into two classes—high acid and low acid. Each type is processed differently.

Boiling-Water Bath High-acid foods, including most fruits, can be processed in a boiling-water bath. A boiling-water bath is a large, deep kettle with a tight-fitting lid. The jars are covered with boiling water and processed for a specified length of time. A removable, divided rack separates and holds the jars off the bottom of the kettle, allowing water to circulate around all sides of the jars.

Pressure Canning Low-acid foods, including tomatoes and other vegetables, need pressure canning. Pressure canning is canning using a pressure canner, which is like a large pressure cooker. Jars of food are processed in steam under pressure. Pressure canning raises the temperature above the boiling point of water to kill the deadly botulinum bacteria, which can survive the heat of boiling.

Pressure canning raises the temperature above the boiling point of water to kill the deadly botulinum bacteria, which can survive the heat of boiling.

Canning Know-How Jars for canning have two-piece lids that create a tight seal. Which of the parts shown here can you use more than once?

Read the manufacturer’s directions carefully before using a canner. Have the gauge on the pressure canner checked every year to make sure it is accurate.

After processing, place the jars on a rack or clean dish towel away from drafts until completely cool, usually 12 hours or longer. During this time, the lids should “pop.” This sound indicates that the jar and lid have formed the perfect seal needed to prevent spoilage. To make sure, press down on the center of the lid.

It should stay down when released because of the vacuum inside.

Seals here

Jars that do not seal properly in the pressure canner can be reprocessed within 24 hours using a new lid. Food quality will suffer, however. You may want to remove the food from the can and refrigerate or freeze it.

To allow flavors to develop, you should store home-canned foods in a clean, cool, dry area for at least two weeks before using. Remove or loosen the screw bands to prevent them from rusting. A rusted band can cause a faulty seal.

Discussion Ask students: When and why would you replace the jar lid’s metal screw band? (Answers will vary, but may include: you may want to replace the metal screw band if it is no longer in good condition. If the band no longer holds the top in place, or is rusted, you should replace it.)

Caption Answer You can use intact jars and screw bands more than once. A new lid must be used each time.

Skill Practice Guided Practice

Create Ask students to create a chart comparing and contrasting the two methods to pack foods into jars. (Charts will vary, but may include: The raw-pack method is canning raw foods. Raw food is put into jars and hot liquid is added. Raw-pack helps foods retain shape and texture. The hot-pack method is canning simmered foods. Simmered food is put into jars with some of its liquid. Hot-pack “preshrinks” foods and they fit closely together, leaving less air in the jar, which improves food quality.)

Apply Ask students to write a paragraph in which they describe the two methods of packing foods into jars and explain why it is important to boil jars after canning. (Paragraphs will vary, but students may include: The raw-pack method is the canning of raw foods. Put the prepared raw food into the jars. Pour in a hot liquid, such as syrup, water, or juice. Raw packing helps delicate foods retain their shape and texture. The hot-pack method is the canning of simmered foods. Simmer the food, then place the food and some of the liquid into the jars. The light cooking “preshrinks” foods. They fit together more closely, leaving less air in the jar. This increases the vacuum effect, which improves the food's quality. It is important to boil jars after canning since some microorganisms can survive blanching and packing. Have students share their paragraphs with the class.)
Canning Fruit and Vegetable Spreads

You can also can homemade fruit and vegetable spreads, such as jellies, preserves, jams, and fruit butters. Jellies are mixtures of juice and sugar, firmed with a gelling agent. Preserves are whole fruits or large pieces cooked with sugar. Jams use chopped fruits or vegetables. Butters are pureed fruit pulp cooked with sugar and spices until smooth and creamy.

Cook jellies, preserves, jams, and fruit butters in a large, wide pot with a flat bottom so the mixture has room to boil and foam without bubbling over. Prepare small batches so the food cooks quickly. Process the mixture in a boiling-water bath.

There are thousands of recipes for tasty fruit and vegetable spreads, including many that are low in added sugar.

Pickling Food

Pickling means packing food in a mixture of pickling salt, vinegar, water, and spices. Pickling turns cabbage into sauerkraut or kimchi and cucumbers into pickles. You can also pickle mixed vegetables and beans and sweetened combinations of chopped fruits, vegetables, or both. Hard-cooked pickled eggs are a regional favorite. Pickled fruits are simmered in a spicy, sweet-sour syrup that complements naturally tart foods, including crabapples and watermelon rind.

The vinegar in pickling liquid is high in acid, so all pickled recipes can be processed in a boiling-water bath.

Drying Food

Drying, or dehydration, preserves food by depriving microorganisms of the moisture they need for survival. This method is the oldest type of preservation, yet it requires special equipment. Food must dry slowly and evenly, retaining enough water to be edible but not enough water to breed microorganisms.

The most convenient, reliable way to dry food is to use a food dehydrator. A food dehydrator dries foods safely through a balance of moderate temperatures, low humidity, and good air circulation. Most dehydrators have a 24-hour timer and an adjustable thermostat to dry each food in the proper time and at the proper temperature.

Food can also be dried in an oven set to 140º. A convection oven works better, since the temperature can be kept even and air can circulate, drying the food. If the temperature gets over 140º, the food will cook, rather than dry. Another concern is the cost of running the oven for the eight hours it takes to dry most foods.

Almost any kind of food can be dried. Apples, berries, peaches, and pears are delicious dried. Peppers, peas, corn, onions, and green beans also dry well. Treat fruits with ascorbic acid before drying, and blanch vegetables before drying them.
The owner’s manual for your dehydrator should give recommendations for drying different foods. Store home-dried produce just as you would store dried store-bought produce: in glass jars or sturdy plastic containers or bags. Choose containers that close securely to keep out moisture.

**Using Home-Preserved Foods**

Dried foods make nutritious snacks and are great for dipping. You can add dried foods to soups or soften them in warm water. The warm water causes dried foods to rehydrate, or absorb water and become soft again. For example, you can soften dried blueberries by soaking them in warm water before adding them to muffin or pancake batter.

Properly frozen fruits and vegetables keep their quality for 12 to 18 months. Thawed frozen fruits and vegetables tend to have a softer, mushier texture than fresh fruits and vegetables. This is less noticeable if you cook frozen foods in recipes. Try serving frozen foods when they are still slightly frozen. Except for corn on the cob, which should be partially thawed, vegetables can be cooked frozen without thawing.

Before using canned foods, examine jars carefully. Bulging lids and liquids trickling from under the lid are signs of spoilage. Examine jars when you open them, too. Check for mold, unusually soft food, or cloudy, bubbling, or spurting liquid. Discard the food without tasting it.

Never taste canned low-acid foods cold. Canned foods containing botulinum bacteria often look and smell normal, but even a teaspoon can be fatal. Boil low-acid foods for 10 to 15 minutes before tasting them. Use a conventional cooktop only. A microwave oven heats too unevenly to kill all the microorganisms.

**Safeguarding the Food Supply**

Just as you work to keep your own food supply safe, the government works to keep the nation’s food supply safe. Several government agencies work to help ensure that foods are handled properly from farm to marketplace. Each agency has responsibilities, such as examining ingredients, testing new processing technologies, and preventing contamination.

**Food and Drug Administration**

The Food and Drug Administration (FDA) is the division of the Department of Health and Human Services that oversees the overall safety of the food supply. The FDA has an impact on every food and beverage you buy.

**Food Additives**

The FDA examines food additives such as preservatives and dyes to see whether they are safe. After conducting public hearings and reviewing test results, the FDA determines how the additive may be used and in what amount. It also decides how the ingredient should be listed on the food label, like the one shown in Figure 19.6.

**Figure 19.6 Extra Ingredients**

**Know Your Additives** Some food additives improve quality and lengthen shelf life. What ingredient in this bread is likely to be an additive?

**INGREDIENTS:** ENRICHED FLOUR (NIACIN, REDUCED IRON, THIAMINE MONONITRATE, RIBOFLAVIN), WATER, HIGH FRUCTOSE CORN SYRUP. CONTAINS 2% OR LESS OF WHEY, SOYBEAN OIL, YEAST, SALT, CULTURED WHEY, SOY FLOUR, DOUGH CONDITIONERS (SODIUM STEAROYL LACTYLATE, AMMONIUM SULFATE, CALCIUM SULFATE, CALCIUM PEROXIDE, AND/OR ASCORBIC ACID, PROTEASE), MONOCALCIUM PHOSPHATE.

**Caption Answer** The dough conditioners. High-fructose corn syrup is also usually considered an additive.

**Discussion** Ask students: What are some other reasons for using food additives? (Answers will vary, but may include: Food additives are also added to improve flavor, taste and appearance.)
Critical Thinking  
Food Safety After students finish reading about food-related recalls, market withdrawals, and safety alerts in the Be a Smart Consumer activity, ask students: If a company voluntarily recalls a food product that is suspected of contamination, even though no illnesses have been reported to date, should it be held responsible for illnesses reported at a later date? Why or why not? Have students write a paragraph in response to these questions. Paragraphs must include at least two specific, thoughtful reasons to support the student’s stance. Initiate a class discussion by asking students to share their reasoning with the class. (Responses may include that all businesses, even those that voluntarily recall products that may be contaminated, have an ethical responsibility to ensure that the public is made aware of possible health risks.)

Reading Strategy  
Fat Replacers Encourage students to learn more about olestra and the changes in labeling requirements for olestra over the years. Suggest that they find a magazine or newspaper article that explains why the Food and Drug Administration requires manufacturers to add vitamins A, D, E, and K to products containing olestra. Have students use a graphic organizer to compile their findings. (Students may point out that manufacturers must label all products containing olestra to inform consumers of its side effects, that it inhibits the body’s absorption of vitamins A, D, E, and K, and that the product has been fortified with these vitamins to compensate for olestra’s effects on these nutrients.)

Protecting the Food Supply

All companies that process, package, or sell food in the United States are required to register with the FDA. This helps health officials track sources of tainted food in case of an outbreak of foodborne illness. The rule applies to makers and distributors of fresh and processed items, even chewing gum and animal foods, whether they are located in the United States or overseas. A few types of businesses, including farms, restaurants, and supermarkets, are excluded. Meat, egg, and poultry producers, which are regulated by the USDA, are also exempt.

Challenge With your teacher’s permission, use the FDA’s Web site to learn about food-related recalls, market withdrawals, and safety alerts for the last 60 days. What foods are mentioned? Why? Where did they come from?

The FDA classifies additives with a long history of safe use as “Generally Recognized as Safe” (GRAS). Items on the GRAS list, or safe list, range from sugar to seaweed and can be used by food processors for specific uses without further testing.

No additive is approved permanently. If new evidence shows that an additive might be unsafe, the FDA may require retesting and may tell manufacturers to stop using it.

Fat Replacers

The FDA also oversees the use of “fat replacers” found in many fat-free and reduced-fat processed foods. Fat replacers mimic the smoothness and creaminess of fat, without the calories. They are made from carbohydrates, proteins, fats, or a combination of these.

Carbohydrate-based fat replacers include modified food starch, cellulose, dextrin, and guar gum, which thicken foods. These ingredients are common in fat-free salad dressings.

Fat replacers based on carbohydrates cannot survive much heat, so they do not work well in fried foods.

Protein-based fat replacers are made from egg whites and fat-free milk. They are often used in frozen and refrigerated products. Low-fat cheese, ice cream, baked products, and cream soups contain protein-based fat replacers. Fat replacers based on protein cannot survive much heat, so they also do not work well in fried foods.

Fat-based fat replacers are made from chemically altered fats. They are stable in heat and very versatile, making them suitable for baked foods, cake mixes, frostings, dairy foods, and some fried foods. Olestra (ole-str’a) is a fat-based replacer that passes through the body without being absorbed. Foods made with olestra are fortified with vitamins A, D, E, and K to boost the absorption of fat-soluble vitamins. Olestra causes mild digestive problems for some people. Salatrim is another fat-based replacer found in baked goods, dairy products, and sweet products.

Most fat replacers have fewer calories per gram than fat, but some fat-free and low-fat foods are still high in calories. Check the Nutrition Facts panel for the fat, sugar, and calories per serving.

Hazard Analysis and Critical Control Point

Some outbreaks of foodborne illness have been traced to contamination during processing. To avoid contamination, the FDA requires some processors to use a system called Hazard Analysis and Critical Control Point (HACCP, pronounced “hassip”). HACCP is an individualized plan or set of procedures that predicts and prevents threats to food safety during food processing and service. For example, meat can become contaminated while it is being handled to make packaged sandwiches. A delicatessen that makes sandwiches might have HACCP plan that requires specific safety procedures to prevent contamination. Workers might be required to wear sanitary gloves and change them whenever they need to handle money. A set of procedures might be followed each time sandwich meat is moved from the refrigerator to the counter. Still another set of rules might be set each time food is received at the delicatessen.

International food agencies and manufacturers around the world follow HACCP. Manufacturers that use HACCP keep records to show whether the HACCP program is working. Public Health agencies usually evaluate food service, business compliance with HACCP procedures.
What Would You Do?

- **Recalls**
  - What happens if a manufacturer or the FDA learns that a food is unsafe? Usually, a food maker issues a recall, the immediate removal of a product from store shelves. The brand name and package code numbers are publicized in the media. Consumers who have purchased the food are urged to return it to the store for a refund. If the company does not voluntarily recall an item, the FDA may take legal action.

- **Irradiation**
  - The FDA also judges the safety of food processing methods, including new and sometimes controversial methods such as irradiation. Irradiation is the process of exposing food to high-intensity energy waves to increase shelf life and kill harmful microorganisms. Irradiation does not make foods radioactive. Like other processing methods, irradiation can slightly affect flavor, texture, and vitamin levels.

  The FDA first approved the use of irradiation for spices and wheat flour in 1963. The process proved successful, with no known negative health effects. The FDA gradually extended approval for irradiation to produce, poultry, pork, beef, and seafood. Irradiated foods must be identified with the radura symbol.

  Some people support irradiation because it can reduce cases of foodborne illness and control pests without poisons. Other people oppose irradiation because they worry that the radioactive elements used in irradiation plants may create harmful byproducts.

Environmental Protection Agency

The Environmental Protection Agency (EPA) is an agency of the federal government that helps to protect the environment. It helps to monitor the impact of food production on land, air, and water.

The EPA also regulates the use of pesticides. Just as the FDA regulates which additives can be used in foods, the EPA also decides when, how, and in what amounts pesticides can be used in growing food.

**Predict, Prevent, Protect**

There are seven principles of HACCP. These seven principles require food manufacturers to predict what may go wrong during food processing. They encourage food manufacturers to identify ways to prevent potentially dangerous errors. And they ask food manufacturers to think of specific ways to protect the food from hazards in the event that something does go wrong. Each of the seven principles of HACCP promotes prediction, prevention, and protection in a different way. For example, the fifth principle asks food manufacturers to establish “corrective actions”—or brainstorm steps to take in order to correct a mistake or accident that occurs during food processing.

**What Would You Do?**

- **What corrective actions would you take if you broke a dish or glass while working in the foods lab? How would you prevent this from happening in the future? Develop your own specific HACCP plan of procedures.**

- **Explore the Photo**
  - **Caption Answer** spices, flour, produce, poultry, meat, and seafood
  - **Discussion** Why might a pregnant woman avoid a food product with a radura symbol on the package? (Critics of irradiation claim that the process may create harmful byproducts that cause cancer and birth defects.)

- **SAFETY MATTERS**
  - **Answer** Answers will vary, but should include a series of steps devised to make washing dishes safer.
The EPA and other government agencies regularly test levels of chemical residues on food. Residues are substances left in food as byproducts of processing or agriculture. For example, the EPA monitors the amount of pesticides in grains, produce, and animal feed. Pesticides in animal feed can build up in animals’ tissues, harming them and the people who eat them.

A build-up of pesticides and other chemical residues can lead to serious health problems in people and other inhabitants of an ecosystem. For every pesticide, the EPA establishes a tolerance, or a maximum safe level in food. If a pesticide is found above tolerance levels, it may be banned or restricted.

**Food Safety and Inspection Service**
The Food Safety and Inspection Service (FSIS) is the branch of the United States Department of Agriculture (USDA) responsible for the wholesomeness of meat, poultry, and eggs. FSIS inspectors check the sanitation of packing plants and storage facilities. They test food products for residues of hormones, antibiotics, and other drugs used in raising animals. They keep diseased animals out of the food supply. FSIS officials work with foreign governments to ensure that imported animal products meet U.S. safety standards. Like the FDA, the FSIS can request a recall if it believes that a meat, poultry, or egg product poses a health risk.

**Centers for Disease Control and Prevention**
The Centers for Disease Control and Prevention (CDC) is the lead federal agency for protecting the health and safety of people. Foodborne and waterborne diseases are one concern of the CDC’s National Center for Infectious Diseases (NCID). The NCID works with governmental and nongovernmental organizations at the federal, state, and local level to monitor foodborne and waterborne diseases, to train people to identify them, to research causes of these diseases, and to promote prevention and control.

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**No-Bake Oatmeal Raisin Cookies**

**Ingredients**
- 1 cup Sugar
- 4 oz. Butter
- ½ cups Low-fat milk
- 1 cup Oats
- ½ cups Raisins
- ½ cups Chocolate chips

**Yield** 12 servings (two cookies per serving)

**Directions**
1. Put the sugar, butter and milk in a pot and bring to a boil, stirring constantly. Allow the mixture to cook for five minutes.
2. Turn off the heat and add the oats and raisins and mix them in.
3. Add the chocolate chips and mix again.
4. Drop tablespoonfuls of the mixture onto wax paper. They will stiffen as they cool. Refrigerate uneaten cookies.

**Nutrition Analysis per Serving**
- Calories 186
- Total fat 7 g
- Saturated fat 4 g
- Cholesterol 11 mg
- Sodium 5 mg
- Carbohydrate 31 g
- Dietary fiber 1 g
- Sugars 25 g
- Protein 2 g

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**Regional Food Safety**
Have students investigate the laws and policies that address food and safety in their own state or community. Encourage students to contact county and state health departments for information. Ask students to write one paragraph in which they describe their findings. Have students share their paragraphs and findings with the class.
CHAPTER 19
Review & Applications

Content and Academic Vocabulary Review
1. Create multiple-choice test questions for each of these content and academic vocabulary terms.
   - Content Vocabulary
     - contaminant (p. 280)
     - foodborne illness (p. 280)
     - microorganism (p. 280)
     - toxin (p. 280)
     - spore (p. 280)
     - food safety (p. 280)
     - sanitation (p. 281)
     - personal hygiene (p. 281)
     - 20-second scrub (p. 281)
     - cross-contamination (p. 283)
     - internal temperature (p. 284)
     - rancidity (p. 286)
     - freezer burn (p. 287)
     - preserve (p. 290)
     - sugar-pack method (p. 291)
     - syrup-pack method (p. 291)
     - tray-pack method (p. 291)
     - dry-pack method (p. 291)
     - blanching (p. 292)
     - headspace (p. 292)
     - raw-pack method (p. 293)
     - hot-pack method (p. 293)
     - boiling-water bath (p. 293)
     - pressure canning (p. 293)
     - rehydrate (p. 294)
     - GRAS list (p. 295)
     - irradiation (p. 297)
     - recall (p. 297)
     - tolerance (p. 298)

   - Academic Vocabulary
     - tolerate (p. 280)
     - reserve (p. 283)

Review Key Concepts
2. Identify the causes of foodborne illness.
3. Explain the importance of cleanliness in the kitchen.
4. Summarize ways to cook food safely.
5. Describe safe food storage practices.

Critical Thinking
7. Explain the pros and cons of irradiation.
8. Conclude whether a sandwich maker is practicing food safety if he touches cooked chicken, his face, and cutting boards with gloved hands.
9. Explain whether Mona should throw away all of the food in her full freezer and refrigerator. Upon returning from a trip, she learns her power was out for 46 hours.
10. Describe how income, time, and the size of a family might affect which methods are used to preserve foods.

submerge it in a container of cold water, use the microwave, or cook it in a longer period. Serve cooked food at its proper temperature, and do not let perishable foods sit at room temperature for more than two hours.

To store food safely, follow the package instructions, use older stored items before newer ones, write the purchase date on containers without use- or sell-by dates, use canned food within a year, clean storage areas regularly, and buy only as much food as you need. Store shelf-stable foods at room temperature. Refrigerate or freeze perishable foods promptly and when not in use. Properly package foods for freezing to prevent freezer burn. In the event of a power outage, open the refrigerator and freeze as infrequently as possible.

Methods for safe food preservation include freezing, canning, pickling, and drying. Freezing stores food at a temperature of 0˚ and is the most convenient way to store most types of produce. Canning is the practice of cooking and preserving foods in glass jars. Pickling is packing food in a mixture of pickling salt, vinegar, water, and spices. Drying preserves food by depriving microorganisms of moisture.
Critical Thinking

7. Irradiation is the process of exposing food to high-intensity energy waves to increase shelf life and kill harmful microorganisms. Supporters favor irradiation because it can reduce cases of foodborne illness and control pests without poisons. Some oppose it because they worry the radioactive elements used in irradiation plants may create harmful byproducts.

8. The sandwich maker is not practicing food safety. He should wash his gloved hands or change his gloves after touching uncooked chicken and his face. Wearing gloves does not prevent cross contamination of bacteria from one food or surface to another.

9. Mona’s actions are not entirely correct. Since a full freezer should keep food frozen for about two days in the event of a power outage, the food in her freezer was probably still safe to keep and eat. Mona could use the coldest setting to refreeze the food, and transfer any foods that may have thawed but are still cold to the refrigerator to use as soon as possible. Mona was correct to throw away the foods in her refrigerator, which will only keep for four to six hours during a power outage.

10. Income can influence the selection of a preservation method because some methods are more costly than others. For example, freezing is the least costly method, while canning, which requires glass jars and possibly a pressure canner, is probably the most costly. A food dehydrator for use in drying may also be costly.

11. Answers will vary depending on the fruits used. For the sake of variety and interest, each lab team should use different fruits.
17. Food Contaminants Mold spores are everywhere, and given the right conditions, can grow into fungal colonies.

**Procedure** Cut two bread slices in half. Label four plastic sandwich bags: dry, water, lemon juice, and simple syrup (equal parts sugar and water). Put one of the bread pieces into the “dry” bag. Put 8–9 drops of water on the next bread piece, and repeat with the lemon juice and the syrup. Seal up all 4 bags, and put in a dark warm place. Check the bread daily over the next 12 days. Record the results.

**Analysis** Create a bar graph with percentages of mold on bread on the y axis, and the labels from the bags as the x axis. Which showed the most growth and which the least?

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18. Choosing Containers Ramona knows that she will be very busy at work next week and won’t have time to do a lot of cooking. She would like to make a big pot of soup this week and freeze it to eat next week. Ramona has several cylindrical, resealable, freezer-proof containers that measure 6 inches wide and 4.1 inches tall. If she makes 6 quarts (346.5 cubic inches) of soup, how many containers will she need?

**Math Concept** Cylindrical Volume A cylinder is a solid with circular parallel bases. Calculate the volume (V) of a cylinder as \( V = \pi r^2 h \), where \( r \) is the radius of the circular base, and \( h \) is the cylinder’s height.

**Starting Hint** The container’s radius is half of its diameter (width). Remember to subtract 1 in. from the height to allow for a proper headspace. Use 3.14 for \( \pi \).

**NCTE 12** Use language to accomplish individual purposes.

**Multiple-Choice Question**

20. Which government organization oversees the overall safety of the food supply?

a. The senate
b. The FDA
c. The HACCP
d. The USFA

**Test-Taking Tip** Multiple-choice questions may prompt you to select the “best” answer. They may present you with answers that seem partially true. The best answer is the one that is completely true, and can be supported by information you have read in the text.

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19. Public Service Announcement Develop, write, and record a 30-second public service announcement about food safety. Your announcement should capture listeners’ attention and inform them about one important aspect of food safety. Air it on the school’s public address system.

**NSES B** Develop an understanding of the structures and properties of matter.

**NCTE 12** Use language to accomplish individual purposes.

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**Chapter 19 Review & Applications**

**Interpersonal and Collaborative Skills**

15. Try to assign a different demonstration topic to each group. Demonstrations will vary.

**Financial Literacy Skills**

16. It is cheaper for the Swansons to can their own peach jam. To buy 30 jars of jam from the market costs $120 a year. To buy a pressure canner and can their own jam costs $105 the year they buy the canner and jars. In subsequent years, if they reuse the jars and keep the canner in good condition, canning may not cost them anything.

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**English Language Arts**

19. Announcements will vary, but should be informative, grammatically correct, and easy to understand when heard.

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20. b. The FDA