Food Selection and Preparation

A Laboratory Manual

SECOND EDITION

Frank D. Conforti

YELLOW CAKE
1 cup cake flour
2/3 cup granulated sugar
1/4 teaspoon salt
1 1/2 teaspoons double-acting baking powder
1/4 cup shortening, butter,
1/2 cup milk
1/2 teaspoon vanilla extract
1 large egg, room temperatu
1.Preheat oven to 350°F. Se
position of th
2.Cut waxed p bottom of an 8
round cake p
3.Grease only the cake pan

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Figure 4.3 was adapted from General Mills, Inc., *Betty Crocker's Cookbook*, copyright 1978, pg 213; Figures 8.1, 8.2, and 8.3 were adapted from General Mills, Inc., *Betty Crocker's Microwave Cookbook*, Random House, Inc., 1981; all figures appearing in Appendix H were adapted from General Mills, Inc., *Betty Crocker's Best Recipes for Meat and Vegetable*; the Chicken Foodservice cuts chart in Appendix G is reprinted from North American Meat Processors, Chicken Foodservice Poster, Revised May 2006, reprinted with permission of John Wiley & Sons, Inc.; and the Pork Foodservice Cuts chart in Appendix G is reprinted from North American Meat Processors, Pork Notebook Guides, Revised May 2006, reprinted with permission of John Wiley & Sons, Inc.

Contents

Preface

My objective in writing this manual was to create a learning tool for the student in food service, hospitality management, dietetics, or family and consumer education. Ten years have elapsed since the first edition of this manual. During those 10 years many changes have taken place in food selection and preparation. In order to keep up with the changing tide in food, this manual has been updated to reflect these current trends. There are new recipes and reformulation of existing recipes with regard to ingredients or manipulation. There are also updates of technical information in each unit to be in touch with the current trends and discoveries in food.

The student should learn how to prepare nutritious food and how to make substitutions when necessary, yet still maintain the integrity and quality of food. Therefore, the student must understand the function of the ingredient(s) in a particular food system. The student must understand why the ingredient is being added and what effect the ingredient will have on the quality of the food product during preparation. This manual hopes to carry out this purpose not only with the recipes that are found in each particular unit, but also the questions, exercises, and vocabulary words that are part of each unit.

Each laboratory is an independent unit and can be assigned according to any sequence chosen by the instructor. There are a number of recipes in each unit, but they all do not have to be included in the lesson especially if some laboratory periods run for 2 hours instead of 3 hours. A careful selection of activities by the instructor should give the student a firm basis in foods and a clear understanding of the proper selection and manipulation of ingredients that will lead to a quality product.

I hope that you will enjoy this manual as much as I have over the years in the development of its content. I have to give credit to the students (and there have been over 2,000 since the first edition had come out!) who have contributed to its success. It is because of these students' incisive recommendations, constructive criticisms, and devotion to the subject of food that this manual has evolved into what it is today. It is hoped that many more students will become acquainted with its contents, and that they will come away with an interest and deep respect for food and the contribution that food makes in one's health and daily life. Finally, I hope that this manual will make a contribution by being a continuing source of information long after the course is completed.

Acknowledgments

A revision of a book takes time, patience, and the support of many people. I would like to express my appreciation to the following people who have contributed to the revision of this manual: Sherry Seville, Virginia Tech, whose expertise at the computer assisted in formatting the revised manuscript for publication; Sharon Kast, also of Virginia Tech, whose time and patience were responsible for the photographs that appear in some of the laboratory units; and especially to the students whose suggestions and participation over the years have made this manual an integral part of the Food course at the Department of Human Nutrition, Foods, and Exercise.

LABORATORY 1

Measuring Techniques

Laboratory 1
Measuring Techniques

Proper measuring techniques must be emphasized to ensure success in food preparation. There are differences when measuring liquid and dry ingredients, and the student must learn these techniques as soon as possible in order to be successful in food preparation. The objective of this laboratory exercise is to introduce the student to proper measuring techniques.

VOCABULARY

boiling point	meniscus	solvent
conduction heat	opaque	solute
convection heat	simmering	

MEASURING TECHNIQUES

The American Standards Association has defined the capacities of various measures, but not all measuring equipment has been standardized to meet these specifications. Variations of 5%, more or less than standard, are allowable.

I. NONMETRIC MEASURE OF VOLUME

A. DRY MEASURES

A set of dry measuring cups includes measures for 1/4 cup, 1/3 cup, 1/2 cup, and 1 cup (there are some manufacturers that make 2/3 cup and 3/4 cup measures). These measures are used for dry ingredients and solid fats. Ingredients vary in the way they pack down, lump, or cling to the measuring cup. Use the following guidelines when measuring:

1. All-purpose flour, cake flour, granulated sugar, and confectioner's sugar should be lightly spooned into the appropriate size dry measuring cup. **Do not shake or pat down**. Use a straight-edged spatula or knife to level off ingredients (Fig. 1.1).

FIG. 1.1: Spoon dry ingredients lightly into cup and level off with a straight-edged spatula.

2. Nuts, coconut, and bread crumbs should be spooned into the cup and packed down lightly.
3. Brown sugar should be spooned into the dry measure cup and packed down firmly with spatula and spoon.
4. Solid fats include hydrogenated shortening, lard, margarine, and butter. The solid fat should be packed into the dry measure with firm pressure. Butter and margarine should be at room temperature before being measured.

B. SMALL AMOUNTS OF INGREDIENTS

1. Baking powder, baking soda, salt, and spices are used in such small amounts that they must be measured in small capacity measures of 1 tablespoon or less.
2. Ingredients should be stirred and free of lumps.
3. The desired measure is dipped into the ingredient and leveled off.
4. Usually, the measuring spoons are found as 1/8 teaspoon, 1/4 teaspoon, 1/2 teaspoon, 1 teaspoon, 1/2 tablespoon, and 1 tablespoon.

C. LIQUIDS

1. Oil, honey, milk, molasses, water, melted fat, and other liquid ingredients should be measured in a graduated, transparent liquid measure with a pour spout.
2. Fill the measure to the desired graduation and check it by holding the measure at eye level so the bottom of the meniscus—the curved, upper surface of the liquid—matches the desired line on the side of the measure (Fig. 1.2).
3. Opaque liquids (such as milk and honey) that do not show a meniscus are measured by aligning the top of the liquid with the line on the measure.
4. Many liquids, especially oil and honey, tend to cling to the sides of the cup. To obtain an accurate transfer of the liquid, it is essential that the inside of the cup be scraped out with a rubber spatula. **Hint: spray measuring cup with cooking spray before measuring molasses or honey**. **This will make removal of the ingredient more efficient**.

FIG. 1.2: Read the measure by holding it at eye level so the bottom of the meniscus matches the desired line on the side of the measure.

D. OTHER MEASURING ADVICE

1. If the recipe specifies 3 teaspoons of baking powder, the tablespoon measure should be used to make the measurement. To measure 3 separate teaspoons introduces greater error in measurement.
2. When the recipe specifies less than 1 cup of liquid, and the measurement is made in a 2-cup graduated measure, there is also a greater chance of error.
3. It is important to use the measuring utensil that is closest in size to the amount of ingredient for greater accuracy.

EQUIVALENT MEASURES

1 tablespoon	=	3 teaspoons
1/8 cup	=	2 tablespoons
1/4 cup	=	4 tablespoons
1/3 cup	=	5 tablespoons + 1 teaspoon
1/2 cup	=	8 tablespoons
2/3 cup	=	10 tablespoons + 2 teaspoons
3/4 cup	=	12 tablespoons
1 cup	=	16 tablespoons or 1/2 pint
1 pint	=	2 cups
1 quart	=	4 cups or 2 pints
1 gallon	=	4 quarts

II. TO LEARN CORRECT TECHNIQUES FOR MEASURING INGREDIENTS

A. FLOUR (ALL-PURPOSE OR CAKE)

1. Method 1

a. Fill 1/2 cup dry measure by dipping into canister of flour.
b. Level with spatula.
c. Weigh flour on gram scale and record weight in Table 1.1.
d. Repeat.

2. Method 2

a. Place 1/2 cup dry measure on a piece of waxed paper of 12 square inch.
b. Sift flour directly into the cup until the cup overflows. Do not let the sifter touch the cup.
c. Level flour with the edge of the spatula.
d. Weigh flour and record weight in Table 1.1.
e. Repeat.

3. Method 3

a. Stir flour in canister to lighten.
b. Carefully spoon flour 1 tablespoon at a time into 1/2 cup dry measure.
c. Level flour with the edge of the spatula.
d. Weigh flour and record weight in Table 1.1.
e. Repeat.

Table 1.1 EVALUATION OF THE WEIGHT OF 1/2 CUP OF FLOUR

Method	Trial 1	Trial 2	Standard Weight*
1			
2			
3			

*All purpose: 1/2 cup, sifted: 58.0 g; 1/2 cup, spooned: 62.5 g; cake flour: 1/2 cup, sifted: 48.0 g; 1/2 cup, spooned: 55.5 g.
Source: *Handbook of Food Preparation: Food and Nutrition Section*, 9th edition, 1993, American Home Economics Association, p. 182.

QUESTIONS

1. Which method of measuring flour yields the best check? Why?

2. What would cause a difference in weight from the standard?

3. How would you substitute all-purpose flour for cake flour in a recipe? Would this substitution work for all type of baked products?

B. SUGAR: GRANULATED AND BROWN

1. Method 1

a. Fill a 1/4 cup dry measure with granulated sugar by dipping it into the canister.
b. Level the sugar with the edge of the spatula.
c. Weigh sugar and record in Table 1.2.
d. Repeat.

2. Method 2

a. Fill a 1/4 cup dry measure with brown sugar by spooning sugar into cup.
b. Level the sugar with the edge of the spatula.
c. Weigh sugar and record in Table 1.2.
d. Repeat.

3. Method 3

a. Fill a 1/4 cup dry measure with brown sugar by pressing the sugar into the measuring cup.
b. Level the sugar with the edge of the spatula.
c. Weigh sugar and record in Table 1.2.
d. Repeat.

Table 1.2 EVALUATION OF THE WEIGHT OF 1/4 CUP OF SUGAR

Method	Trial 1	Trial 2	Standard Weight*
1			
2			
3			

*Light brown sugar, packed: 1/4 cup = 50 g; dark brown sugar, packed: 1/4 cup = 50 g; granulated sugar: 1/4 cup = 50 g.
Source: *Handbook of Food Preparation: Food and Nutrition Section*, 9th edition, 1993, American Home Economics Association, p. 195.

QUESTION

1. How does the method for measuring brown sugar differ from that of measuring granulated sugar?

C. LIQUID

1. Method 1

a. Fill a liquid measuring cup with water to 1/4 cup mark.
b. Place a cup on a level surface and position yourself at eye level with the water before attempting to read the water level (Fig. 1.2).
c. Transfer all the water from the measuring cup to a 100-mL graduated cylinder and read the volume in milliliters.
d. Record the volume in Table 1.3 and repeat.
e. Repeat Steps a through d, but use milk.

2. **Method 2**

a. Fill a 1/4 cup dry measure with water.
b. Place measure on a level surface and position yourself at eye level with the water before reading the water level.
c. Transfer all the water from the cup to a 100-mL graduated cylinder and read the volume in milliliters.
d. Record the volume in Table 1.3 and repeat.

Table 1.3 EVALUATION OF LIQUID MEASUREMENTS

Method of Measurement	Trial 1	Trial 2	Standard Volume*
1			
2			

*1 cup liquid measure = 236 mL; 1/4 cup liquid measure = 59 mL.
Source: *Handbook of Food Preparation: Food and Nutrition Section*, 9th edition, 1993, American Home Economics Association, p. 180.

QUESTIONS

1. Was there a visual difference between the water and milk when they were measured, and why?

2. What is the error that occurs when using a dry measure for measuring liquids?

D. FATS

1. **Method 1**

a. Fill a 1/4 cup dry measure with a solid fat.
b. Using a rubber spatula, press fat into the cup making sure there are no air pockets.
c. Level off with a straight-edged spatula.
d. Carefully, remove fat from cup with a rubber spatula and weigh.
e. Record weight in Table 1.4 and repeat.

2. **Method 2**

a. Melt solid fat in a saucepan over **low heat**.
b. Take a 1 cup liquid measuring cup and pour melted fat up to the 1/4 cup measure mark.
c. Weigh and record the weight in Table 1.4 and repeat.

Table 1.4 EVALUATION OF THE WEIGHT OF 1/4 CUP HYDROGENATED FAT

Method	Trial 1	Trial 2	Standard Measure*
1			
2			

*Hydrogenated shortening, solid: 1/4 cup = 46 g.
Source: *Handbook of Food Preparation: Food and Nutrition Section*, 9th edition, 1993, American Home Economics Association, p. 175.

QUESTIONS

1. What precautions should you take for measuring fats?

2. Account for the differences in weight of the fats.

3. Why is it important to allow fats, such as butter and margarine, to come to room temperature before measuring and mixing?

III. WATER AND THERMOMETRY

1. Most of the changes brought about by foods by cooking take place in a watery medium (moist heat).
2. Water absorbs heat from the hot unit through the cooking utensil and transfers this heat to the food.
3. When water boils, convection heating currents surround the food; therefore, even and quick cooking of the food occurs.
4. Water sets its limit to how hot it gets (100°C or 212°F), while fat can go to higher extremities.
5. The intensity of the heat is measured by a thermometer (either in °F or °C).

A. FACTS ON USING A THERMOMETER

1. The bulb must be completely covered with hot liquid.
2. The bulb should not touch the sides or bottom of the utensil.
3. There are 100° between the boiling point and the freezing point of water on the centigrade scale.
4. There are 180° between the boiling point and the freezing point of water on the Fahrenheit scale.
5. Therefore,
   a. $1°C = 1.8°F$
   b. $°C = (°F - 32) \div 1.8$
   c. $°F = (°C \times 1.8) + 32$

B. LEARN TO RECOGNIZE COMMONLY USED TEMPERATURES

Heat water to each temperature specified in Table 1.5 and note its appearance.

Table 1.5 EVALUATION OF COMMONLY USED TEMPERATURES

Term	Description	°F	°C
Room		77.0	25
Lukewarm		98.6	37
Scalding*		149.0	65
Simmering		185.0	85
Boil slowly		212.0	100
Boil rapidly		212.0	100

*The temperature varies with material being scalded.

QUESTIONS

1. Explain what happens when water boils.

2. Name some instances when scalding temperature is used in food preparation.

3. What happens when salt is added to boiling water? If sugar is added?

C. DETERMINING THE ACCURACY OF LABORATORY OVENS

1. Take an oven thermometer and calibrate your ovens. Place the rack in the middle of the oven. Use 350°F as a standard to go by.
2. Record oven temperature: ____

QUESTIONS

1. Why is it important that the temperature of the oven be exact?

2. In what position would you place the oven rack to cook food in a conventional oven for:

   a. a two-layer cake?

   b. a tube cake pan?

   c. a cookie sheet pan?

   d. a roasted whole turkey?

3. What is a convection oven? What temperature adjustment is made when using such an oven? Is the rack adjustment the same for the products mentioned in Question 2 for the convection oven?

IV. APPLICATION OF MEASURING TECHNIQUES: COOKIES

OBJECTIVES

1. To practice proper measuring techniques involving dry and liquid measuring.
2. To familiarize the student with reading a recipe and becoming acquainted with certain culinary terms.

A. CHOCOLATE CHIP COOKIES

1/3 cup shortening
1/4 cup granulated sugar
1/4 cup light brown sugar, packed
1 large egg
1/4 teaspoon vanilla extract
3/4 cup + 1 tablespoon all-purpose flour
1/4 teaspoon baking soda
1/4 teaspoon salt
3 oz. semisweet chocolate chips

1. Preheat oven to 375°F. Make sure oven rack is in the middle position.
2. **Sift** together flour, salt, and baking soda; set aside.
3. In a medium-sized bowl, **cream** together shortening, granulated sugar, brown sugar, egg, and vanilla for 2 minutes.
4. Add flour mixture to creamed mixture; **mix** only until flour is combined.
5. **Stir** in chocolate chips. Chill dough in freezer for 5–10 minutes. (This helps the dough from not overspreading during baking.)
6. Drop dough by rounded teaspoonfuls about 2 inches apart onto ungreased baking sheet.
7. Bake for 8–10 minutes, or until edges start to brown slightly. Remove pan from oven, and allow cookies to cool for 2 minutes on the pan.
8. With a spatula remove cookies from pan and place on a wire rack to cool.

B. CHOCOLATE CHIP COOKIES (LOWER-FAT VERSION)

1/2 cup granulated sugar minus 1 tablespoon
1/4 cup light brown sugar, packed
1/4 cup butter or margarine at room temperature
1 teaspoon vanilla
1 egg white
1 cup + 2 tablespoons all-purpose flour
1/2 teaspoon baking soda
1/4 teaspoon salt
1/4 cup miniature semisweet chocolate chips

1. Preheat oven to 375°F. Make sure that the rack is on the middle position in the oven.
2. Sift together, flour, salt, and baking soda; set aside.
3. In a medium-sized bowl, **cream** together butter, granulated and brown sugar, egg white, and vanilla for 2 minutes.
4. Stir in flour mixture until just combined. Stir in chocolate chips. Chill dough for 5–10 minutes in the freezer.
5. Drop dough by rounded teaspoonfuls about 2 inches apart onto an ungreased baking sheet.
6. Bake for 8–10 minutes, or until edges are lightly brown.
7. Remove pan from oven and allow cookies to cool for 2–3 minutes before removing with a spatula to a cooling rack.

C. OATMEAL COOKIES (BASIC RECIPE)

1/2 cup all-purpose flour
1/2 teaspoon baking powder
1/4 teaspoon salt
3/4 teaspoon cinnamon
1/4 cup + 3 tablespoons milk
1/4 cup + 2 tablespoons shortening
1/2 cup light brown sugar, packed
1 large egg
1 1/2 cups quick cooking oatmeal
1/4 cup chopped walnuts or pecans
1/4 cup sweetened coconut
1/4 cup chopped raisins or dates

1. Adjust the rack to the middle of the oven. Preheat oven to 375°F.
2. Sift together flour, baking powder, salt, and cinnamon into a medium-sized bowl.
3. Add shortening, brown sugar, milk, and egg to flour mixture and beat until smooth.
4. Add oatmeal and mix thoroughly.
5. Add walnuts, coconut, and raisins and mix until combined.
6. Drop dough by teaspoonfuls onto a greased cookie sheet.
7. Bake for 12–15 minutes. When cookies appear dry and the edges are light brown, remove them from oven. Cool slightly and then remove cookies from the sheet onto a cooling rack.

D. OATMEAL SPICE COOKIES (LOW-FAT VERSION)

2 1/4 cups quick cooking oatmeal
2 tablespoons orange juice
1 cup all-purpose flour
1/2 teaspoon baking soda
1/2 teaspoon baking powder
1/4 teaspoon salt
1/4 teaspoon cinnamon
1/8 teaspoon cloves
1/8 teaspoon nutmeg
3 tablespoons margarine or butter, softened
3 tablespoons canola oil
3/4 cup dark brown sugar, packed
1 tablespoon molasses
1 large egg white
2 teaspoons vanilla extract
2 tablespoons granulated sugar—for shaping cookies

1. Preheat oven to 350°F. Spray two baking sheets with vegetable spray; set aside. Adjust racks in the oven to be one at the top and the other at the bottom.
2. Stir together oats and orange juice in a medium-sized bowl; set aside.
3. Sift together flour, baking soda, baking powder, salt, cinnamon, cloves, and nutmeg onto a sheet of wax paper; set aside.
4. In a large mixing bowl, with mixer at medium speed, beat margarine and oil until well blended and smooth.
5. Add brown sugar, molasses, egg white, and vanilla and beat until smooth and fluffy.
6. Blend in flour mixture.
7. Using a wooden spoon, mix in oatmeal mixture until thoroughly incorporated.
8. Shape dough into 1 inch balls, and place 3 inches apart onto baking sheets. Flatten cookies using the bottom of a glass that has been lightly greased and dipped in the 2 tablespoons of granulated sugar. Dip the glass in sugar each time after flattening each cookie.
9. Place pan in preheated oven. After 4 minutes, change the position of the baking sheets and bake cookies for another 4–5 minutes.
10. Let cookies stand on sheets for 3–4 minutes. Using a spatula, transfer cookies to cooling racks and let stand until completely cooled.

E. SNICKERDOODLES

1 3/4 cups all-purpose flour
1/2 teaspoon baking soda
1/2 teaspoon cream of tartar
1/4 teaspoon salt
1 cup minus 1 tablespoon granulated sugar
1/4 cup butter, softened
1 tablespoon light corn syrup
1 1/2 teaspoons vanilla extract
1 large egg
2 tablespoons granulated sugar
1 1/2 teaspoons cinnamon

1. Preheat oven to 375°F. Adjust racks one at the top of oven, the other at the bottom. Spray two baking sheets with cooking spray; set aside.
2. Sift together flour, baking soda, cream of tartar and salt; set aside.
3. Combine sugar (1 cup minus 1 tablespoon) and butter in a large mixing bowl, and beat with a mixer at medium speed until well blended. Add corn syrup, vanilla, and egg; beat well. Gradually, add flour mixture (in three additions) to sugar mixture, beating just until combined. Cover and chill for 10 minutes.
4. Combine 2 tablespoons sugar and cinnamon, and blend well in a small dish.
5. Shape dough into 30 balls. Roll balls in sugar mixture. Place balls 2 inches apart onto baking sheets. Flatten balls with bottom of glass. Bake cookies for 4 minutes; then rotate pans by changing their positions in the oven and bake for another 4 or 5 minutes (cookies will be slightly soft). Cool cookies on baking sheets for 2 minutes. Remove cookies from pans and place on wire cooling racks.

F. BROWNIES

2 oz. unsweetened chocolate
1/3 cup shortening
1 cup granulated sugar
3/4 teaspoon instant coffee granules
2 large eggs
1/2 teaspoon vanilla extract
1/2 cup + 2 tablespoons all-purpose flour
1/2 teaspoon salt
1/2 cup semisweet chocolate chips
1/2 cup walnuts, chopped (optional)

1. Preheat oven to 350°F. Make sure that the rack is in the middle position.
2. Grease an 8 × 8 × 2 cubic inch pan.
3. Melt chocolate and shortening in a 2-quart saucepan over **low heat**. Stir constantly with a wooden spoon. As soon as the mixture has melted, remove it from heat and cool.
4. Mix in sugar, eggs, instant coffee granules, and vanilla.
5. Stir in remaining ingredients. Spread in pan.
6. Bake for 30 minutes or until brownies start to pull away from the sides of the pan (if using a toothpick to test for doneness, the toothpick should have some moist crumb attached to it when removed). **Do not overbake or the brownies will be dry**.
7. Cool slightly. Cut into bars 2 × 1½ inches. Place bars on cooling racks.

GENERAL QUESTIONS

1. How should brown sugar and solid fat be measured? Explain why these ingredients must be measured in this way.

2. What does it mean to "cream?"

3. Why should the oven rack be in the middle position when baking the cookies? Why were the cookies (low-fat oatmeal and snickerdoodles) rotated in the oven mid-way during their baking?

4. If a glass baking dish was used for making the brownies, what change in the baking temperature would there be?

5. It is assumed that a conventional oven is used for the recipes in this unit. What changes in temperature and time would there be if a convection oven was used? How should rack position be addressed in the convection oven?

6. Why were the cookies placed on cooling racks?

7. How important is exact oven temperature to baking quality?

LABORATORY 2

Food Preservation: Canning and Freezing

Laboratory 2
Food Preservation: Canning and Freezing

The foods we eat should be wholesome, nutritious, and safe. This laboratory exercise will demonstrate to the student how to extend the shelf life of food by using extremes in temperatures, heat (canning), and cold (freezing).

VOCABULARY

antioxidant
blanch
boiling water bath
freezer burn
headspace
high acid food
low acid food
polyphenoloxidase
pressure canner process
sterilization
turgor
venting

OBJECTIVES

1. To examine the effect of extremities in temperature (heat versus cold) in extending the shelf life of food.
2. To demonstrate and observe the differences between raw pack and hot pack.
3. To demonstrate and discuss the differences between the boiling water bath process and the pressure canner process.
4. To prepare jellies, jams, conserves, and pickles as a form of preserving fruits and vegetables.
5. To define and demonstrate the differences between freezing fruits and vegetables as a simple method of preservation.

PRINCIPLES

1. **Time** and **temperature** are very important factors when canning. These two factors ensure that the product will be free of microorganisms and at the same time be sterile for a long shelf life without refrigeration.
2. The canning process (heat treatment) to be used is determined by the pH of the food:
   a. *High acid foods* (pH $<$ 4.6) (fruits, pickles, jams, jellies, and some tomato products) are processed by the **boiling water bath** (212°F).
   b. *Low acid foods* (pH $\geq$ 4.6) (vegetables, poultry, meat, milk, fish, soups, etc.) are processed by the **pressure canner process** (240°F, at 10 pounds pressure).
3. Food for canning can be packed by either **raw pack** or **hot pack**. The pH of the food does not dictate how the food would be packed in the jar. Raw pack guarantees more food identity, but more food will fit into the jar by the hot pack method.
4. Foods (pH $\geq$ 4.6) processed under pressure must be done to insure the destruction of *Clostridium botulinum.*
5. Pickling of food involves vinegar (acid) and salt, whereby, the **boiling water bath method** will suffice in lowering the microbial load.
6. When canning food, the **time of processing** is dependent on size of the jar (large versus small); type of jar (glass versus metal); type of food (hard versus soft); type of packing (raw versus hot).
7. Jellies are made by a balanced formulation of fruit, pectin, acid, and sugar.
8. Enzymes are responsible for the darkening of sliced fruits and vegetables. Pretreatment of fruits and vegetables prior to freezing is necessary because freezing only **slows down** the enzyme but **does not destroy** the enzyme.
9. Fruits, because of their texture, cannot be blanched but are treated with an antioxidant prior to freezing.
10. Vegetables are blanched prior to freezing in order to inhibit enzyme action.
11. Containers in which fruits or vegetables are stored during freezing must be tightly sealed in order to prevent freezer burn (sublimation).

I. OBSERVE AND LEARN HOW TO USE UTENSILS AND EQUIPMENT COMMONLY USED IN CANNING

A. JARS AND THEIR CLOSURES

1. Check for and discard any glass jars with cracks or chips and any rings with dents or rust; these defects prevent any airtight seals.

2. Wash jars in **hot soapy water** and **rinse well** (jars and rings are reusable); place jars upside down on a clean cotton towel and do not invert them until you are ready to fill the jar.
3. Place lids in a pan of water; bring to a boil. Remove from heat and leave in hot water until ready to use. This softens the rubber on the lid and provides for an airtight seal.

Label each lid:
Food, Pack (if applicable), and Process
Date canned
Laboratory day and time
Kitchen#

B. METHODS OF PACKING

1. *Raw Pack*: Uncooked food is placed into jars. The food is then covered with boiling liquid, leaving headspace recommended (Fig. 2.1).
2. *Hot Pack*: Food is heated in syrup, water, steam, or extracted juice. The food is packed in jars and covered with boiling liquid, leaving headspace recommended.

FIG. 2.1: Headspace prevents loss of liquid and effects seal in vacuum-type closures.

C. PROCESSING EQUIPMENT

1. *Water Bath*: Select a deep pot with a lid. There should be a rack on the bottom of the pot so that the jars can rest on during processing. There should be enough water in the pot, so when the jars are placed in the pot the water should be 2–3 inches above the jars. The water should be boiling when the jars are added to the pot. As soon as the jars are added the water will stop boiling. Start timing when the water starts to boil.
2. *Pressure Canner* : Put water in the canner to a depth of 2–3 inches (**source of steam for processing**). Place jars on rack in canner. Fasten lid securely. Open the pet cock and place the canner on the heat. When steam starts to escape in a steady stream, start timing for 7–10 minutes. Close the pet cock and allow the pressure to build. Most foods at pH $\geq$ 4.6 are processed at 240°F at 10 pounds pressure. As soon as gauge registers this value, start timing and hold at 240°F for the allotted time. **In order to hold the pressure constant this is achieved by controlling the heat to the canner**. At the end of the processing time, turn off the heat and allow the gauge to return to zero before opening canner and removing jars.