Food Preparation Lab Manual for FSHN 1150

Food Preparation Lab Manual for FSHN 1150

By Iowa State University Department of Food Science and Human Nutrition, edited by Erica Beirman and Kate Gilbert

Iowa State University Digital Press
Ames, Iowa

This book is published by

Iowa State University Digital Press
701 Morrill Rd, Ames, Iowa 50011, United States

www.iastatedigitalpress.com

DOI: https://doi.org/10.31274/isudp.2025.196

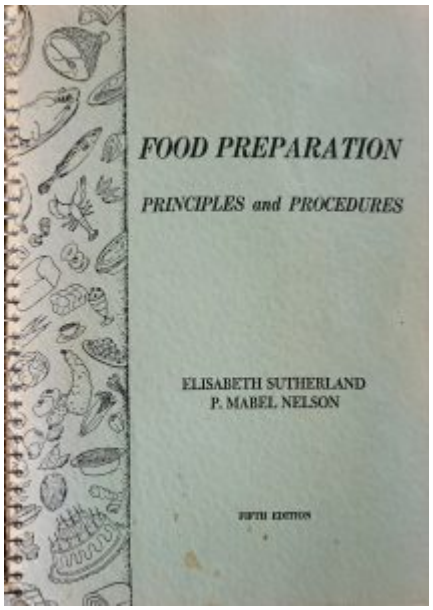
Iowa State University is located on the ancestral lands and territory of the Baxoje (bah-kho-dzhe), or Ioway Nation. The United States obtained the land from the Meskwaki and Sauk nations in the Treaty of 1842. We wish to recognize our obligations to this land and to the people who took care of it, as well as to the 17,000 Native people who live in Iowa today.

Contents

Introduction

Manual History

A version of this manual has been around longer than we know. Shown to the right is a version from 1968, and it was the fifth edition. Recipes, charts, and questions have been added or removed over time, but much of the same content still exists in the lab manual. It is exciting to present a new version while noting the history and precedent of the lab manual and food labs taught in MacKay Hall over many, many years.



A Lab Manual from 1968

Recipe Use

Recipes were chosen for this laboratory manual to illustrate the principles of food preparation and food science. While most of the recipes produce a standard product, some are not designed for general use. For example, cream pie filling recipes are designed to set within a three-hour laboratory period and may be too stiff if allowed to stand longer. In some cases, the ingredient proportions and time/temperature of heating or cooling depend upon the recipe's size, and results will not be satisfactory if the recipe is scaled up.

Ingredients

- Margarine may be substituted for butter in recipes unless the recipe specifies otherwise.
- Bottled lemon juice may be used in all recipes unless a recipe specifies fresh juice.
- Dried herbs will be used more frequently than fresh herbs.
- Broth, stock, or bouillon may be substituted for each other as needed.

1. Laboratory Equipment and Procedures

1.1 Laboratory Procedures

Attire

- Lab coats or chef coats are required. Lab coats may be purchased at the University Bookstore, at Chemistry Stores in Gilman Hall, or online.
- Hair must be covered with a hairnet; no caps will be allowed in the laboratory.
- All students must wear enclosed shoes while in the food preparation laboratory.
- Jewelry should be limited to small rings, earrings, and watches.
- Coats, backpacks, and other belongings not required in the laboratory should be left in the lockers provided in the hall outside the lab.

Come to work with clean clothes. Wear a clean lab coat and hairnet (will reuse from one lab to the next).

Housekeeping Duties

Unit Duties: Units must be kept clean, orderly, and completely equipped. Individuals or groups are responsible for leaving units clean at the end of class.

Care of cooking and serving utensils

- Rinse or soak utensils immediately after use. Wash all dishes with hot soapy water, changing the water as often as necessary. Use extra care with starchy, sugary, and greasy dishes.
- For your own safety, DO NOT put sharp knives to soak in dishwater. Rinse dishes with hot water, dry them, and replace them in units where they were found.

Care of ranges

- Wipe range tops and fronts. Clean any oven spills.
- Check to see that the oven and surface burners are turned off at the end of class.

Care of sinks, cabinets, and countertops

- Sinks and countertops must be washed and sanitized at the end of the lab period.
- Replace non-unit equipment and utensils in the appropriate place.
- At the end of class, towels, and dishcloths should be hung to dry on the racks provided.

General Laboratory Duties

The following duties are the responsibility of all students to maintain the orderly operation of the laboratory.

- Be responsible for the general orderly appearance of the laboratory.
- After evaluation, remove the display paper and clean the display area.
- Return perishable food to the refrigerator in proper storage containers.
- Wash empty containers and return them to the food cart.
- See that all dishes are taken after evaluation.
- Wash special equipment used by the instructor for demonstration, evaluation, or sampling.
- Be sure cupboard doors and drawers are closed at the end of class.
- Empty garbage bowls and wastebaskets.

Sanitation

Washing Hands

1. Wet hands with warm, running water.
2. Add soap and rub hands together to make a soapy lather for at least 20 seconds.
3. Rinse hands and forearms thoroughly under warm, running water.
4. Dry hands thoroughly with a clean paper towel.

Wash your hands before you begin food preparation and as many times throughout food preparation as needed (returning from the bathroom, handling raw food, cleaning a spill on the floor, etc).

Washing Dishes

1. Discard food into the garbage bowl or trash.
2. Fill the sink with hot soapy water. Scrub dishes with a dishcloth in the sink.
3. Rinse dishes with hot water.
4. Stack clean, rinsed dishes in the dish drying rack.
5. Dry dishes thoroughly with a clean dishtowel.

Handling Food

1. Refrigerate foods at less than 40°F. Heat foods to at least 165°F.
2. Do not allow food to sit at room temperature for more than 2 hours.
3. Use a serving spoon for serving and your own utensils for tasting.
4. Wrap leftover foods in plastic wrap or foil, or place them in a plastic container with a tight-fitting lid.

1.2 Measurement Techniques

Objectives

- **Observe and demonstrate the ability to use standard measurement techniques, which are necessary to obtain accurate proportions of ingredients and consistent food products.**

Temperatures and Measurements

Most recipes in this manual are designed for common household utensils and appliances. Because of that, most measurements are common household measurements. The Celsius scale is used for all temperatures except oven temperatures, which are in Fahrenheit.

In order to convert temperature from one scale to another, use the following formulas:

°C = (°F − 32) ÷ 1.8

°F = (°C × 1.8) + 32

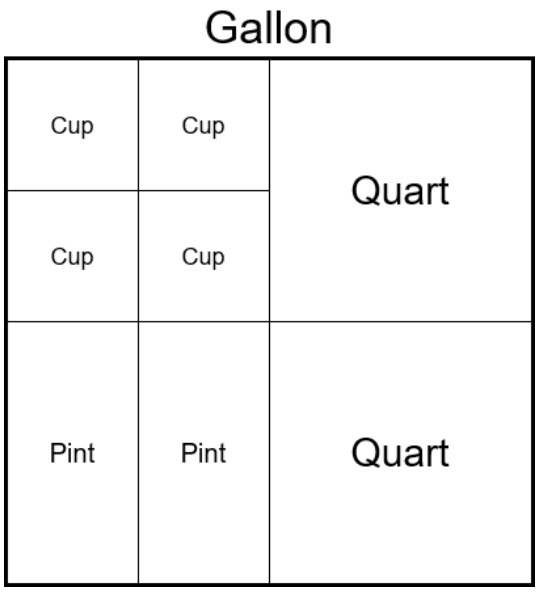
Measurement Equivalents

It will be helpful to know measurement equivalents in the lab. This will be beneficial if recipes need to be scaled smaller or larger. Understanding equivalents will also give you an idea of the proportions of ingredients in recipes. Equivalents with abbreviations used in the laboratory manual:

- 3 teaspoons (tsp.) = 1 Tablespoon
- 16 Tablespoons (tbsp.) = 1 cup
- 2 cups = 1 pint (pt.)
- 2 pints = 1 quart (qt.)
- 4 quarts = 1 gallon (gal.)
- 1 large egg = ~¼ cup = 4 tbsp.
- 1 cup = 8 fluid ounces (fl. oz.)
- 1 pound (lb.) = 16 ounces (oz.) = 454 grams (g.)

Some products must be packed or weighed to attain the correct measurement.

- 1 cup grated cheese = 4 oz. = 114 g.



There are 4 quarts in a gallon, two pints in a quart, and 2 cups in a pint.

FROM:

TO↓	Tbsp	ounce	cup	pint	quart	gallon
tsp	3	6	48	96	192	768
Tbsp		2	16	32	64	256
ounce			8	16	32	128
cup				2	4	16
pint					2	8
quart						4

How to use: 3 teaspoons equal a tablespoon, 6 teaspoons equals one fluid ounce, 48 teaspoons equals a cup, etc.

Measurement Techniques

1. Calculate the amount of each ingredient needed to make one-third of the original recipe's amount.
2. List the appropriate utensils for measuring these ingredients, using the minimum number of measurements.

Coffee Cake

Ingredients	1/3 Recipe	Measuring Utensils
Topping:		
2 tbsp. brown sugar		
¾ tsp. cinnamon		
1½ tsp. flour		
1½ tsp. butter		
Batter:		
1 cup + 2 Tbsp. sifted flour		
1½ tsp. baking powder		
⅜ tsp. salt		
½ cup sugar		
1 egg, beaten		
½ cup milk		
2 tbsp. vegetable oil		

Heat oven to 375ºF. Blend topping ingredients together until they crumble. Set topping aside. Sift flour, baking powder, salt, and sugar into a mixing bowl. Make a well in the center. Combine egg, milk, and oil. Add liquid to dry ingredients, stirring only to blend. Spoon into a greased 7¾ × 3⅝-inch loaf pan and sprinkle with topping. Bake at 375ºF. for about 25 minutes or until the cake springs back when pressed lightly with a finger.

1.3 Lab Scavenger Hunt

Objectives

- **Get familiar with the lab units and equipment**

Find items 1–12 listed below in your lab unit and place them on your counter. When you have located all of the items, let the instructor or TA know.

1. Vegetable Peeler
2. Pastry Blender
3. Broiler Pan
4. 1 Pint Baking Dish
5. Water Bath
6. Cutting Board
7. Custard Cup
8. Double Boiler
9. Mesh Strainer
10. Saucepan
11. Sauté pan
12. Loaf pan (5½" × 2¾")

Bonus Items (not in your lab station)	Location in lab
13. Towel drying rack	
14. Scales	
15. Extra mixing bowls	
16. Plates and cups for sampling prepared food	

1.4 Lab Equipment & Measurement Techniques Conclusion

1. Why should the fewest measurements be used when making a recipe?

2. Why is flour sifted before measuring for volume measurement?

3. Why should liquid and dry ingredients be measured in different types of cups?

4. How is brown sugar measured? Why?

5. How do you find out where equipment is stored in the lab?

6. Why is it important to use the right equipment when following recipes?

1.5 Water: Temperature and Heating Equipment

Objectives

- **Relate descriptive temperature terms to the observable changes in water at various temperatures.**
- **Compare heating equipment and determine the best uses for each.**

Commonly used water temperatures in an open (regular) saucepan

Lukewarm temperature (30–37°C; _____ °F)

1. Does lukewarm water feel warm or cool to the touch?

2. What is normal body temperature?

   _____°C; _____°F.

Simmering temperature (85–99°C; ____°F)

1. Describe the surface appearance of simmering water:

Boiling temperature (100°C; _____°F)

1. Describe the surface appearance of water at… a **slow** boil:

2. …a **rapid** (rolling or fast) boil:

Fast or Slow Boil

1. What are the advantages of cooking foods at a slow boil rather than a fast boil?

2. What are the advantages of cooking foods at a fast boil rather than a slow boil?

3. When might water boil at less than 100°C; or more than 100°C?

Double Boiler

1. What happens if there is too much water in the bottom of the double boiler?

2. List appropriate uses for a double boiler:

Steamer

1. How would the rate at which foods cook in a steamer compare to the rate in a saucepan? Explain.

2. List appropriate uses for a steamer:

Pressure Saucepan or Cooker

1. At what temperature does water boil under:
    - **5 lbs. pressure?** _____109°C; _____°F.
    - **10 lbs. pressure?** _____°C; _____240°F.
    - **15 lbs. pressure?** _____121°C; _____°F.

2. How would the rate at which foods cook in a pressure saucepan compare to the rate at which they cook in a regular saucepan? Explain.

3. Temperature decreases by 1°C for each 960-foot increase in altitude. At what temperature would water boil in Denver, Colorado (altitude approximately 5,000 feet above sea level)?

   _____°C; _____°F.

4. List appropriate uses for a pressure saucepan.

1.6 Sensory Attributes Activity

How to Describe the Sensory Attributes of Foods

As a part of this lab activity, you will be asked to describe the attributes of a food product accurately and completely. The task is to describe the food, not your reaction to the food. For example, a chocolate pudding might be medium brown, smooth and shiny, thick but not gelled, and have a flavor that includes sweet, chocolate, and vanilla components. To make these kinds of descriptions, you will need to learn to go past your first reaction ("I like it!" or "I don't like it!") and notice specific details about the food itself.

We usually notice the attributes of foods in the following order:

1. Appearance
2. Odor/Aroma
3. Consistency and Texture
4. Flavor

When we eat food, we often do not try to separate these sensations; we naturally form an overall opinion about how much we like or dislike the product based on all of its attributes. With practice, however, we can learn to be more analytical about identifying and describing the sensory attributes of foods. To best describe the sensory attributes of foods, try the following approach:

1. Appearance

Look at the food and describe all of the following that apply (not all of the attributes listed will apply to every food, and for some foods, you will need to come up with additional terms).

Color Description

- Is it red, orange, brown, yellow-green, etc.?
- The intensity of color: Is it light, medium, or dark?
- Brightness: Is it bright or dull?
- Evenness of color: Is the color even, or is it uneven or blotchy?

Size and shape of the pieces or particles

- Are the pieces or particles relatively small, medium, or large? Square, round, flat, etc?
- Evenness of distribution: Are the particles within the food uniformly or non-uniformly distributed?

Surface Texture

- Is it dull or shiny; smooth or rough, grainy, curdled or bumpy; plump or shriveled:
  Does it look wet or dry, soft or hard; if made up of particles, are they loose or clumped?

Clarity

- Is it clear or hazy or cloudy, transparent, translucent, or opaque? Are particles or bubbles evident?

2. Odor or Aroma

Sniff the food a few times to detect the odor or aroma. The odor is caused by volatiles that reaches the olfactory receptors high up in the nasal cavity. There are thousands of possible descriptors for food aromas. Sometimes we call the specific aromas "notes." For example, a cookie might have a toasted wheat note or a caramelized note, a buttery note, and a vanilla note.

3. Consistency and Texture

When we manipulate food with our hands or utensils and bite and chew it, we can judge how the food reacts to stress. As you sample your product, see if the following apply (you may also need other terms).

- Is the product thin or thick?
- Is it soft, firm, or hard?
- Is it airy, or is it dense or heavy?
- Is the product springy or rubbery?
- Is the product slippery or slimy?
- Is the product sticky?
- Is the product brittle or crumbly?

When we eat food, we can also perceive the size and shape of particles in food through our sense of touch. And we can also note aspects that relate to the release of fat and moisture. Does your product have some of the following attributes?

- Smoothness (absence of particles)
- Grittiness (has small, hard particles)
- Graininess (has small particles)
- Chalkiness (imparts a film of fine particles or is powdery)

- Flakiness (breaks into flat overlapping layers)
- Fibrousness (has long, stringy particles)
- Lumpiness (has large, even particles)
- Juiciness (releases moisture as you chew; feels wet in your mouth)
- Oiliness (leaves an oily residue in your mouth)
- Greasiness (leaves a more solid greasy residue in your mouth)

4. Flavor

Flavor is the impression we get from the chemicals in the food that are released when we are eating. Flavor consists of 1) tastes, 2) aromatics, and 3) other sensations due to the stimulation of nerves in our mouth and nasal cavity.

Tastes are caused by water-soluble materials that reach the taste receptors on our tongue and other mouth surfaces. Tastes are limited in number and include:

- Sweet
- Sour
- Salty
- Bitter
- Umami

Aromatics include notes like lemon, butter, rancid, burnt, cheesy, cinnamon, meaty, and thousands more such sensations. When we chew a product, it seems like these flavor notes are coming from our mouth, but the volatile molecules being released from the food travel to the olfactory receptors when air is forced up and over them. The aromatics are responsible for much of the flavor impact of most foods.

Chemical Feeling Factors: Some chemicals in foods cause sensations that are not taste or smell but are important to flavor in some foods. These include:

- Astringency (a sensation of dryness or puckering in the mouth)
- Heat (from spices)
- Cooling (from menthol)
- Biting (for example, from highly carbonated beverages)
- Pungency (for example, from horseradish)

Try to name all of the tastes, flavor aromatics, and chemical feeling factors that you can identify in your product.

5. Noise

Some foods make noise when we eat them. These noises contribute to perceptions such as:

- Crispiness
- Crunchiness
- Squeakiness

Sensory Evaluation

Food _____

Appearance (sight)	
Odor/Aroma (smell)	
Texture/Consistency (touch)	
Flavor (taste)	
Noise (sounds you hear while chewing)	
Other observations/ comments:	

2. Varietal Differences

2.1 Introduction to Varietal Differences

Before You Come to Lab

Name: _____

Watch “The Science Behind Potatoes and Why the Type Matters | Mashed Potatoes | What’s Eating Dan?” video posted on Canvas.

1. What potato type has the most starch?

2. What potato type has the least starch?

3. Which type of potato works best for mashed potatoes?

Varietal Difference Definition: Each fruit and vegetable has numerous types grown, and many of these types or varietals can be found in the grocery store.

Importance: Understanding the characteristics of each of these types or varieties will make it easier to know what to purchase for what purpose. Sometimes, a variety is chosen because of flavor/texture/appearance preferences, and sometimes, a variety is chosen because it will perform the best in a recipe like apple pie or mashed potatoes.

Potatoes (Three Types with Varieties Used in Lab)

- **Mealy**: glistening appearance; granular dry feeling on tongue; best choice for baked, mashed, or French fries. (Russet Burbank)
- **All Purpose**: intermediate between waxy and mealy. (Yukon Gold, Klondike Yellow)
- **Waxy**: translucent appearance; feels pasty and wet on the tongue; best choice for boiled potatoes and potato salad. (Red Pontiac)

The mealiness of potatoes is dependent on the following:

- **Variety** (Russet varieties are mealy; red-skinned varieties are waxy)
- **Growing conditions** (soil, climate, fertilizer)
- **Storage time** (new potatoes tend to be waxy)
- **Storage temperature** (above 50°F, sugar → starch; below 50°F, starch → sugar)

Apples (Varieties Selected for Lab)

- **Red Delicious**: best eaten raw; loses mild, delicate flavor and remains firm when cooked.

  Uses: Fruit Baskets, Field Trip Sack Lunches

- **Granny Smith**: tart, crisp apple, breaks down easily, making it a good applesauce apple.

  Uses: Applesauce, caramel apples

- **Golden Delicious**: has distinct fresh flavor; retains flavor and shape when cooked.

  Uses: Baked in pie, crisps, etc.

- **Gala**: crisp, very sweet, juicy; best fresh, loses flavor when cooked.

  Uses: Fruit salads, Raw/Fresh

- **Honeycrisp**: crisp, sweet, tart, juicy, and full of flavor; a great all-purpose apple, but due to its cost, it is more commonly eaten raw/fresh.

  Uses: Raw/Fresh

- **Pink Lady/Cripps Pink**: sweet & tart (has high sugars and high acids) with a crisp bite and effervescent finish. It has a bright white flesh that is slow to brown. This apple is also one of the main varieties used for pre-packaged apple slices.

  Uses: Raw/Fresh

Varietal Differences in Additional Fruits and Vegetables

Peaches

- **Cling**: fruit adheres to pit; firm flesh; generally used for canning or other commercial purposes; may be more orange in color.
- **Freestone**: fruit falls easily away from pit or stone; soft, juicy flesh; may be more yellow-colored.

Oranges

- **Navel**: marketed November to late May; no seeds; less juice than Valencias have; pebbled skin; *separates into sections* easily.
- **Valencia**: marketed late March to early October; has seeds; *more juice* than navels have; skin may have a greenish tinge.

Onions

- **Dry Onions**:
  - storage onion: large bulb; white, yellow or red; harvested in late summer; strong flavor; store 10-12 months
  - sweet onion: large bulb; white, yellow or red; “short day”; sweet & mild; store 1-2 months; varieties: Vidalia, Walla Walla, Maui; Texas Super Sweet
- **Green Onion (Scallion)**: immature onion with little or no bulb; mild.
- **Shallot**: mild onion-like bulb, divided into cloves.

Sweet Potatoes

- **Dry-meated**: mealy, yellow-to-tan flesh.
- **Moist-meated**: soft, tan-to-brownish red flesh. (Often called yams; however, true yams are of a different genus.)

2.2 Osmosis and Enzymatic Browning

Objectives

- **Observe osmosis.**
- **Understand how osmosis can be used to move water in and out of raw fruits and vegetables.**
- **Observe enzymatic browning.**
- **Identify some methods of controlling enzymatic browning.**

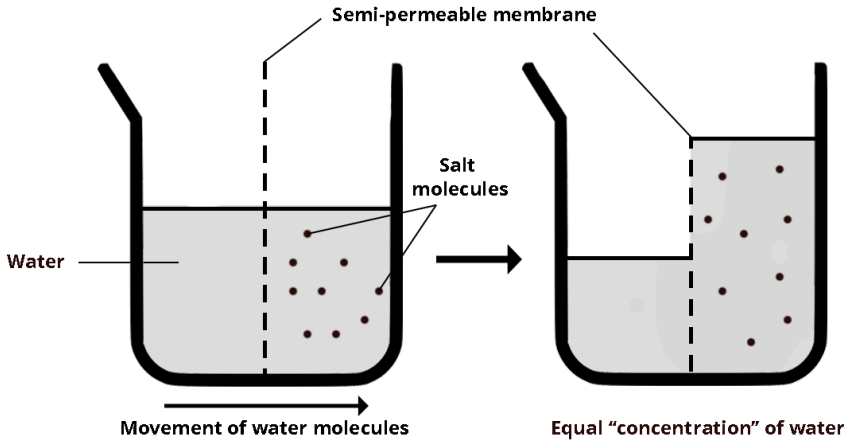
Osmosis

Definition: Water moves across a semipermeable membrane in response to solute concentration. Osmosis is important when considering fruit and vegetable cell membranes.

Cell membranes are semipermeable, which:

- Allows water to pass in and out of cells
- Blocks passage of dissolved solutes

This means water will move across the cell membrane to try to even out concentrations. **Cells full of water = crisp fruits and vegetables.**



Water will move from areas of high concentration (greater amount of free water) to areas of low concentration (areas where there is more water bound to solutes.)

Importance in food quality: Osmosis may lead to a soggy, not crisp texture in fruits and vegetables

Give an example of osmosis in a food product:

Observe the effect of salt on the appearance and texture of cucumbers

Method	Appearance	Texture
Soak in 1 cup of cold water only		
Soak in salt/water solution (2 tbsp salt to 1 cup cold water)		

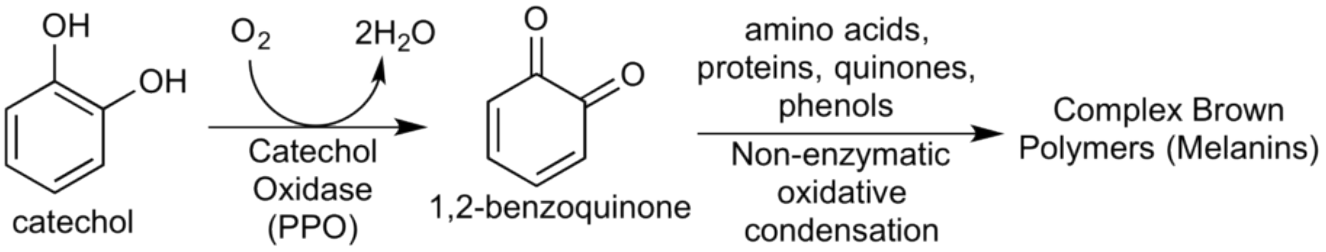
Method	Appearance	Texture
Sprinkle with 2 tbsp salt only		

Explanation:

Enzymatic Browning

Definition: Browning reaction when some fruits and vegetables are cut and exposed to oxygen. Substrate + Enzyme + Oxygen = Browning **–OR–** Phenolic compounds + Polyphenoloxidase + Oxygen

Importance in food quality: Appearance (not a safety concern)



Give an example of enzymatic browning in a food product:

Give an example of a way to prevent enzymatic browning:

Demonstrate enzymatic browning and methods of control

1. Slice an apple or banana onto separate dishes with a stainless steel knife.
2. Apply assigned treatment.
3. Allow to stand uncovered for one hour.
4. Record observations.

Treatment	Appearance
None	
Diluted lemon juice (1 part to 3 parts water)	
Commercial anti-darkening agent	

2.3 Varietal Difference Potato and Apple Recipes

Objectives

- **Identify the characteristic differences in several varieties of potatoes and apples.**
- **Prepare some varieties of potatoes and apples by different methods to illustrate uses for which each variety is best suited.**

Prepare the assigned variety of potatoes according to the following directions.

Baked Potato

Heat oven to 425°F. Scrub potato. Bake on oven rack. After 20 minutes of baking, pierce each potato with a fork. Bake until potatoes feel soft when pressed with fingers, approximately 45 minutes total. Roll the potato gently with your hands; then cut a cross in the top with a knife and push in the ends and sides of the potato to fluff before serving.

Boiled Potatoes

Wash, peel, and cut 2–3 medium potatoes into even thin slices. In a medium saucepan, add the potatoes to enough water to cover the potatoes and ½ tsp. salt. Bring the potatoes to a simmer and then cook until tender, 15–25 minutes; then drain. Cover the potatoes in the saucepan with a lid; just monitor the cooking, so the water doesn't boil over.

Mashed Potatoes

Ingredients

2 medium potatoes

1 Tablespoon butter

dash salt

3–4 tbsp hot milk **OR**
3–4 tbsp reserved cooked liquid and 1 tbsp nonfat dry milk

Instructions

Wash, peel, and cut 2–3 medium potatoes into even thin slices. In a medium saucepan, add the potatoes to enough water to cover the potatoes and ½ tsp. salt.

Bring the potatoes to a simmer and then cook until tender, 15–25 minutes; then drain. The potatoes will cook faster if the saucepan is covered with a lid; just monitor the cooking, so the water doesn't boil over.

After draining, mash the potatoes until smooth. Add the butter and salt to taste. Gradually mix in milk with a potato masher until light and fluffy.

Microwave Baked Potato

Scrub medium-sized potato and dry; pierce with a fork in several places. Microwave for 3 to 5 minutes until the potato feels soft when pressed with fingers, following specific microwave oven directions for power and time. Let the potato stand for 5 minutes, then cut a cross in the top with a knife and push in the ends and sides of the potato to fluff before serving.

Instant Mashed Potatoes

Prepare two servings of potatoes according to the package directions.

Sensory Evaluation of Potatoes

Type	Variety	Characteristics	Sensory Observations	Best Uses
Waxy			Baked: Mashed: Boiled: Microwaved:	
Mealy			Baked: Mashed: Boiled: Microwaved:	
All-purpose			Baked: Mashed: Boiled: Microwaved:	

Prepare the assigned variety of apples according to the following directions.

Apple Crisp (Think Apple Pie)

Ingredients

- 2 medium apples (or ~2 cups peeled and sliced)
- 1 Tablespoon sugar
- 1 teaspoon cornstarch
- 2 Tablespoons quick oatmeal
- 2 Tablespoons oat flour
- 2 Tablespoons brown sugar
- 1 Tablespoon butter

Instructions

Wash and peel 2 apples (depending on size). Remove the core and cut the apples into 1/4-inch thick slices. Mix the sugar and cornstarch together, and then mix the sugar and cornstarch with the apple slices. Put the coated apples into a one-pint baking dish and pack down slightly.

Mix together oatmeal, oat flour, and brown sugar. Cut in the butter with a pastry blender or a fork to form crumbles. Sprinkle the mixture over the top of the apples.

Without a lid, bake in the oven at 350°F for 40 minutes. Let cool for 10–15 minutes and serve.

Boiled Apple Slices (Think Applesauce)

Ingredients

- 2 medium apples
- 2 cups water
- 2 Tablespoons sugar

Instructions

Wash, peel, quarter, and core apple. Slice into ¼-inch slices. Boil gently in water in a covered saucepan until tender, approximately 8 minutes. Add sugar and continue to cook until apple slices are translucent, approximately 4 minutes more. Add more water if necessary.

Raw/Fresh Slices

Wash, core, and slice 2 apples. Serve for sensory evaluation.

Sensory Evaluation of Apples

Variety	Characteristic (Flavor & Texture)	Sensory Observations	Best Uses
Granny Smith		Baked: Boiled: Fresh:	
Golden Delicious		Baked: Boiled: Fresh:	
Red Delicious		Baked: Boiled: Fresh:	

Variety	Characteristic (Flavor & Texture)	Sensory Observations	Best Uses
Gala		Baked: Boiled: Fresh:	
Honeycrisp		Baked: Boiled: Fresh:	
Pink Lady		Bake: Boiled: Fresh:	

2.4 Varietal Differences Conclusion

1. List 4 additional fruits and/or vegetables with varietal differences by looking at seed catalogs like Johnny's, Stark Brothers, Parks, and Burpee. Be ready to share about one thing you found in the seed catalogs (online or in one of the catalogs in the lab).

2. What characteristic distinguishes an excellent sauce apple from an excellent pie or baking apple?

3. What vitamin is valued in orange sweet potatoes, especially in parts of Africa?

4. What is one way to re-crisp fresh (raw) vegetables?

5. What is one way to slow or prevent enzymatic browning?

3. Vegetables

3.1 Lab Introduction

Before You Come to Lab

Name: _____

Watch the videos posted on Canvas to answer the following questions about vegetable preparation.

1. How do you eat an artichoke leaf or petal?

2. What did Julia add to the eggplant before she cooked the eggplant?

3. Why can Jacques Pépin look at the camera while he is cutting with the chef's knife?

Remember to…

- Wear fully enclosed shoes and your lab coat.
- Bring your lab manual to class.
- Fill out the introduction questions above to be checked at the beginning of the lab.

3.2 Pigments in Fruits and Vegetables

Objectives

- **Identify the major pigment categories found in fruits, vegetables, and other plant foods.**
- **Observe the effects of pH on plant pigments and texture of vegetables.**

Pigments in Fruits and Vegetables

There are 4 pigments commonly found in fruits and vegetables. It is not always obvious that there is a pigment present. It can become more noticeable when the pH of fruit or vegetable is adjusted. Some pigments are vitamin precursors (beta carotene is a carotenoid) and antioxidants (anthocyanins). Nutrition recommendations include consuming a rainbow of fruits and vegetables, which may be a good and easy-to-remember way to consume fruits and vegetables.

Describe the colors of the following pigments and list examples.

Anthocyanin

Color:

Examples:

Anthoxanthin

Color:

Examples:

Carotenoid

Color:

Examples:

Chlorophyll

Color:

Examples:

Pigment Table for Observations

Pigment	Vegetable Being Used	Color (neutral pH)	Water or Fat Soluble	Color in Acid	Texture in Acid	Color in Base	Texture in Base
Anthocyanin	Red Cabbage		Water				
Anthoxanthin	Cauliflower		Water				
Carotenoid	Carrots		Fat				
Chlorophyll	Broccoli		Fat				

3.3 Effect of Cooking Method on Vegetable Flavor Types

Objectives

- **Identify the various flavor categories of vegetables.**
- **Determine the influences of a cover and of the amount of water during cooking on the flavor of vegetables.**

Vegetable Flavor Categories

Brassica Vegetables

- One type of sulfur-containing precursors = distinct aroma.
- Examples include Broccoli, Cabbage, Brussels Sprouts, Cauliflower, Kale, Kohlrabi, Mustard, Turnip, & Rutabaga

Allium Vegetables

- Another type of sulfur-containing precursors = distinct aroma.
- Examples include Onions, Chives, Leeks, Fennel, & Garlic

Mild Flavor Vegetables

- All other vegetables (regardless of how “mild” the flavor is).
- Examples are numerous and include Carrots, Peas, Artichoke, Asparagus, Eggplant, Okra, Squash, Tomatoes, Potatoes, & Green Pepper

Effect of Cooking Method on the Palatability of Vegetables

Prepare 1 cup of fresh vegetables for each part of the assignment. The lab will need a total of 4 cups of each vegetable. Keep vegetable pieces the same size for uniform cooking. Cook, following specific assignment directions, to the appropriate degree of doneness for the assigned vegetable. Record cooking time.

Raw vegetable preparation

- ***Cabbage (green):*** Remove the outer leaves, and wash the remaining head. It is not necessary to remove the entire core. Shred cabbage into bite-size pieces with a chef's knife.
- ***Carrots:*** Peel, wash and slice into ¼-inch slices. If the carrot is large, quarter lengthwise before slicing crosswise.
- ***Onions:*** Remove outer skin by peeling**.** Cut off the root end. For large onions, cut into bite-size pieces.

Directions for cooking vegetables for each flavor category

Boiling in a Small Amount of Water *(Recommended for Mild-Flavored Vegetables)*

1. Use only enough water to prevent scorching the vegetables during cooking; approximately ¼ cup water for a one-quart saucepan. Add more if needed to prevent scorching.
2. Add ¼ tsp. salt for each cup of vegetable being cooked.
3. Add the vegetable to boiling water, cover the pan, and bring back to a boil. Begin timing.
4. Boil gently until the vegetable is crisp-tender. This means the fork can easily be inserted into the vegetable, but the vegetable is not yet mushy or overly soft.
5. Record cooking time.

Boiling in a Large Amount of Water *(Recommended for Brassica and Allium Vegetables)*

1. Boil enough water to cover the vegetable.
2. Add ¼ tsp. salt for each cup of vegetable being cooked.
3. Add the vegetable to boiling water and bring the water back to a boil. Do not cover the pan. Begin timing.
4. Boil gently until the vegetable is done. (Crisp-tender for Brassica and mild-flavored vegetables, and until tender for Allium vegetables.)
5. Drain the vegetable.
6. Record cooking time.

Steaming *(Beneficial for Vegetables That Overcook Easily)*

1. Use enough water in the bottom part of a steamer so the pan will not boil dry during the cooking period.
2. When the water in the bottom part of the steamer is boiling, place the vegetable in top of the steamer.
3. Assemble the steamer and cover it with a lid. Begin timing.
4. Cook the vegetable in steam over rapidly boiling water until done (crisp-tender).
5. Record cooking time.

Microwave Cooking *(Convenient Method)*

1. Use a 1-pint baking dish with a tight-fitting lid or plastic wrap appropriate for the microwave. Add 2-4 tablespoons water.
2. Cook on full power for 2.5-3 minutes for one cup of vegetables. Check for doneness and microwave for additional time if not crisp-tend.
3. Salt the vegetables once they are done heating, approximately 1/4 teaspoon salt per cup of the vegetable.
4. Record the cooking time.

Evaluation

Record observations on flavor, texture, and appearance:

Vegetable	Lid on, Small Amount of Water	Lid off, Large Amount of Water	Steamer	Microwave
Mild flavor: Carrots				
Brassica sp.: Cabbage				
Allium sp.: Onions				

3.4 Vegetables A to Z

Objectives

- **To practice various cooking methods for fresh and frozen vegetables – boiling, broiling, baking, steaming, panning, sautéing, etc.**
- **To prepare less-familiar vegetables in order to appreciate the wide variety of characteristics of vegetables.**

Terms, as Used in the Lab Manual

- **Blanch or Parboil**: Partially cook in a large amount of boiling water to inactivate enzymes or to facilitate peeling.
- **Pan (verb)**: Cook very thin slices of a vegetable at high heat in enough oil to keep them from sticking. Vegetables may be covered, and a very small amount of water (1-2 tbsp.) added to create steam. The pan should be shaken to prevent sticking.
- **Sauté**: Cook in a small amount of fat over fairly high heat in an open, shallow pan until just done; vegetables should look translucent, not brown.
- **Stir-Fry**: Heat a small amount of oil. Add very thin slices of vegetables and cook over medium-high heat. Stir constantly. A wok is the preferred utensil, but a large, deep skillet may be used. Cook only a few vegetables at a time.
- **Cube**: Cut food into uniform cubes approximately ½ inch in each dimension unless the directions specify another size.
- **Dice:** Cut into uniform cubes, approximately ¼ inch.
- **Chop**: Cut into small irregular-shaped pieces.
- **Mince**: Divide food into very small (1/16 inch or less) irregular-shaped pieces with a knife or garlic press.
- **Julienne**: Cut into thin strips. (match-stick size, about ⅛ x ⅛ x 2 inches)
- **Crisp-Tender**: “Crisp” refers to a slight crunch while the vegetable still has structure. “Tender” refers to the fact that your teeth/knife can easily sink all the way through.

Raw Vegetable Preparation

Most fruits and vegetables are picked and packaged straight from the field, so it is important to wash fruits and vegetables before consuming them. Remove and discard any damaged leaves or parts. Cut out cores where applicable, like onions, cabbage, and brussel sprouts.

Prepare vegetables according to the following recipes

Artichokes with Butter Sauce

Ingredients

- 1 whole artichoke
- 2 Tablespoons butter
- 1½ teaspoons lemon juice
- 1½ teaspoons chopped parsley

Instructions

Hold artichoke by the stem and dash up and down in a bowl of water. Cut off stem with scissors, 1 inch from top, and ¼ of the top of each leaf. Discard the bottom row of leaves.

Boil gently in salted water to cover until end of stem is tender and leaves pull easily from base, approximately 20-30 minutes. Carefully remove from water and drain upside down.

Prepare butter sauce: melt butter, add lemon juice and parsley. Heat 1-2 minutes to blend flavors. Place artichoke stem end down on a plate and serve with the hot butter sauce.

To eat, dip each leaf into sauce, pull leaf through teeth drawing off tender part, and discard the remainder of the leaf.

Stir-Fried Asparagus

Ingredients

- ⅓ lb. fresh asparagus spears
- 1 Tablespoon vegetable oil
- 1/8 teaspoon salt
- dash of pepper

Instructions

Wash and snap off lower woody stems of asparagus and discard stems; cut tips into bias-cut (diagonal) pieces, 1½ inches long.

In a saute pan, stir-fry asparagus and seasonings in oil for 1 minute. Cover skillet and shake while cooking, about 2-3 minutes, until asparagus is crisp-tender.

Scalloped Broccoli

Ingredients

⅓ to ½ lb. broccoli

¾ cup thin white sauce (see below)

1 oz. grated sharp cheddar cheese

¼ cup fine dry bread crumbs

1 Tablespoon melted butter

dash paprika

White Sauce:

2 ¼ teaspoon butter or margarine

2 ¼ teaspoon flour

1/16 teaspoon — salt to taste

¾ cup milk

Instructions

Wash and trim broccoli. Cut into 2–3 inch spears. Boil broccoli in a large amount of water until nearly crisp-tender.

Prepare the white sauce: Melt butter in a saucepan; blend in flour and salt; remove from heat. Add milk, stirring to blend, return to heat and stir gently while heat to a full boil.

In a 1-pint glass baking dish, alternate layers of broccoli, white sauce, and cheese. Repeat until all broccoli is used.

Blend bread crumbs with melted butter, spread on top of casserole, and bake uncovered at 375°F for 20 minutes. Sprinkle with paprika.

Pan-Fried Brussel Sprouts

Ingredients

3/4 lb. small brussel sprouts

4 Tablespoons vegetable oil

salt and pepper to taste

Instructions

Wash and trim the brussel sprouts. Then, cut each one in half. Arrange the brussel sprouts in a single layer, cut side down, in a large saute pan. Drizzle the oil evenly over the brussel sprouts.

Cover the pan and cook on medium-high heat. Cook for ~5 minutes and check for browning. If the brussel sprouts are browned on the cut side, drop the temperature to medium-low and continue cooking with the lid on for another ~3 minutes. If the brussel sprouts are not browned, continue cooking with the lid on at medium-high heat for another ~3 minutes. The brussel sprouts should be cooked until crisp-tender.

Remove the brussel sprouts from the saute pan and season with salt and pepper.

Cabbage with Cheese Sauce

Ingredients

- ¼ head green cabbage
- 2 bacon slices
- ½ cup thin white sauce

Cheese Sauce:

- 2 ¼ teaspoon butter or margarine
- 2 ¼ teaspoon cornstarch
- 1/16 teaspoon — salt to taste
- ¾ cup milk
- 1 oz. grated sharp Cheddar cheese

Instructions

Wash cabbage; trim off wilted leaves, remove the core, and chop the cabbage into bite-size pieces. Boil cabbage in a large saucepan in a large amount of water until crisp-tender.

Fry bacon in a saute pan over moderately low heat until crisp. Reserving drippings, remove bacon from pan and crumble.

Prepare the white sauce: Melt bacon drippings or butter in a saucepan; blend in the cornstarch and salt; remove from heat. Add milk, stirring to blend, return to heat, and stir gently until a full boil is reached. Boil for 1 minute while stirring constantly, and then remove from the heat. Stir in cheese until melted.

Arrange the hot drained cabbage on the platter, pour the cheese sauce over the top, and sprinkle with bacon bits.

Carrots with Dill and Sour Cream

Ingredients

- ½ lb. carrots
- 1 Tablespoon vegetable oil
- ½ teaspoon dried dill-weed
- ½ teaspoon chicken bouillon
- ½ teaspoon sugar
- ⅓ cup water
- 1 Tablespoon sour cream

Instructions

Wash and peel carrots; cut into julienne (matchstick) strips (about ⅛ x ⅛ x 2 inches).

Sauté carrots and dill in oil for approximately 5 minutes without browning. Stir in chicken bouillon granules, sugar, and water, and cook until carrots are crisp-tender.

With a slotted spoon, remove carrots, transfer to a dish, and keep warm. Reduce cooking liquid to approximately two tablespoons; blend in sour cream and add carrots. Heat to serving temperature if necessary.

Cauliflower Rice Stuffed Peppers

Ingredients

- 2 bell peppers, halved & seeds removed
- 1 tablespoon olive oil
- 1 tablespoon garlic, minced
- ½ cup diced red onion
- 1 bag frozen riced cauliflower
- 3/4 cup canned black beans (drained)
- ⅓ cup salsa
- 1 teaspoon cumin powder
- 1 teaspoon chili powder
- 1 Tablespoon lime juice
- 1/8 teaspoon salt
- 1/8 teaspoon black pepper

Toppings (optional)

- Lime juice
- ⅓ cup salsa

Instructions

Preheat oven to 375°F. Use a 9×13 inch baking dish. Wash and halve both peppers. Then brush the peppers with ~ 1 tsp of olive oil. Set aside.

Heat a sauté pan on medium heat. Add 2 tsp olive oil, minced garlic, and diced red onion. Sauté for 1 minute, stirring frequently. Then add cauliflower 'rice' and cook for an additional 2 minutes, still stirring frequently. Place the lid on the pan and cook for ~1 more minute.

Then, remove from heat and transfer the mixture to a large mixing bowl. Add the remaining ingredients — black beans, salsa, cumin powder, chili powder, lime juice, salt, and pepper — to the cauliflower rice and mix thoroughly.

Stuff the halved peppers with ~ 1/2 cup of the mixture until all peppers are full, then cover the baking dish with aluminum foil. Bake for 30 minutes. Then remove the foil, increase heat to 400°F, and bake for another 15–20 minutes or until peppers are soft and slightly golden brown. Serve with toppings (optional).

Sautéed Leeks

Ingredients

- 3 medium leeks
- 2 Tablespoons butter
- ¼ cup chicken broth
- 1 teaspoon lemon zest
- salt and pepper to taste

Instructions

Discard tough outer leaves of leeks. Trim off green tops and roots; slice the remaining leeks lengthwise twice so they have been cut into quarters. Then, slice the quarters crosswise into 2-inch strips.

Wash the strips by lifting them up and down in the water. Lift leeks out of water. Repeat until no more sand or dirt settles to the bottom of the container.

Melt butter over moderate heat in a sauté pan. Add leeks with water still clinging to them. Cook for five minutes, stirring occasionally. Add broth and zest, cover the pan, and cook until leeks are tender (about five additional minutes). Season with salt and pepper.

Peanut Creamed Onions

Ingredients

- ½ lb. (8 oz.) small boiling onions
- ½ cup medium white sauce
- 2 Tablespoons chopped salted peanuts
- dash mace

White Sauce:

- 1 Tablespoon butter or margarine
- 1 Tablespoon cornstarch
- ½ cup milk
- 1/16 teaspoon — salt to taste

Instructions

For fresh onions, blanch the onions in boiling water for about 10 seconds. Drain, chill, trim, and slip off skins. Skip the blanching step if frozen boiling onions are used. Cook in fresh boiling water to cover until almost done.

Prepare the white sauce: Melt fat in a saucepan; blend in cornstarch and salt; remove from heat. Add milk, stirring to blend, return to heat, and stir gently until a full boil is reached. Boil for 1 minute while stirring constantly, and then remove from the heat.

Halve onions, combine with white sauce, half the peanuts, and mace in a 1-pint baking dish. Top with remaining nuts and bake uncovered at 375°F for 20 minutes.

Peas with Broccoli Medallions

Ingredients

- 2 green onions, sliced
- 1 Tablespoon vegetable oil
- 1 cup shelled peas, fresh or frozen
- ½ cup peeled broccoli stems cut into 1/8-inch disks
- ¼ cup water
- ⅛ teaspoon salt
- dash pepper
- ½ teaspoon lemon zest
- 3/4 teaspoon dried parsley or 1 ½ tsp. fresh parsley

Instructions

Sauté green onions in oil; add peas, broccoli stems, water, salt, and pepper.

Cover and cook until peas are crisp-tender, about 5 minutes.

Stir in lemon zest and dried parsley.

Parsnips Caramel

Ingredients

- ½ lb. (8 oz.) parsnips (3 medium)
- 2 Tablespoons brown sugar
- 1 Tablespoon butter

Instructions

Wash and peel parsnips, cut into ½-inch round slices, and steam until nearly tender. Drain any remaining water.

Put parsnips into a one-pint baking dish, sprinkle with brown sugar, and dot with butter. Bake uncovered at 400°F for 10 minutes.

Roasted Golden Beets and Parsnips*

Ingredients

- 2 medium golden beets &/or parsnips
- 2 Tablespoons olive oil
- 2 Tablespoons balsamic vinegar
- 1/2 teaspoon dried thyme
- 1 teaspoon salt
- 1/2 teaspoon black pepper
- 2 Tablespoons honey
- 1/4 to 1/2 teaspoon salt sprinkled on prepared beets and parsnips

Instructions

Preheat the oven to 425°F and line a rimmed baking sheet with parchment paper.

Thoroughly wash the golden beets and parsnip and peel them. Then, slice into bite-size pieces. Arrange the beet and parsnip pieces on a baking sheet and drizzle/sprinkle with olive oil, balsamic vinegar, dried thyme, salt, and pepper.

Bake at 425°F for about 30–45 minutes or until fork tender. Drizzle with honey and sprinkle with salt before serving.

**This recipe can be made with all golden beets or all parsnips, depending on vegetable availability.*

Rutabagas and Turnips

Ingredients

- ½ cup cubed turnips
- ½ cup cubed rutabagas
- 1 teaspoon butter
- dash pepper

Instructions

Peel and cube vegetables. In two separate saucepans, boil vegetables (turnips in one pan and rutabagas in another) in salted water until tender. Drain vegetables.

Then combine the turnips and rutabagas in a serving bowl, add butter, and season lightly with pepper.

Panned Spinach

Ingredients

- ½ lb. (8 oz.) spinach
- ⅛ teaspoon salt
- 2 teaspoons fresh or frozen lemon juice
- 1 hard-cooked egg, chopped

Instructions

Sort leaves and remove stems. Wash spinach thoroughly by lifting spinach up and down in the water. Remove spinach from the water. Repeat until no more sand settles to the bottom of the container. Drain.

Cook spinach with salt in a saute pan with a tight-fitting lid for about 3 minutes, using only the water clinging to the leaves from the last rinsing. Drain, sprinkle with lemon juice, and garnish with chopped hard-cooked egg.

To Hard Cook an Egg:

In a saucepan, add an egg to enough cold water to come at least 1" above the egg. Bring the pan to a boil. Cover pan; remove from heat. Let the egg stand in the hot water for 15–20 minutes. Drain the hot water and carefully place the hot egg in ice water. When the egg is cool, remove it from its shell.

Baked Acorn Squash

Ingredients

- ½ medium acorn squash
- ½ cooking apple, diced
- 1 Tablespoon brown sugar
- ¼ teaspoon cinnamon
- ½ teaspoon butter

Instructions

Remove seeds from squash; place squash cut-side down in a baking dish large enough to allow contact between the cut surface of the squash and the bottom of the dish. Pour boiling water to ¼ inch depth around the squash.

Bake uncovered at 400°F for 35 minutes. Drain water. Invert the squash and fill the center with the mixture of apple, brown sugar, cinnamon, and butter. Continue baking, uncovered, until apple and squash are tender, about 40 additional minutes.

Spaghetti Squash Parmesan

Ingredients

- ½ medium spaghetti squash
- Salt & pepper to taste
- 1 Tablespoon butter, melted
- 2 Tablespoons grated Parmesan cheese

Instructions

Heat oven to 350°F. Halve squash lengthwise; scoop out seeds. Place squash, cut side down, in a baking dish large enough to allow contact between the cut surface and the bottom of the pan. Pour boiling water to a ¼-inch depth around the squash.

Bake in a 350°F oven for 45–60 minutes until tender. Drain water. With a fork, shred and separate the squash pulp into strands. Remove the squash from the shell, and toss with salt, pepper, melted butter, and Parmesan cheese.

Four Cheese Broiled Tomatoes

Ingredients

- ¼ cup grated Parmesan and Romano cheese blend
- ¼ cup ricotta cheese
- ¼ cup shredded part-skim mozzarella cheese
- ¼ cup mayonnaise
- ½ teaspoon minced garlic
- ½ Tablespoon dried oregano
- ¼ teaspoon salt
- 2 large tomatoes

Instructions

In a small bowl, combine the first seven ingredients.

Cut each tomato into thick slices. Spread each slice with ~2 tablespoons of cheese mixture.

Place on a foil-lined baking sheet. Broil 3 inches from the heat for 3–5 minutes or until the cheese mixture is golden brown and the tomatoes are heated through.

Oven Roasted Vegetables

Ingredients

- 1 sweet potato, peeled
- 1 red potato
- 1 carrot, peeled
- ½ fennel bulb, top and root removed
- ¼ green pepper
- ½ red onion, peeled
- 1 garlic clove
- 1 Tablespoon olive oil
- 2 teaspoons balsamic vinegar
- ⅛ teaspoon salt
- ¼ teaspoon lemon pepper

Instructions

Wash and trim vegetables; cut into 2-inch pieces. Cut off the green top and tough root of the fennel and chop the bulb into bite-size pieces.

Use a large spoon to combine vegetables and remaining ingredients and stir until vegetables are well coated.

Bake in a 9×13 inch roasting pan at 425°F for 45 minutes or until vegetables are tender and lightly browned.

Panned Zucchini Parmesan

Ingredients

- ½ lb. (8 oz.) zucchini squash
- 2 Tablespoons coarsely chopped onion
- 1 Tablespoon butter
- 1 Tablespoon water
- 1/8 teaspoon salt
- dash of pepper
- 2 Tablespoons grated Parmesan cheese

Instructions

Wash and trim ends of zucchini (do not peel); cut into ⅛" round slices.

In a skillet, sauté onion in butter 1 to 2 minutes. Add all other ingredients except cheese.

Cover, bring to a boil, and cook for one minute.

Uncover and cook, turning with a spatula, until tender. Cool slightly (1–2 minutes), sprinkle with cheese, toss, and serve.

Evaluation

Write observations of these vegetables and methods of preparation in the table (on the next two pages). Include appearance, flavor, degree of doneness, compatibility of ingredients, and quality of fresh ingredients, if applicable.

Recipe	Method of Preparation	Flavor Category	Pigment Category	Sensory Attributes
Artichokes with Butter Sauce				
Stir-Fried Asparagus				
Scalloped Broccoli				
Pan-Fried Brussel Sprouts				
Cabbage with Cheese Sauce				
Carrots with Dill and Sour Cream				

Recipe	Method of Preparation	Flavor Category	Pigment Category	Sensory Attributes
Cauliflower Rice Stuffed Peppers				
Sautéed Leeks				
Peanut Creamed Onions				
Peas with Broccoli Medallions				
Parsnips Caramel				
Roasted Golden Beets & Parsnips				
Rutabagas and Turnips				

Recipe	Method of Preparation	Flavor Category	Pigment Category	Sensory Attributes
Panned Spinach				
Baked Acorn Squash				
Spaghetti Squash Parmesan				
Broiled Tomatoes				
Oven Roasted Vegetables				
Panned Zucchini				

3.5 Lab Conclusion Questions

1. Why is it important to wash fruits and vegetables before consuming them?

2. When would acid be added to vegetables?

3. What was the best cooking method for the three flavor categories of vegetables?
   a. Brassica:

   b. Allium:

   c. Mild:

4. Are the best methods for flavor and nutrient retention consistent? If not, what conflicts exist? What compromise do you suggest?

5. You can buy fresh, frozen, and canned vegetables in the grocery store. How do the different forms compare in price and sensory attributes?

4. Starch Characteristics, Cookery, & Cereal Grains

4.1 Starch and Cereal Introduction

Before You Come to Lab

Name: _____

Read the article posted on Canvas: Classic Smooth and Silky Béchamel (White Sauce) Recipe.

1. A white sauce can be used as the base for other sauces or recipes. List three other sauces or recipes from the article.

2. What are the three main ingredients in a Bechamel or white sauce (besides salt and pepper)?

3. Read through the steps of making a white sauce and list the main steps here (just the bolded part is fine).

Terms, as Used in the Lab Manual

To learn about starch and its functionality, it is helpful to start with definitions.

- **Starch Granule**: Native structure, energy storage for plant.
- **Amylose**: Small linear starch molecule, needed to form a gel

- **Amylopectin**: Large branched starch molecule that contributes a lot of viscosity
- **Granule Swelling**: First step of gelatinization, water enters the starch granule and starts to swell.
- **Gelatinization**: Process of starch thickening- absorption of water into granules as starch is heated with liquid.
- **Retrogradation**: Starch molecules bond together tighter over time, crystalline aggregates in starch gel, further setting of starch gel over storage- lead to syneresis.
- **Syneresis**: Draining of liquid from gel structure produced by retrogradation.
- **Gel vs. Sol**: Gel holds its shape, and sol is thickened but still flows.
- **Root Starch**: Starch extracted from potatoes or cassava (tapioca)
- **Cereal Starch**: Starch extracted from cereal grains such as corn, wheat, and rice

Corn starch and wheat flour are commonly used starch thickeners. Why might one be used instead of the other?

When making starch-thickened foods, the basic process is **heating starch with a liquid while stirring**. There are a few added steps to make sure the sauce turns out smooth without lumps. Here are **three ways to avoid lumps:**

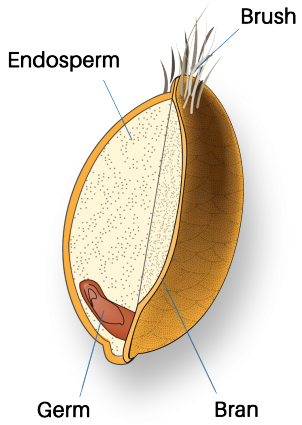
1. Mix starch with cold liquid to make a smooth mixture. (Pudding or gravy)
2. Mix starch with oil/melted fat to form a smooth paste. (White sauce)
3. Mix starch with granular dry ingredients (sugar) to disperse starch granules. (Pudding)

Cereal Grains

Starch comes from a variety of sources, including cereal grains (and root starches, legumes, etc.) Cereal grains fit into two categories: refined grains and whole grains.

Simply put, **whole grains include the endosperm, germ, and bran.** The Whole Grains Council expands the definition to “Whole grains or foods made from them contain all the essential parts and naturally-occurring nutrients of the entire grain seed in their original proportions.”

Refined grains are endosperm with either the germ, bran, or both the germ and bran removed.



A cereal grain is made up of endosperm, germ, and bran.

4.2 Starch-Thickened Products

Objectives

- **Demonstrate increased skill in thickening starch mixtures.**
- **Prepare some basic starch-thickened products.**
- **Identify a standard product for pudding and compare its qualities with commercial pudding products.**

Preparation of White Sauce and Variations

	Thin	Medium	Thick	Very Thick
Butter or margarine	1 tbsp.	2 tbsp.	3 tbsp.	4 tbsp.
Flour	1 tbsp.	2 tbsp.	3 tbsp.	4 tbsp.
Salt*	1/8 tsp.	1/8 tsp.	1/8 tsp.	1/8 tsp.
Milk	1 cup	1 cup	1 cup	1 cup

Melt fat in a saucepan. Blend in flour and salt; remove from heat. Add milk, stirring to blend; return to heat and stir gently while heating quickly to a full boil. Boil for 1 minute if the sauce is not to be cooked further.

*Amount of salt may vary with added ingredients or intended use of the white sauce.

White Sauce Variations

- **Tomato Sauce**: Substitute tomato juice for milk in the above recipe for medium sauce. Omit salt.
- **Brown Sauce**: Follow instructions for medium white sauce with the following changes: 1) Omit salt if a salted liquid is used. 2) After the flour and butter are blended, continue to heat until the mixture has turned a light brown color. 3) Substitute water or broth for milk.

Sensory Evaluation

Sauce	Appearance	Texture	Uses
Thin White Sauce			Cream soup, vegetable sauce
Medium White Sauce			Casserole base, cheese sauce
Thick White Sauce			Soufflé
Very Thick White Sauce			Croquettes
Tomato Sauce			Tomato soup or gravy
Brown Sauce			Gravy, meats

Prepare Cream Soups

Cream of Asparagus, Spinach, or Pea Soup

Ingredients

- 2 teaspoons finely chopped or minced fresh onion (not dry minced)
- 1 Tablespoon butter or margarine
- 1 Tablespoon cornstarch
- 1/8 teaspoon salt
- 1 cup milk
- ¼ cup pureed or finely chopped vegetable
- dash of white pepper

Instructions

Cook onion in butter over low heat until onion is translucent.

Stir in cornstarch and salt; remove from heat. Add milk, stirring to blend; return to heat and stir gently while heating quickly to a full boil.

After the mixture has boiled for 1–2 minutes, add vegetables. Heat to serving temperature and add a dash of white pepper.

Pimento and Onion Soup

Ingredients

- 2 teaspoons minced fresh onion
- 1 Tablespoon butter or margarine
- 1 Tablespoon cornstarch
- ⅛ teaspoon salt
- 1 cup milk
- 1 Tablespoon chopped pimento
- dash of white pepper

Instructions

Cook onion in butter over low heat until onion is translucent.

Stir in cornstarch and salt; remove from heat. Add milk, stirring to blend; return to heat and stir gently while heating quickly to a full boil.

After the mixture has boiled for 1–2 minutes, add pimiento. Heat to serving temperature and add a dash of white pepper.

Cream of Celery Soup

Ingredients

- ¼ cup thinly sliced celery
- 2 teaspoons minced fresh onion
- 1 Tablespoon butter
- 1 Tablespoon cornstarch
- ½ cup milk
- ½ cup chicken or vegetable broth

Instructions

Cook celery and onion in butter over low heat until vegetables are translucent.

Stir in cornstarch; remove from heat. Add milk and broth, stirring to blend, return to heat, and stir gently while heating quickly to a full boil.

Boil for 1 minute, then remove from heat.

Cream of Potato Soup

Ingredients

- ⅔ cup diced potatoes
- ¼ teaspoon salt
- ½ cup reserved cooking liquid, from cooking potatoes
- 2 teaspoons minced fresh onion
- 1 Tablespoon butter
- 2 teaspoon cornstarch
- ½ cup milk
- 1 teaspoon fresh parsley, chopped
- dash of white pepper

Instructions

Peel, dice and cook potatoes in enough salted water to just cover potatoes; drain and reserve cooking liquid.

Cook onion in butter over low heat until onion is translucent.

Stir in cornstarch; remove from heat and add milk and reserved cooking liquid from potatoes, stirring to blend, return to heat and stir gently while heating quickly to a full boil.

Boil for 1 minute, then remove from heat.

Add potatoes and parsley; heat to serving temperature and add a dash of white pepper.

Creamed Peas, Carrots, and Potatoes

Ingredients

- ½ cup diced potatoes
- ¼ cup diced carrots
- ¼ cup peas, frozen
- 1 Tablespoon butter
- 1 Tablespoon corn starch
- ¼ teaspoon salt
- 1 cup half and half
- 1/2 teaspoon parsley, dried

Instructions

Vegetable Preparation: Peel and dice potatoes and carrots. Measure potatoes, carrots, and peas.

Cooking Vegetables: In a saucepan, first, cook potatoes and carrots in enough lightly salted water to cover them. When the potatoes and carrots are almost done cooking, add in the peas and cook for an additional 2–3 minutes. Drain the vegetables.

Cream Sauce: Melt butter in a saucepan. Blend in cornstarch and salt; remove from heat. Add half and half, stirring to blend; return to heat and stir while heating to a full boil. Boil for 1 minute.

Mix cooked vegetables and parsley into the cream sauce and serve.

Sensory Evaluation

Cream Soup	Appearance	Consistency	Flavor
Asparagus			
Spinach			
Pea			

Cream Soup	Appearance	Consistency	Flavor
Pimento and Onion			
Celery			
Potato			
Creamed Peas, Carrots, and Potatoes			

Prepare Basic Puddings

Cocoa Pudding

Ingredients

- 1 Tablespoon cornstarch
- ¼ cup sugar
- 1 Tablespoon cocoa
- dash salt
- 1 cup milk
- ½ teaspoon vanilla
- ½ teaspoon butter

Instructions

In a small saucepan, mix cornstarch, sugar, cocoa, and salt. Blend in milk.

Cook over medium heat, stirring gently until the mixture boils. Continue cooking over direct heat for 2 to 3 minutes, stirring slowly but constantly.

Remove from heat, blend in vanilla and butter, and pour into serving dish to cool.

Chocolate Pudding

Ingredients

- 1 Tablespoon cornstarch
- ¼ cup sugar
- dash of salt
- 1 cup milk
- ⅓ oz. unsweetened chocolate, cut into small pieces
- ½ teaspoon vanilla

Instructions

In a small saucepan, mix cornstarch, sugar, and salt. Blend in milk; add chocolate.

Cook over medium heat, stirring gently until the mixture boils. Continue cooking over direct heat for 2 to 3 minutes, stirring slowly but constantly.

Remove from heat, blend in vanilla, and pour into serving dish to cool.

Vanilla Pudding

Ingredients

- ¼ cup sugar
- 1 Tablespoon + 1½ teaspoons cornstarch
- 1/8 teaspoon salt
- 1 cup milk
- 1½ teaspoons butter
- ½ teaspoon vanilla extract

Instructions

In a small saucepan, combine sugar, cornstarch, and salt. Gradually stir in milk.

Cook over medium heat, stirring gently until the mixture boils. Continue cooking over direct heat for 1 to 2 minutes, stirring slowly but constantly.

Remove from heat and stir in butter and vanilla. Pour into a serving dish and cool.

Peach Tapioca Pudding

Ingredients

- 1 Tablespoon quick-cooking tapioca
- dash salt
- ⅔ cup peach juice (from the can) and/or water**
- ½ cup peaches, chopped fine
- few drops of almond extract

Instructions

In a small saucepan, mix tapioca and salt. Blend in peach juice and/or water; let stand for 5 minutes.

Cook over medium heat, stirring occasionally until the mixture barely simmers. Simmer for 1 minute; remove from heat.

Cover and let stand for about 5 minutes to complete gelatinization of starch. Stir in peaches and almond extract. Pour into a serving dish and cool.

**Add 1 Tablespoon sugar for each ½ cup of water.

Prepare Commercial Puddings As Assigned

Prepare a package of regular packaged pudding and pie filling mix or instant pudding mix according to package directions.

Sensory Evaluation

Evaluate all puddings at the same temperature if possible.

Pudding	Appearance	Texture	Flavor	Overall Quality
Cocoa				
Chocolate				
Vanilla				
Peach Tapioca				
Packaged (regular box mix)				
Packaged (instant box mix)				
Ready to Eat (snack pack)				
Ready to Eat Rice (refrigerated)				
Ready to Eat Tapioca (refrigerated)				

4.3 Cookery of Cereals

Objectives

- **To recognize a variety of raw and cooked cereal products and identify the processing that gives each its unique characteristics.**

Follow the package instructions for your assigned cereal. Make 2 servings and use water for the liquid to prepare the cereal. Evaluate cereals and fill in the table below.

Cereal Product	Whole Grain or Refined Grain?	Sensory Characteristics: Appearance, Texture, and Flavor	Cooking Time
Traditional Oats (Old-Fashioned)			
Quick Oats			
Instant Oats			
Cream of Rice			

Cereal Product	Whole Grain or Refined Grain?	Sensory Characteristics: Appearance, Texture, and Flavor	Cooking Time
Cream of Wheat			
Malt-O-Meal			
Quick Grits			
Cornmeal			
Multigrain			

4.4 Starch and Cereal Conclusion

1. List the four ingredients used to make a white sauce (aka Bechamel sauce) in lab and the function of each:

2. What happens to the white sauce (especially as it cools) as more flour is added to the recipe?

3. Corn starch and wheat flour are commonly used starch thickeners. Why might one be used instead of the other?

4. Describe the sensory differences between a cereal starch-thickened pudding versus a root starch-thickened pudding.

5. What is the difference in texture between refined grain cereals and whole grain cereals?

6. What is the difference in nutrition between refined grain cereals and whole grain cereals?

5. Cereals vs. Legumes

5.1 Cereal and Legume Introduction

Before You Come to Lab

Name: _____

Check out the Whole Grains Council website (find the link in Canvas).

1. Explain what an enriched grain is.

2. Does an enriched grain have the same amounts of vitamins and minerals as a whole grain? Explain.

Watch “The Science Behind Pressure Cookers” to refresh your memory on how pressure cookers work.

3. In the video example, the air pressure in the pressure cooker is about double the air pressure at sea level. What temperature does the water boil at in the pressure cooker?

Cereal Ingredients

There is a wide range of cereal grains and varieties within those cereal grains. Many cereal grains are further processed, such as grinding, flaking, separating the grain components (for refined grains), and precooking. These steps are designed to make the grains easier to use and eat, but it can be a bit

confusing when looking at all of the cereal grain ingredients and foods in the store. Building on what was observed and discussed in Chapter 4, here are some additional cereal products to know.

- **Polenta:** Corn mush, a staple of Italy, made from cornmeal
- **Couscous:** small pasta pieces made from semolina flour, also a traditional North African dish with the same name
- **Bulgar:** Parboiled, dried & cracked wheat, used to make Tabbouleh
- **Farina:** Coarsely ground wheat endosperm, used to make a modified version of Gnocchi (Italian small dumplings traditionally made from potato).
- **Quinoa:** Ancient grain, high in protein & minerals (calcium, phosphorus, iron)
- **Malted Barley:** Sprouted barley that has been dried, can be used for flavoring or for making beer and spirits.

This lab will include a variety of rice dishes using different kinds of rice. Here are some of the rice types that can be used.

Rice Types	Whole Grain?	Typical Application
Long grain	No	Separates easily, drier texture
Short grain	No	Higher starch content, sticks together, used in sushi
Brown	Yes	High-fiber, bran is present (could be short, medium, or long-grain)
Converted	No	Parboiled rice, soaked & dried before milling. Process infuses nutrients into the endosperm
Arborio	No	Specialty rice used for risotto for its starch properties
Wild	Yes	Wild rice is not technically rice but is a semi-aquatic grass native to North America that is 100 percent whole grain. Wild rice grains are long, slender, and dark brown. Cooked grains have a nutty flavor and chewy texture.

Legumes

Cereals pair well with legumes but differ in a few specific ways.

Legume Definition: a plant with seed pods; seeds contain a good source of protein, fat, starch & fiber

- **Legumes need to be soaked and often pressure-cooked** due to a tough seed coat, higher protein content, and larger particle size.
- **Two ways to speed the cooking of legumes** are soaking and pressure cooking.
- **Fat (butter or oil)** is added to the pressure cooker when cooking legumes to reduce foaming.

This lab will include a variety of legume dishes. Here are some of the legume types that can be used:

Legume	Uses	Notes
Black-eyed-peas	Hopping John	
Kidney beans	Chili	
Garbanzo beans or Chickpeas	Hummus, Ensalada de Frijoles	
Pinto beans	Refried Beans, Pinto Bean Casserole	
Black beans	Salsa	
Soybeans	Soybean Casserole, often further processed	
Tofu	Soy “cheese”	
Peas	Split Pea Soup	

5.2 Cereal Grain Recipes

Objectives

- **Prepare cereal grain dishes appropriate for a variety of menu uses.**

Prepare cereal grain dishes according to the following recipes.

Barley

Squash, Corn, and Barley Succotash

Ingredients

3 cups water

¼ cup quick barley

1/4 teaspoon salt

1 Tablespoon olive oil

¼ cup finely chopped onion

1/4 teaspoon salt

2 cups butternut squash, peeled and cut into ½-inch cubes

½ cup chicken broth

1/8 teaspoon black pepper

1/8 teaspoon dried thyme, crushed

¾ cup whole-kernel corn

2 Tablespoons snipped fresh parsley

Instructions

In a medium saucepan, bring water to boiling. Add barley and ¼ tsp salt. Return to boiling; reduce heat. Cover and simmer for about 40 minutes or until barley is tender, stirring occasionally. Drain and set aside.

Meanwhile, in a very large skillet, heat oil over medium-high heat. Add onion; cook and stir for about 5 minutes or until tender. Stir in the remaining ¼ tsp salt, squash, broth, pepper, and thyme.

Bring to a boil; reduce heat. Cover and simmer for 10–15 minutes or until squash is just tender. Stir in corn; cover and cook for 5 minutes more.

Stir in barley and parsley; heat through and serve.

Corn

Polenta with Cheese

Ingredients

- 1 cup boiling water
- ⅓ cup yellow cornmeal
- 1/8 teaspoon salt
- ⅓ cup cold water
- ⅓ cup grated parmesan cheese
- 1 oz. shredded Swiss cheese

Instructions

Boil 1 cup of water and set aside. Mix cornmeal, salt, and ⅓ cup cold water in a separate saucepan. Stir 1 cup boiling water into the saucepan mixture.

Cook, stirring constantly, until the mixture boils; reduce heat. Cover and simmer, stirring occasionally; about 10 minutes.

Remove from heat. Spread ⅓ of the mixture in a greased 1-pint casserole. Sprinkle ⅓ of the Parmesan and Swiss cheeses over the cornmeal. Continue to layer the cornmeal and different cheeses two more times. Bake uncovered in 350°F oven until hot and bubbly, 15–20 minutes.

Rice and Wild Rice

Fried Rice

Ingredients

- ⅓ cup medium-grain rice
- ¾ cup water
- ⅛ teaspoon salt
- 1 green onion, sliced
- 2 teaspoons vegetable oil
- ¼ cup cooked beef, ham, or pork
- 1 Tablespoon soy sauce
- 1 egg, slightly beaten

Instructions

Put rice, water, and salt in a heavy saucepan; cover with a tight-fitting lid. Bring to a full boil; reduce heat to a very low boil and cook until done, * approximately 15–25 minutes, depending on the variety of rice and temperature. (Add more water if necessary to prevent scorching.)

*Rice is done when a kernel pressed between the fingers feels completely soft.

Sauté onions in oil until tender; remove onions from pan. Add rice to the pan and cook until hot (add more oil if necessary), 5–10 min. Stir in onions, meat, soy sauce, and egg. Cook over low heat, stirring constantly, until eggs are cooked. Pack rice into a 1-pint baking dish; invert onto a plate to serve.

Asparagus Risotto

Ingredients

- ½ pound asparagus, trimmed, cut into 1-inch lengths
- 2 ½ cups canned chicken broth
- 1 Tablespoon olive oil
- ¼ cup chopped onion
- ¾ cup arborio rice or medium-grain white rice
- ¼ cup water
- 3 Tablespoons butter
- ¼ cup + 2 Tablespoons freshly grated Parmesan cheese

Instructions

Blanch asparagus pieces in a saucepan of boiling, salted water for 2 minutes. Drain. Rinse asparagus under cold water.

Bring chicken broth to a simmer in a saucepan. Reduce heat to low and keep broth hot.

Heat olive oil in a heavy, large saute pan over medium heat. Add chopped onion and sauté until translucent, about 4 minutes.

Add rice and stir for 3 minutes. Add water and cook until the liquid evaporates. Continue cooking until rice is tender but still slightly firm in the center and the mixture is creamy by adding chicken broth ½ cup at a time, stirring almost constantly, for about 20 minutes.

Add blanched asparagus pieces and stir until heated through, about 2 minutes. Remove from heat. Add butter and stir until incorporated. Stir in grated Parmesan cheese. Season risotto to taste with salt and pepper.

Fruit Pilaf

Ingredients

- ⅓ cup uncooked brown rice
- ¼ cup chopped onion
- 2 Tablespoons uncooked wild rice
- 2 Tablespoons chopped celery
- 1½ Tablespoons butter
- 2 cups water
- 1 teaspoon instant chicken bouillon granules
- ¼ teaspoon ground sage
- ¼ teaspoon ground thyme
- ⅛ teaspoon pepper
- ½ apple, cored, pared, and diced
- ¼ cup dried chopped apricots
- 2 Tablespoons chopped walnuts

Instructions

Sauté brown rice, onion, wild rice, and celery in butter in a saucepan over low heat until onion is tender, about 10 minutes.

Add water, bouillon, sage, thyme, and pepper. Heat to boiling; reduce heat and cover tightly. Gently boil for about 45 minutes until the rices are done. Add more water if necessary to prevent scorching.

Stir in the remaining ingredients. Heat to serving temperature.

Yellow Rice

Ingredients

- ⅔ cup water
- ½ Tablespoon butter
- ¼ cup long-grain rice
- ⅛ teaspoon turmeric
- ⅛ teaspoon salt
- 1 Tablespoon raisins
- ½-inch to 1-inch cinnamon stick
- ⅛ bay leaf

Instructions

In a medium-sized saucepan, melt the butter over moderate heat; add the rice, and stir to mix.

Add remaining ingredients to pan; cover with a tight-fitting lid. Bring to a full boil; reduce heat to a very low boil and cook until done,* approximately 15–25 minutes, depending on the variety of rice and temperature. (Add more water if necessary to prevent scorching.)

*Rice is done when a kernel pressed between the fingers feels completely soft. Discard the bay leaf and cinnamon stick.

Rice Pilaf (Armenia)

Ingredients

- 1 cup water
- 1 Tablespoon butter
- ½ oz. vermicelli pasta, broken into 1-inch pieces
- 1 beef bouillon cube OR 1 teaspoon beef bouillon granules
- ⅓ cup converted rice
- Worcestershire sauce (optional)

Instructions

In a saute pan, melt the butter. Add vermicelli and brown over low heat. Stir frequently.

Add bouillon and water, and bring to a boil.

Stir in rice. Cover, reduce heat, and simmer until done, approximately 20–25 minutes, stirring occasionally. Worcestershire sauce may be added.

Wheat

Parmesan Gnocchi (Italy)

Ingredients

- ⅔ cup milk
- 2 Tablespoons butter
- ¼ teaspoon salt
- 6 Tablespoons farina (Cream of Wheat)
- 1 egg, slightly beaten
- ⅔ cup grated Parmesan cheese
- 8 oz. tomato, pizza, or spaghetti sauce

Instructions

Heat milk, butter, salt, and farina in a saucepan, stirring slowly but constantly. Cook until the mixture is very thick.

Cool slightly and stir in the egg and half of the cheese. Chill until firm.

Form into balls with a teaspoon and roll in the remaining cheese.

Bake on a greased baking sheet at 425°F until hot and light brown, about 10–15 minutes; turn once with a spatula. Heat sauce; serve separately.

Tabbouleh (Middle East)

Ingredients

- ½ cup bulgur
- boiling water
- 1–2 Tablespoons * fresh mint leaves, chopped fine
- ½ cup fresh parsley, chopped fine
- salt and pepper to taste
- ½ cup green onions, chopped fine
- ¼ cup peeled, chopped tomato
- 3 Tablespoons olive oil
- 2–3 Tablespoons lemon juice

Instructions

Place bulgur in a mixing bowl and add enough boiling water to barely cover. Cover and let stand for 30 minutes or until water is absorbed.

Cool bulgur and drain if necessary. Stir in the remaining ingredients.

*½ tsp. dried mint may be substituted if fresh mint is not available, but the quality will not be as good.

Couscous (Moroccan Wheat)

Ingredients

- 1/3 cup slivered almonds
- 2/3 cup fresh pea pods
- 1 Tablespoon butter
- ½ cup couscous
- 1/3 cup slivered almonds

Instructions

Brown almonds in a bit of oil in a sauté pan. Set aside.

Sauté pea pods until crisp-tender, cool quickly under cold water, drain, pat dry, and slice thin crossways.

In the top of a double boiler, heat broth (make sure to have water in the bottom of the double boiler before using it). Add butter and let melt, add couscous, stir and continue to cook in double boiler. Cover and stir several times, cooking for 10–15 minutes until tender.

Add almonds and peas, heat through, adding more butter if desired. Fluff before serving.

Couscous (North Africa)

Ingredients

- ⅔ cup couscous
- ⅓ cup raisins
- ¼ teaspoon salt
- 1 Tablespoon butter
- ¼ teaspoon ground turmeric
- ¼ tsp. salt

Instructions

Mix couscous, raisins, and salt in a 1-quart bowl; stir in boiling water. Let stand until all water is absorbed, 2 to 3 minutes.

Heat butter in sauté until melted; stir in couscous and ground turmeric. Cook and stir until heated to serving temperature, about 4 minutes.

Oats

Thai Curry Oats

Ingredients

- 2 Tablespoons red Thai curry paste
- 1 (13.5 oz) can coconut milk, unsweetened
- 1 cup old-fashioned oats
- ½ large red bell pepper, diced into 1-inch pieces
- 1 lime (juice half and use the other half for garnish)
- 1 cup snow peas, cut in half on the diagonal
- ½ teaspoon salt
- 1 Tablespoon honey
- ¼ cup cilantro, chopped
- ¼ cup sliced scallions (green onions)
- ⅓ cup peanuts

Instructions

Heat the curry paste in a sauté pan over medium-high. Press the paste into the pan, allowing it to caramelize for just a few seconds. Add the coconut milk to the pan and carefully stir to combine with the paste. Stir in the oats, red bell pepper, and snow peas.

Bring mixture to a simmer and continue cooking for 8–10 minutes, until the oats and veggies soften. Stir occasionally while heating to prevent scorching.

Stir in the salt, honey, and lime juice. Let simmer one more minute.

Remove from heat and top with the cilantro, scallions, and peanuts. Serve with lime wedges.

Quinoa

Quinoa

Ingredients

- 1 cup quinoa
- 2 cup water
- 3 Tablespoons olive oil, divided
- ½ red bell pepper, chopped
- 1 zucchini, small, chopped
- Salt & Pepper
- 2 Tablespoons lemon juice
- 2 Tablespoons fresh parsley, finely chopped
- 1 teaspoon sugar
- 2 Tablespoons lemon juice

Instructions

Rinse quinoa by running water over grains in a saucepan. Drain and add two cups of water and a dash of salt to the saucepan.

Bring the water to a boil. Simmer until water is absorbed (10–15 minutes). When cooked, quinoa will be translucent.

In a frying pan, heat 1 tablespoon olive oil. Add chopped bell pepper and sauté for 5 minutes on medium heat. Add chopped zucchini, season with salt and pepper, and sauté for 5 more minutes. Mix with quinoa.

Combine 2 tablespoons olive oil, lemon juice, parsley, and sugar. Mix well and add to quinoa. Season with salt and pepper. Taste and adjust the lemon juice and seasoning.

Quinoa Salad

Ingredients

- 1 cup dry quinoa
- 1 cup vegetable broth
- ½ medium cucumber, chopped
- ¼ cup chopped red pepper
- ¼ cup chopped green pepper
- 1 chopped green onions
- 2 oz chopped dry apricots
- 3 oz feta cheese, herb-seasoned
- 2 Tablespoons olive oil
- 1 Tablespoons red wine vinegar
- ½ teaspoon garlic powder
- 1 cup chopped fresh spinach

Instructions

Simmer the quinoa in vegetable broth for 15 minutes or until tender and broth is absorbed.

Chill cooked quinoa for 20 minutes.

Add cucumber, red and green peppers, green onions, apricots, and cheese.

Combine oil, vinegar, and garlic powder and pour over quinoa and vegetables.

Fold in chopped spinach.

Sensory Evaluation

Cereal Recipe	Cereal Ingredient Used	Sensory Observations	Cereal Ingredient Appearance
Cheese Polenta	Cornmeal		
Couscous—Moroccan Wheat	Couscous		
Asparagus Risotto	Arborio Rice		
Quinoa Salad	Quinoa		
Fruit Pilaf	Brown Rice & Wild Rice		
Parmesan Gnocchi	Farina or Cream of Wheat		
Thai Curry Oats	Old Fashioned Oats		
Tabbouleh	Wheat Bulgar		
Rice Pilaf Armenia	Converted or Parboiled Rice		

5.3 Legume Recipes

Objectives

- **Apply the principles of carbohydrate and protein cookery in rehydrating and cooking dried legumes.**
- **Identify factors that influence the length of cooking time for dried legumes.**
- **Prepare and taste several well-seasoned legume dishes which provide opportunities to gain an increased appreciation of these economical and nutritious foods.**

General Directions For Preparing Legumes

Prior to Lab

1. Sort, then wash, dried legumes. One cup of dried legumes will yield approximately 2¼ cups after cooking.
2. Use soft water, if possible for soaking and cooking. Allow 2½ to 3 cups of water per cup of legumes. If very hard water must be used, add 1/8 tsp. baking soda per cup of beans.
3. Rehydrate, by either:
    a. soaking legumes overnight in cold water, or
    b. boiling legumes in water, uncovered, for 2 minutes then removing from heat, covering, and soaking for one hour.

During Lab

4. Drain legumes, then cook in fresh water, or in broth according to a specific recipe.
    a. Season cooking water with ½ tsp. salt per cup of dried legumes.
    b. Reduce foaming by adding 1 tbsp. fat per cup of legumes.

When using a pressure saucepan:

- Fill only ⅓ full with water and always add fat (see above) to reduce foaming.
- Cook under 15 lbs. pressure, beginning timing after pressure is reached.
- Bring the saucepan slowly to operating pressure and reduce pressure gradually (do not cool under running water) to avoid mushiness and loss of skins.

5. Continue preparation according to the specific recipe.

Recipes

Hopping John

Ingredients

¼ cup dry black-eyed peas

1 cup vegetable broth

1 Tablespoon vegetable oil

½ cup fresh water

2 Tablespoons long-grain polished rice

1 teaspoon chopped green pepper

2 Tablespoons minced onion

2 Tablespoons chopped cooked ham

⅓ cup condensed cream of mushroom soup

Instructions

Gently boil black-eyed peas in a saucepan with broth, vegetable oil, and fresh water for about 15 minutes.

Add rice and cook 15 minutes until peas are just tender.

Add remaining ingredients and season to taste with salt and pepper.

Bake in a covered one-pint casserole dish at 350°F for 30 minutes.

Edamame with Ginger, Garlic, and Sesame

Ingredients

- 2 Tablespoons water
- 6 oz. frozen, shelled edamame
- 1 Tablespoon extra-virgin olive oil
- ½ medium garlic clove, minced
- ½ medium shallot, minced
- 1 teaspoon rice wine vinegar
- 1 Tablespoon toasted sesame seeds
- ¼ teaspoon toasted sesame oil
- 1 teaspoon grated ginger
- salt & pepper

Instructions

Bring the water to a boil in a large sauté pan over high heat.

Add the frozen edamame and pinch of salt, cover, and cook until the beans have thawed, about 2 minutes. Remove the lid and continue to cook until the water has evaporated and the edamame are heated through, about 2 minutes.

Add the oil, garlic, and shallots, and cook until the shallots are soft, about 3 minutes.

Off the heat, stir in the rice wine vinegar, sesame seeds, and sesame oil, grated ginger and season with salt and pepper to taste.

Lentil Soup

Ingredients

- ¼ cup lentils
- 2½ cup vegetable broth
- ¼ cup chopped onion
- ¼ cup coarsely grated carrot
- ½ teaspoon sugar
- ½ teaspoon dry mustard
- 1 Tablespoon vegetable oil
- 1½ teaspoons vinegar
- Salt to taste

Instructions

Combine all ingredients except salt and vinegar in a saucepan.

Gently boil until lentils are soft, about 25–35 minutes.

Add vinegar and salt to taste.

Chili

Ingredients

- ½ cup dry kidney beans
- 2 cups fresh water
- 1 teaspoon salt
- 1 Tablespoon vegetable oil
- 1 slice bacon, diced
- 2 Tablespoons chopped onion
- ¼ lb. ground beef
- 3 Tablespoons ketchup
- 1 cup tomato juice
- 1 Tablespoon chopped celery
- 1 teaspoon lemon juice
- ½ teaspoon brown sugar
- ¼ teaspoon Worcestershire sauce
- ¼ teaspoon vinegar
- ¼ teaspoon salt
- ⅛ teaspoon dry mustard
- 1–1½ teaspoon chili powder

Instructions

Soak kidney beans. Drain and combine beans, fresh water, salt, and vegetable oil in a pressure saucepan. Cook at 15 lbs. pressure for 18 minutes.

Brown bacon in a sauté pan and then remove. Sauté onion in bacon drippings and then remove. Lightly brown beef, then drain off excess fat.

Return bacon and onion to saute pan, add the remaining ingredients and the drained kidney beans. Simmer covered for 30 minutes, adding more tomato juice if necessary.

Ensalada de Frijoles *(Spanish Bean Salad)*

Ingredients

- 2/3 cup dry garbanzo beans
- 3 cups fresh water
- 1 teaspoon salt
- 1 Tablespoon vegetable oil
- ½ cup commercial sour cream
- 3 Tablespoons mayonnaise
- 1 teaspoon grated onion
- 1 small clove garlic, crushed
- ¼ teaspoon salt
- dash pepper
- 4 cups lettuce (approx. ¼ head) torn into bite-size pieces
- ⅓ cup chopped green pepper
- ½ cup sliced pitted ripe olives
- ½ cup shredded Cheddar cheese

Instructions

Soak beans. Drain and combine beans, fresh water, salt, and vegetable oil in a pressure saucepan. Cook at 15 pounds pressure for 12 minutes.

Combine sour cream, mayonnaise, onion, garlic, salt & pepper. Add garbanzo beans and chill for one hour or more.

Toss together the lettuce, green pepper & olives. Add garbanzo bean mixture & sprinkle with grated cheese.

Split Pea Soup

Ingredients

- ⅓ cup dry split peas
- 2 cups vegetable broth
- 1 Tablespoon oil
- ¼ cup chopped onion
- ¼ cup diced carrots
- ¼ cup diced celery
- 5 rosemary needles, crumbled

Instructions

Gently boil split peas in broth with oil for 20–25 minutes.

Add vegetables and seasoning. Continue to simmer until vegetables are tender, approximately 15–20 minutes more.

Season to taste with salt and pepper.

Black Bean Salsa

Ingredients

- ½ cup dry black beans
- 3 cups fresh water
- ½ teaspoon salt
- 1 Tablespoon vegetable oil
- ¼ cup whole-kernel corn
- ¼ cup Roma tomato, seeded, diced
- ½ small fresh jalapeno pepper, seeded, minced
- 1 Tablespoon fresh lime juice
- 1 Tablespoon garlic, minced
- ¼ cup onion, diced
- ¼ cup green pepper, diced
- ¼ cup red pepper, diced
- 1 Tablespoon vegetable oil
- salt & pepper to taste

Instructions

Soak beans. Drain and combine beans, fresh water, salt, and 1 tablespoon of oil in a pressure saucepan. Cook at 15 pounds pressure for 18 minutes.

Drain and cool beans in the refrigerator for 30 minutes.

Add the remaining ingredients to the serving bowl with beans. Serve with tortilla chips.

Creamy Pinto Bean Dip

Ingredients

- ½ cup dry pinto beans
- 2 Tablespoons vegetable oil (in half)
- 1 ¼ teaspoon salt (divided)
- 2 ¼ cups fresh water (divided)
- ½ cup red onion, chopped
- ½ cup red bell pepper, chopped
- 1 ½ teaspoon red wine vinegar
- ¼ teaspoon black pepper
- 2 garlic cloves, chopped
- 1 teaspoon chili powder
- ¼ teaspoon dried oregano

Instructions

Soak pinto beans. Drain. In a pressure saucepan, combine beans, 1 tablespoon vegetable oil, 1 teaspoon salt, and 2 cups fresh water. Cook for 18 minutes at 15 lbs. pressure.

Heat 1 tablespoon vegetable oil in a sauté pan over medium heat. Add onion, garlic, and bell pepper and cook until softened, 4–5 minutes. Mix in the drained pinto beans and chili powder and cook for an additional minute.

Using a food processor, process the bean mixture, red wine vinegar, dried oregano, 1/4 teaspoon salt, black pepper, and 1/4 cup water until smooth. If the dip is too thick, add more water, a tablespoon at a time, and continue processing until smooth. Serve warm or at room temperature.

Soybean Casserole

Ingredients

- ½ cup dry soybeans
- 1 teaspoon salt
- 1 Tablespoon vegetable oil
- 2 cups fresh water
- 1 strip bacon, diced
- 1 cup diced celery
- 1 Tablespoon chopped onion
- 1 Tablespoon chopped green pepper
- 3 Tablespoons flour
- ¼ teaspoon salt
- 1 cup milk
- ¼ cup fine dry bread crumbs
- 1 Tablespoon melted butter

Instructions

Soak soybeans. Drain. Combine beans, salt, vegetable oil, and fresh water in a pressure saucepan. Cook for 22 minutes at 15 lbs. pressure.

Brown bacon in a sauté pan; remove from pan and crumble.

Sauté celery, onion, & green pepper in bacon fat until tender.

Blend flour, ¼ tsp. salt and milk thoroughly; add to celery mixture and bring to a boil.

Add cooked, drained soybeans and bacon.

Pour mixture into a one-pint baking dish. Blend bread crumbs with butter. Top with buttered crumbs, and bake uncovered at 350°F for 30 minutes.

Tofu with Rice

Ingredients

- ¼ cup long-grain polished rice
- ⅔ cup water
- ⅛ teaspoon salt
- ¼ cup chopped onion
- ¼ cup chopped celery
- ¼ cup sliced fresh mushrooms
- ¼ cup chopped carrots
- 1 Tablespoon vegetable oil
- 8 oz. pkg. tofu, drained & crumbled
- 2 Tablespoons soy sauce
- ¼ cup (2 oz.) shredded cheddar cheese (optional)

Instructions

Put rice, water, and salt in a saucepan; cover with a tight-fitting lid. Bring to a full boil; reduce heat to a very low boil and cook until done,* approximately 15–25 minutes, depending on the variety of rice and temperature. (Add more water if necessary to prevent scorching.) *Rice is done when a kernel pressed between the fingers feels completely soft.

Sauté onion, celery, mushrooms, and carrots in oil.

Combine with cooked rice and all other ingredients except cheese. Place in a greased 1-quart baking dish. Cover the dish and bake at 350°F for 20 minutes.

Uncover and top with cheese; bake for 5 more minutes.

Roasted Red Pepper Artichoke Dip with Tofu

Ingredients

- 1 1/3 cups drained, chopped canned artichoke hearts (or one 13.75oz can)
- ½ cup chopped jarred roasted red pepper
- ¾ cup soft silken tofu
- ¼ cup mayonnaise
- 1 cup shredded parmesan cheese
- 1 cup shredded Italian blend cheese
- 1 Tablespoon + 1 teaspoon minced garlic
- 1/8 teaspoon salt

Instructions

Preheat oven to 375°F. Chop the artichoke hearts and roasted red peppers and place them in a medium-sized mixing bowl.

Measure out tofu, mayonnaise, parmesan cheese, Italian blend cheese, garlic, and salt, place in the mixing bowl with the artichoke hearts and roasted red pepper, and stir until incorporated.

Transfer the artichoke mixture to an ungreased 8 by 8 baking dish, place in the oven, and bake for approximately 40 minutes or until brown and bubbly.

Hummus

Ingredients

- ½ cup dry garbanzo beans
- 2 cups fresh water
- 1 teaspoon salt
- 1 Tablespoon vegetable oil
- 2 garlic cloves
- 3 Tablespoons lemon juice
- ¾ teaspoon kosher salt
- ¼ cup tahini (sesame paste)
- 2-4 Tablespoons reserved liquid from cooking beans
- 4 dashes of hot sauce (or to taste)

Instructions

Soak beans. Drain and combine beans, fresh water, salt, and vegetable oil in a pressure saucepan. Cook garbanzo beans at 15 pounds pressure for 12 minutes.

Turn on the food processor fitted with the steel blade and drop the garlic down the feed tube; process until it's minced.

Add the rest of the ingredients to the food processor and process until the hummus is coarsely pureed. Add reserved liquid until desired consistency. Add hot sauce as needed for seasoning.

Serve chilled or at room temperature.

Sensory Evaluation

Legume Recipe	Legume Ingredient Used	Sensory Observations	Dried Legume Appearance
Hopping John	Black-Eyed Peas (and long-grain rice)		
Chili	Kidney Beans		
Ensalada de Frijoles	Garbanzo Beans/ Chickpeas		
Roasted Red Pepper Artichoke Dip with Tofu	Tofu		
Hummus	Garbanzo Beans/ Chickpeas		
Black Bean Salsa	Black Beans		
Split Pea Soup	Split Peas (dried)		
Creamy Pinto Bean Dip	Pinto Beans		
Soybean Casserole	Soybeans		

5.4 Cereal and Legume Conclusion

1. What other types of rice are there (in addition to the kinds of rice used in this lab)?

2. Why is it nutritionally beneficial to pair cereals and legumes? Think rice and beans or peanut butter and bread.

3. If a consumer is short on time, what other way(s) can they prepare legumes quickly?

6. Fats and Oils

6.1 Fats and Oils Introduction

Before You Come to Lab

Name: _____

Watch the “How to Deep Fry” steps and video posted on Canvas.

1. List the safety precautions for each component when frying.

Watch the “How Batters Work” video on Canvas.

2. What are the two functions of water in a batter?

Watch the “What Are Emulsions?” video on Canvas.

3. List 3–4 everyday food emulsions.

Watch the “Learn to Cook: Making an Emulsion” video on Canvas.

4. When making mayonnaise, what speed should the oil be added to the egg yolk and lemon juice mixture?

Fats and Oils

Many foods we eat contain fats or oils, so it is important to understand the types and uses of fats and oils in food.

- **Purpose:** Fats and oils contribute to the flavor, mouthfeel, texture, and overall palatability of food.
- **Examples:** soybean oil, canola oil, peanut oil, corn oil, olive oil, shortening, butter, margarine, and lard

Terms

- **Lipids**: Umbrella term for fats and oils
- **Oils**: Liquid at room temperature
- **Fats**: Solid at room temperature

Lipids are made up of a **triglyceride backbone** and **three fatty acids**. The types of fatty acids dictate whether the lipid is a fat or oil at room temperature.

Draw a triglyceride here:

- **Saturated or Unsaturated:** the more unsaturated (more double bonds) the fatty acid has, the more likely it will be liquid at room temperature
- **Chain Length (# of carbons):** the longer the chain, the more likely to be a fat at room temperature

Deep Fat Frying

Deep Fat Frying is one way we use oil. It is just as the name implies – food is immersed in hot oil so it cooks quickly.

- Oil is an **efficient cooking medium** because the oil will reach higher temperatures than water — optimum around 375°F for frying, while water maxes out at the boiling point at 212°F.
- Deep-fat-fried food is crisp and/or crunchy on the outside and has a distinct fried flavor.
- Many fried foods are coated with a batter or breading before being fried.
    - A **batter is more liquid in nature, a breading is dry** — both are used to coat a food that cannot be fried alone.
    - High-starch foods (fries) can be fried without a batter or breading.

- **Soybean, corn, and peanut oil** work well for frying because they have a high smoke point.
- **Frying oil deteriorates over time.** Oil becomes darker, thicker, and off-flavors develop. Food absorbs more oil as the oil gets older.

Frying Safety

- Leave oil on the back burner
- Monitor the oil temperature and heating duration
- Be careful when placing food in and removing food from the fryer
  - Use slotted spoons and white paper towels
  - Drain excess oil from food when removing
- Have a baking sheet out to extinguish a fire

Emulsions

Fats and oils are often part of a food or drink containing water. Oil and water do not mix, so emulsions often need to be formed. To start it helps to think about the three dispersion types formed in water.

- **Suspension:** Large particles will separate out in a few minutes. Examples: orange juice with pulp and cream rising in milk.
- **Colloid:** Medium-sized particles, translucent/cloudy, emulsions, etc. Examples: salad dressings, protein in milk.
- **Solution:** Small particles completely dissolved and/or associated with the water molecules. Examples: salt water, sugar water, lactose in milk.

An **emulsifier** is an ingredient with a polar and non-polar end that allows oil and water to mix. Examples include egg yolk (lecithin), whole egg, paprika, and dry mustard.

An **emulsion** is a type of a colloid or colloidal dispersion of one liquid in another, in which liquids are immiscible with each other.

- ***Temporary***: large droplets of oil, separates out quickly, ex. True French Dressing
- ***Semi-Permanent***: medium-sized droplets of oil with a thickening agent, ex. Modified French Dressing and Fruit Salad Dressing
- ***Permanent***: small-size droplets of oil with a strong emulsifier, ex. Mayonnaise and Cooked Salad Dressing

There are two forms of emulsions:

- **Oil in Water Emulsion***:* oil droplets are suspended in the water phase, ex. salad dressing, milk
- **Water in Oil Emulsion***:* water droplets are suspended in the oil phase, ex. butter and margarine

6.2 Deep Fat Frying

Objectives

- **Differentiate between oil and water as mediums of heat transfer.**
- **Identify the qualities a food must possess to be successfully deep oil fried.**
- **Determine the effect of various factors on the absorption of oil: amounts and kinds of ingredients; size and shape of food; length of time food is in oil.**

General Directions for Deep Fat Frying

1. If the frying pan is heated on the range, put it on a back burner for safety. If an electric fryer is used, place it in a safe position where no one can inadvertently catch the cord.
2. Keep a lid or flat baking sheet close to the fryer to extinguish a fire in case the oil should flame. Do not cover the fryer unless the oil ignites.
3. Fill the fry kettle only ⅓ to ½ full with oil.
4. Insert a thermometer and heat oil to the desired temperature.
5. Use a slotted spoon, tongs, or basket, depending on the food, to transfer food into and out of the oil. Do not crowd food. Make sure doughnuts, onion rings, etc., are not more than one layer thick.
6. Hold food over oil to drain excess oil before transferring it to a paper towel.
7. Never leave heating oil unattended! (In case of fire, turn off the burner and place the lid or baking sheet on the fry kettle to smother the flame. Use a wet towel, fire blanket, or fire extinguisher to smother other flames.) Do not use water to extinguish an oil fire.
8. Cool used oil, then pour through a strainer lined with two or three thicknesses of cheesecloth to reuse the oil.

Recipes

French Fried Potatoes

Ingredients

- 3 medium russet potatoes, peeled

Instructions

Cut potatoes into ¼-inch strips (or cut ⅛-inch strips for shoestrings, latticed slices for chips.) Soak potatoes in cold water if they are not fried immediately. Dry thoroughly before frying.

Immerse in 375°F (190°C) oil (oil temperature will drop). Maintain temperature at 365°F (185°C) until well browned and cooked through, about 2–3 minutes. Drain on absorbent paper towels, sprinkle with salt, and serve hot.

French Fried Onion Rings

Ingredients

- 1 large mild onion
- ½ cup milk
- 1 cup flour
- 1 egg, slightly beaten
- ½ cup buttermilk
- 1 cup fine dry bread crumbs

Instructions

Peel onion, cut into ¼-inch slices, and separate into rings.

Dip rings into milk, then flour. Combine egg and buttermilk. Dip floured rings into egg-buttermilk mixture, then coat with crumbs. Place in a single layer on a baking sheet and let stand for 20 minutes.

Fry in 365°F (185°C) oil until golden brown. Drain on absorbent paper towels and sprinkle with salt.

French Fried Chicken

Ingredients

- ¼ lb. boneless breasts cut into strips
- 1 teaspoon salt
- ½ cup flour
- ½ teaspoon paprika

Instructions

Coat chicken with salt, flour, and seasonings. Combine egg and buttermilk, and dip chicken in this mixture and then in crumbs.

Heat oil to 350°F (180°C) and add chicken a few pieces at a time. The temperature will drop; regulate heat to keep frying temperature at 330°F

½ teaspoon dry mustard

½ teaspoon onion powder

½ teaspoon garlic salt

1 egg, slightly beaten

½ cup buttermilk

½ -1 cup fine dry bread crumbs

(165°C). Fry until golden brown, about 6-8 minutes. Drain on absorbent paper towels.

Larger pieces may need to be placed in a 350°F oven to finish cooking. (This may take 10 to 15 minutes; internal temperature needs to reach 165°F.)

Orange Puffs

Ingredients

1 cup flour

1 teaspoon baking powder

½ teaspoon salt

1 egg

¼ cup sugar

Orange Glaze

1 cup powdered sugar

2 Tablespoons orange juice

¼ teaspoon grated orange zest

Instructions

Sift flour, baking powder, and salt together and set aside.

Beat egg until thick and lemon-colored. Add sugar gradually, beating until dissolved. Stir in orange zest and melted butter.

Add approximately half of the flour mixture and stir until moistened. Stir in orange juice and milk. Add remaining flour mixture, stirring just until blended.

Drop by teaspoonfuls into 375°F (190°C) oil and fry for 2 minutes or until the interior of the puff is done. Turn once to brown evenly. Drain on absorbent paper towels. While hot, dip in orange glaze.

For the glaze:
Blend powdered sugar with orange juice and orange zest.

Spiced Donut Balls

Ingredients

- 1⅓ cups all-purpose flour
- 2 teaspoons baking powder
- ¼ teaspoon salt
- ⅓ cup sugar
- ¼ teaspoon nutmeg
- ¼ teaspoon allspice
- ½ cup milk
- 1 egg, slightly beaten
- 1 teaspoon vanilla

Cinnamon-Sugar Mixture

- ½ cup sugar
- 2 teaspoons cinnamon

Instructions

Sift flour, baking powder, salt, sugar, nutmeg, and allspice together.

Combine milk, egg, and vanilla. Then, add liquid to dry ingredients, stirring only until blended.

Drop by teaspoonfuls into 365°F (185°C) oil. Fry doughnut balls for 3 to 5 minutes or until brown on both sides and cooked throughout. Drain on absorbent paper towels.

While still warm, dip in a cinnamon-sugar mixture.

For the Cinnamon Sugar Mixture:

Mix sugar with cinnamon.

Rosettes

Ingredients

- ½ cup flour
- 1 Tablespoon sugar
- ¼ teaspoon salt
- ½ cup milk
- 1 egg, slightly beaten
- 1 Tablespoon butter, melted

Instructions

Combine flour, sugar, and salt.

Beat together milk, egg, and melted butter. Then, mix the wet ingredients with the dry ingredients. Refrigerate for thirty minutes to one hour.

Heat timbale or rosette iron in 365°F (185°C) oil. Let oil drip off the iron back into the kettle. Dip heated iron into batter until ¾ covered. Quickly immerse the iron back in the hot oil. While submerged, use a fork to gently remove the rosette from the iron.

Fry briefly, flip over and remove when delicately brown. Hold the rosette upside down over the fry kettle to drain, and then place it on absorbent paper towels. Keep iron in oil to remain pre-heated. Stir batter occasionally.

Sift powdered sugar over rosettes.

Funnel Cakes

Ingredients

- 1 ½ cups milk
- 2 eggs
- ½ teaspoon vanilla extract
- 2 cups flour
- 1 teaspoon baking powder
- 2 Tablespoons sugar
- ½ teaspoon salt
- 3/4 cup powdered sugar for dusting

Instructions

Heat oil to 375°F (191°C).

For the batter:

In a large bowl, beat together the milk, eggs, and vanilla extract. Sift together the flour, baking powder, sugar, and salt. Stir the sifted dry ingredients into the liquid ingredients until a smooth batter forms.

To form the funnel cakes:

Fill a funnel or pancake dispenser with the batter. Start dispensing the batter in the center of the fry kettle and use a swirling motion to dispense the batter in concentric and overlapping circles to make a 6- or 7-inch round.

Fry on both sides until golden brown, approximately 2 minutes per side. Remove from the fry kettle and let drain on paper towels. Sprinkle with powdered sugar and serve warm.

Vegetable Tempura

Ingredients

- Broccoli florets
- Cauliflower florets
- Green pepper strips
- Sweet potatoes cut into ⅛-inch slices
- Onion rings

Tempura Batter

- ⅓ cup all-purpose flour
- 1 Tablespoon + 1 teaspoon cornstarch
- ¼ teaspoon baking powder
- ¼ teaspoon salt

Instructions

Select vegetables from the list. Cut into bite-sized pieces; pat dry if necessary.

Heat oil to 375°F (190°C). Dip vegetable pieces into tempura batter; allow excess batter to drip back into the bowl. Fry a few pieces at a time until golden brown, turning once. Drain on absorbent paper towels. Serve with tempura sauce.

For the Tempura Batter:
Sift flour, cornstarch, baking powder, and salt until well blended. Beat egg and water until smooth. Add dry ingredients to liquid ingredients and stir just until ingredients are blended; refrigerate the batter for thirty minutes to one hour before using.

1 egg

⅓ cup ice water

Tempura Sauce

¼ cup chicken broth

¼ cup soy sauce

¼ cup water

1 teaspoon sugar

For the Tempura Sauce:

Combine all ingredients in a saucepan. Heat to serving warm temperature.

Eggrolls

Ingredients

¼ pound ground pork

3 Tablespoons chopped green onions

¼ head green cabbage

1 carrot, grated

1 Tablespoon soy sauce

1 teaspoon grated fresh ginger

1 egg, blended

1 package egg roll wrappers

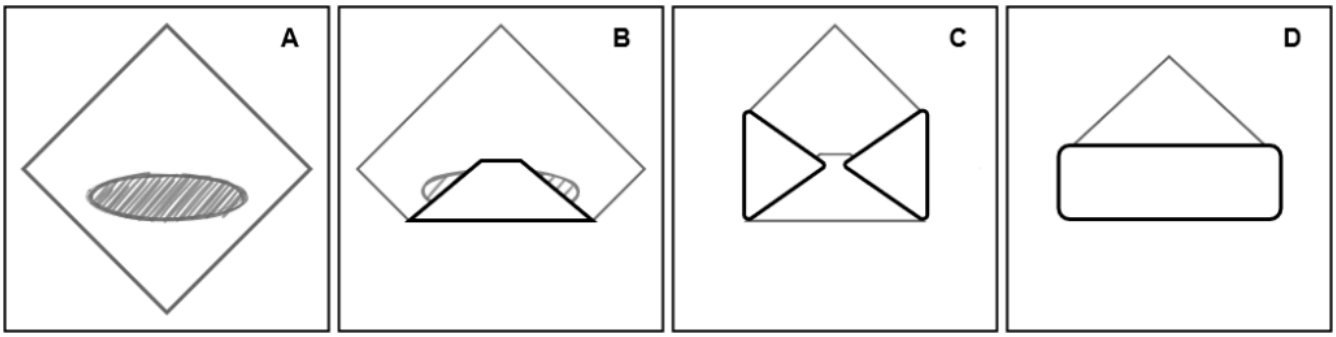
Instructions

Combine meat, onions, and vegetables.

Sauté in a large sauté pan or in two medium sauté pans. Add soy sauce, ginger, and egg. Mix and heat thoroughly.

Place 1–3 tsp. of the mixture in each square of egg roll paper. Dampen two opposite corners and fold to form a triangle. Fold two narrow ends together and press tightly to hold the filling inside.

Fry in deep fat at 375°F for 4–5 minutes to golden brown. Drain and serve hot.



A. Place filling in the middle diagonally on the wrap. B. Fold the bottom corner over the filling; roll snugly halfway to cover the filling. C. Fold in both sides snugly against the filling; moisten the edge of the last flap. D. Roll wrap up and seal the top corner; lay flap-side down until ready to cook.

Characteristics of Standard Products for Deep Oil Fried Foods

Appearance	Texture	Flavor
The outside surface should be relatively smooth and cooked to a uniform golden brown color. The interior should be cooked throughout and show minimum oil absorption.	The crust should be tender and/or crisp (not soggy).	Products should be free from any greasy flavor or mouthfeel.

Sensory Evaluation

Recipe	Sensory Observations
Funnel Cakes	
Orange Puffs	
Spiced Doughnuts	
Rosettes	
Onion rings	
Chicken	

Recipe	Sensory Observations
Egg Rolls	
Tempura	
French Fried Potatoes	

6.3 Salad Dressings and Emulsions

Objectives

- **Discuss the principles of emulsion formation.**
- **Identify various emulsifying agents and determine their effect on the viscosity and permanency of the emulsion.**

Prepare salad dressing according to the recipes below.

Recipes

True French Dressing *(temporary emulsion)*

Ingredients

¼ teaspoon dry mustard

¼ teaspoon paprika

¼ teaspoon sugar

2 Tablespoons apple cider vinegar

¼ teaspoon salt

dash black pepper

¼ cup vegetable oil

Instructions

Place all ingredients in jar and shake well just before serving.

Modified French Dressing *(semipermanent emulsion)*

Ingredients

- ½ teaspoon gelatin
- 2 teaspoons cold water
- 1 Tablespoon boiling water
- ½ teaspoon dry mustard
- ½ teaspoon paprika
- 1½ teaspoon sugar
- ½ teaspoon salt
- dash cayenne pepper
- ½ cup vegetable oil (chilled)
- 2 Tablespoons vinegar or lemon juice

Instructions

In a custard cup, hydrate gelatin in 2 teaspoons of cold water. In a liquid measuring cup, heat 1 tablespoon of water in the microwave (20-30 seconds to boil).

Add boiling water to the hydrated gelatin and stir. Cool to lukewarm.

Mix remaining dry ingredients together and add to oil. Add vinegar or lemon juice. Beat for 5 minutes with an electric mixer.

Add gelatin and beat for 5 more minutes.

Chill for about 10 minutes in the refrigerator and beat again for 5 minutes.

Fruit Salad Dressing *(semipermanent emulsion)*

Ingredients

- ⅓ cup sugar
- 2 teaspoons paprika
- 1 Tablespoon flour
- 2 teaspoons dry mustard
- ⅓ cup vinegar
- 2 teaspoons lemon juice
- ⅔ cup vegetable oil
- 2 teaspoons celery seed
- 2 teaspoons grated onion

Instructions

Combine dry ingredients in a saucepan. Add vinegar. Cook until thick.

Cool to room temperature; stir in lemon juice.

Add oil in a slow stream, beating with an electric mixer for 5 minutes.

Add celery seed and grated onion, and beat with an electric mixer for 5 more minutes.

Mayonnaise Dressing *(permanent emulsion)*

Ingredients

- ½ teaspoon sugar
- ¼ teaspoon salt
- ½ teaspoon dry mustard
- 1 pasteurized egg yolk (2 Tablespoons)
- 1½ teaspoons vinegar or lemon juice
- ½ cup vegetable oil

Instructions

In a small mixing bowl, combine dry ingredients, egg yolk, and vinegar; beat until well mixed.

Add ½ tsp. oil and beat vigorously with an electric mixer*. Continue adding oil, doubling the amount at each addition and beating vigorously after each addition.

*Larger recipes may be prepared in a blender.

Cooked Salad Dressing *(permanent emulsion)*

Ingredients

- 1 Tablespoon + 1 teaspoon cornstarch
- 2 Tablespoons sugar
- ½ teaspoon salt
- ½ teaspoon dry mustard
- ¼ cup + 2 Tablespoons water
- 1 Tablespoon vinegar
- ¼ cup pasteurized whole egg
- ½ cup vegetable oil

Instructions

In a saucepan, mix dry ingredients; gradually add water and vinegar. Heat. Boil for one minute.

Pour into a blender and cool to approximately 55^{o}C so that egg protein will not coagulate. Add egg and blend until smooth.

Add oil gradually while the blender is running. Continue blending until the mixture is thick. Scrape the sides of the blender as needed to make sure all ingredients are incorporated.

Evaluation of Emulsions

Name of Emulsion	Type of Emulsion	Emulsifying Agents	Size of Oil Globules	% Oil	Viscosity	Stability	Flavor
True French Dressing							
Modified French Dressing							
Fruit Salad							
Mayonnaise							
Cooked Salad Dressing							

6.4 Fats and Oils Conclusion

1. What happens when you overload the fryer, especially when frying potatoes for French fries?

2. What happens when you fry doughnuts in oil that has already been used to fry onion rings?

3. Why is it important to add the oil slowly when making mayonnaise or cooked salad dressing?

4. Why is milk homogenized?

Protein Chart

Fill out this chart as you work through the protein lab weeks.

Protein Type	Proteins Present	Products From Lab	Denaturation/ Coagulation	Notes
Milk				
Cheese	Casein Whey			
Whole Eggs				
Egg Foams				
Tender Meat				
Less Tender Meat				

7. Dairy Foods

7.1 Protein and Dairy Introduction

Before You Come to Lab

Name: _____

Watch the parmesan cheese video on Canvas. Then, order the following cheese-making steps from beginning to end.

___ Heat milk and add the enzyme, rennet. Let sit.

___ Ripen or age the cheese up to 2 years.

___ Press and mold the cheese.

___ Separate the curds from the whey.

___ Salt brine the cheese wheels (1 month).

___ Cut into curds.

Protein Basics

Proteins are made up of amino acids. Understanding the structure of proteins helps explain the functions of a variety of proteins in food.

- **Primary Structure**: Amino acids linked together with peptide bonds.
  - **Peptide bonds** are covalent (strong) bond between the acid group of one amino acid and the amino group of another amino acid.
- **Secondary Structure** has a three-dimensional organization, that can include a helical structure, pleated sheet, or a random coil.
  - The amino acid chain forms the 3-D structure to get to its lowest energy state.
  - Bonding forces are mainly weak and include hydrogen bonds, van der Waals forces, and disulfide bridges.

- **Tertiary Structure** is a more complex 3-D Structure and can form as globular proteins or fibrous proteins.
  - The orientation of amino acids for a protein in a water system would be hydrophobic on the interior and hydrophilic on the exterior.
  - Bonding forces are weak and include hydrogen bonds and van der Waals forces.
- **Quaternary Structure** is a large protein molecule formed by ~4 polypeptide chains.
  - Bonding forces are again weak and include hydrogen bonds and van der Waals forces.

Changing protein structure

Protein structure can change through denaturation, coagulation, and hydrolysis.

Denaturation is a physical change altering the 3-D structure and properties of proteins.

- Breaking of hydrogen bonds
- Disruption of van der Waals forces
- Unfolding of tertiary structure
- Different side chain groups become exposed
- No change in primary structure (amino acid sequence)

Coagulation is the next step after denaturation and is a further physical change to the protein.

- Clumping together of denatured protein molecules to form an insoluble protein mass
- May be desirable or undesirable

Proteins can denature and coagulate due to heat, beating or physical manipulations (egg whites), and even freezing. Proteins can also denature and coagulate due to the addition of acid and the protein reaching its isoelectric point.

The **isoelectric point** is the pH at which the protein has a neutral charge and is least soluble.

- Number of positive charges = number of negative charges
- Protein molecules — unstable
- Form curds or precipitate
- Wanted with cheese, not with tomato soup!

Hydrolysis is the breaking of peptide bonds to form smaller peptides.

- Alters primary structure
- Most commonly done by enzymes such as rennet — to make cheese

Dairy Products

Most dairy products in the United States are made from cow's milk. There are many products that are classified by fat content and if they have been cultured. See the dairy recipes for sensory evaluation of a variety of dairy products.

Milk is also used to make cheese. Here are helpful definitions to have in order to understand the cheese-making process and cheese types.

Cheese Making Definitions

- **Casein Protein**: curd, denatured by acid, not heat
- **Whey Protein**: denatured by heat, not acid
  - **Gjetost**: Goat cheese made from the whey, 43% Lactose
- **Acid Coagulated**: i.e. "souring" Acid coagulation. Hydrogen displaces Calcium, lost in whey. Soft curd. i.e. cottage cheese
- **Rennin (or enzyme) Coagulated**: Enzyme that coagulates milk, cleaving proteins at specific points enables the retention of Calcium. Tougher curd.
- **Ripening (Changes)**: Stronger flavor profiles, less moisture, smaller protein chains.
- **Process Cheese**: Cheese is melted and mixed with an emulsifier to improve melting characteristics

7.2 Dairy Products and Cookery

Objectives

- **Compare the appearance, texture, and flavor as well as compositional differences among various types of milk products.**
- **Demonstrate some of the basic concepts of protein cookery.**

Describe the distinguishing sensory properties of each of the following dairy products.

Dairy Product	Components/ Characteristics	Sensory Observations Made in Lab
Skim milk	0–0.5% fat	
Low-fat milk	0.5–1% fat	
Reduced fat milk	1–2% fat	
Whole milk	3.25% fat	
Half & Half	10–12% fat	
Whipping cream — heavy	36–40% fat	

Dairy Product	Components/ Characteristics	Sensory Observations Made in Lab
Solid Fat		
Butter	80% milk fat	
Margarine	80% vegetable fat	
Canned and Processed		
Evaporated milk	7.5% protein “concentrated milk”	
Sweetened condensed milk	8.5% protein + 44% sugar added	
Nonfat dry milk	0–0.5% fat, water removed	
Cultured		
Yogurt	0–3.5% fat, varies by type	
Kefir	Cultured by yeast & bacteria making it practically lactose-free	
Buttermilk	0–1% fat, cultured	
Sour Cream	18–20% fat, cultured	

Prepare Cream of Tomato Soup

Cream of Tomato Soup

Ingredients

½ cup tomato juice

½ teaspoon sugar

dash pepper

small piece of bay leaf

White Sauce

1 teaspoon celery, chopped fine

1 teaspoon onion, chopped fine

½ teaspoon green pepper, chopped fine

2 teaspoons cornstarch

dash salt

½ cup milk

Instructions

Simmer tomato juice, sugar, pepper, and bay leaf for five minutes. Remove the bay leaf.

In a separate saucepan, prepare the white sauce. Sauté celery, onion, and green pepper in butter. Blend in cornstarch and salt; remove from heat. Add milk, stirring to blend, return to heat, and stir gently while heating to a full boil.

Slowly stir hot tomato juice into the hot white sauce.

Serve immediately.

Sensory Evaluation

Product	Appearance	Texture	Flavor
Cream of Tomato Soup			

Effects of Dry Heat on Mild, Extra Sharp, and Process Cheddar Cheeses

Prepare each of the dishes according to the recipes below, using mild, sharp, and process Cheddar cheeses. Weigh cheese for each recipe.

Grilled Cheese

Use 2 slices of cheese for each sandwich: mild, extra-sharp, or process Cheddar cheese

1. Taste unheated cheese samples and record observations in the chart below.
2. Place 1.5-2 slices of cheese between two pieces of bread.
3. Heat 1 tablespoon butter in a saute pan over medium-low heat.
4. Press the sandwich slightly and place it in the saute pan. Cook until golden on the bottom, 3 to 5 minutes.
5. Turn, and cook until the other side is golden and the cheese melts, 3 to 5 more minutes.
6. Record observations in the chart.

Evaluation: Effects of Heat on Mild, Extra-Sharp, and Process Cheeses

Note differences in fat separation, flavor, tenderness, and stringiness.

	Mild Cheddar	Extra Sharp Cheddar	Process Cheddar
Grilled cheese sandwich			

Macaroni and Cheese

Ingredients

⅔ cup uncooked macaroni

3 cups water

1 teaspoon butter

2 Tablespoons dry bread crumbs

Cheese Sauce

1 Tablespoon butter

1 Tablespoon flour

1/8 teaspoon salt

1 cup milk

3 oz. shredded Cheddar cheese

Instructions

Preheat a water bath filled half full in a 350°F oven.

Cook macaroni in boiling salted water until almost tender. Drain macaroni.

Prepare Cheese Sauce:

Melt butter in a saucepan. Blend in flour and salt; remove from heat. Add milk, stirring to blend; return to heat and stir gently while heating quickly to a full boil. Remove from heat. Wait 45 seconds, and blend the cheese into the sauce.

Stir macaroni into the cheese sauce. Place mixture into a 1-pint baking dish. Melt 1 tsp butter, mix with crumbs, and sprinkle over the top.

Set the baking dish in the preheated water bath and bake uncovered at 350°F for 30 minutes.

Evaluation: Appearance, Flavor, and Texture of Each Macaroni and Cheese

Product	Mild Cheddar	Extra Sharp Cheddar	Process Cheddar
Macaroni and Cheese			

7.3 Cheese Varieties

Objectives

- **Apply principles of cheese cookery from previous labs in preparing various cheese dishes.**
- **Identify the distinguishing characteristics of a variety of cheeses and cheese products.**

Natural Cheeses and Cheese Blends

Note the distinguishing characteristics and compositional differences of cheeses in the categories on the following pages. Then use the types to compare cheese during the Cheese Sampling.

Type	*Description*
Process Cheese Blends	**Process Cheese** is made by grinding or mixing together by heating and stirring one or more cheeses of the same or different varieties. An emulsifying agent is then blended into the mixture. Small amounts of acid, cream, water, and spices or flavorings may be added. **Example:** Deluxe American Process Cheese **Analysis:** £ 40% moisture,[3] 32% fat for process Cheddar cheese
Cheese Food	**Cheese Food** is made the same way as the cheese (process or cold pack) except that milk, skim milk, cheese whey or whey albumin, or their concentrates, may be added, as well as acid, water, spices, or flavorings. **Example:** **Analysis:** £ 44% moisture,[3] 23% fat.
Process Cheese Spread	**Process Cheese Spread** is made the same way as process cheese food except that it may contain stabilizers, more moisture, and less fat, and must be spreadable at 70°F. **Example:** Cheese Whiz **Analysis:** £ 44–60% moisture,[3] 20% fat for process Cheddar Cheese.
Cheese products	**Cheese products** that do not meet any of the standards listed above may be labeled "imitation cheese" or "cheese products." **Example:** boxed Velveeta

Type	Name	% Fat*,**	% Moisture*	Distinguishing Characteristics
Soft, unripened	Cottage	4	80	Acid coagulated (small curd)
	Cream	35	54	Acid coagulated
	Neufchatel	23	62	Acid coagulated
Firm, unripened	Gjetost	30	13	Goats' milk, whey cheese 44% lactose
	Mozzarella	22	50	Stretched curd
Soft, ripened 1–2 months	Camembert	24	52	Mold and bacteria ripened
	Limburger	27	48	Yeast and bacteria ripened
Semisoft, ripened 1½–4 months	Havarti	36	42	Cows' or buffaloes' milk, enzyme coagulated, small openings ('eyes')
	Feta	21	55	Sheep's milk, stored in salt brine, open texture
	Muenster	30	42	Yeast and bacteria ripened
Firm, ripened 1–12 months or more	Cheddar	33	37	Bacteria ripened
	Colby	32	38	Open texture, bacteria ripened
	Edam	28	42	Bacteria ripened
	Gouda	27	41	Bacteria ripened
	Provolone	27	41	Stretched curd smoked
	Swiss	27	37	Gas forming bacteria ripened
Alpine Style	Prairie Breeze			Characterized by crystals in the cheese and a sweet, nutty flavor
Ripened 5 months to 2 years	Parmesan	26	29	Very hard, granular, must be grated
	Romano	27	31	Very hard, granular, must be grated
Blue-vein mold-ripened 2–12 months	Blue	29	42	Blue mold cheese from cow's or goats' milk
	Roquefort	31	39	Blue mold cheese from ewes' milk, made in Roquefort, France

*From **Composition of Foods. Dairy and Egg Products; Raw, Process, and Prepared.** agr. Handbook No. 8-=1, 1976. pp. 1-33

**Cheeses labeled "reduced fat" must, like any other food, contain at least 25% less fat than that standard for the cheese.

Cheese Sampling

Help prepare cheese samples as assigned.

Sensory Observations

Cheese Curds:

- Place a cheese curd in each 2 oz sample cup.
- No pairing or type; curd formation is the start of most cheeses, so this is a good place to start

Sensory Observations:

Cream Cheese, Type: _____

- Combine 4 oz cream cheese with 3 T fresh chives and 1 T chopped olive
- Portion 1–2 tsp in each 2 oz sample cup
- Add a bagel chip or pita chip to each portion before serving.

Sensory Observations:

Gjetost with sliced apples, Type: _____

- Place a small piece of gjetost in each 2 oz sample cup.
- Serve with 1 Granny Smith and 1 sweeter apple (Gala, Braeburn, Honey crisp, etc).
- Slice apples right before serving and place 1 slice of each apple in each cup.

Sensory Observations:

Camembert with praline topping, Type: _____

- Praline Topping Recipe
  - ¼ cup dark brown sugar
  - 2 tbsp butter
  - 1 tbsp light corn syrup
  - ¼ c heavy whipping cream
  - ½ cup chopped walnuts
- Heat sugar, butter, and corn syrup in a saucepan over low heat. Simmer for 3 minutes; stir in the walnuts. Store in a plastic container.
- Place a small wedge of camembert in each 2 oz sample cup. Add ~1 teaspoon praline topping to each cup.

Sensory Observations:

Havarti with caramelized onions, Type: _____

- Melt 1 tablespoon butter in a saucepan, sauté 1 onion until caramelized, about 30 min. Store in a plastic container.
- Place a small piece of havarti in each 2 oz sample cup. Add ~1 teaspoon of caramelized onion to each cup.

Sensory Observations:

Gouda with fig jam, Type: _____

- Place a bite-size piece of Gouda and ~1 teaspoon of fig jam in each 2 oz sample cup.

Sensory Observations:

Prairie Breeze Alpine Style cheese with chocolate-covered almonds, Type: _____

- Place a bite-size piece of Prairie Breeze plus a chocolate-covered almond in each 2 oz sample cup.

Sensory Observations:

Parmesan with tomatoes, Type: _____

- 3 tomatoes, chopped, combined with 2 tablespoons olive oil and a small amount of salt. Store in a plastic container.
- Place a bite-size piece of parmesan in each 2 oz sample cup.
- Top with chopped tomato mixture and drops of balsamic vinegar right before serving.

Sensory Observations:

Maytag blue with toasted hazelnuts and honey, Type: _____

- Toast raw hazelnuts in 350°F oven for 8–12 minutes, until lightly brown; remove skins (if any)
- Place a small piece of blue cheese in each 2 oz sample cup. Add 2 roasted hazelnuts and ~1 teaspoon honey to each cup.

Sensory Observations:

7.4 Dairy Conclusion

1. When do you want coagulation to happen and not happen in dairy products?
    a. Good coagulation:

    b. Unwanted coagulation:

2. What type of cheese should you use in a grilled cheese or macaroni and cheese if melting is a priority?

3. What happens to cheese flavor and texture as it ages?

8. Eggs

8.1 Egg Introduction

Before You Come to Lab

Name: _____

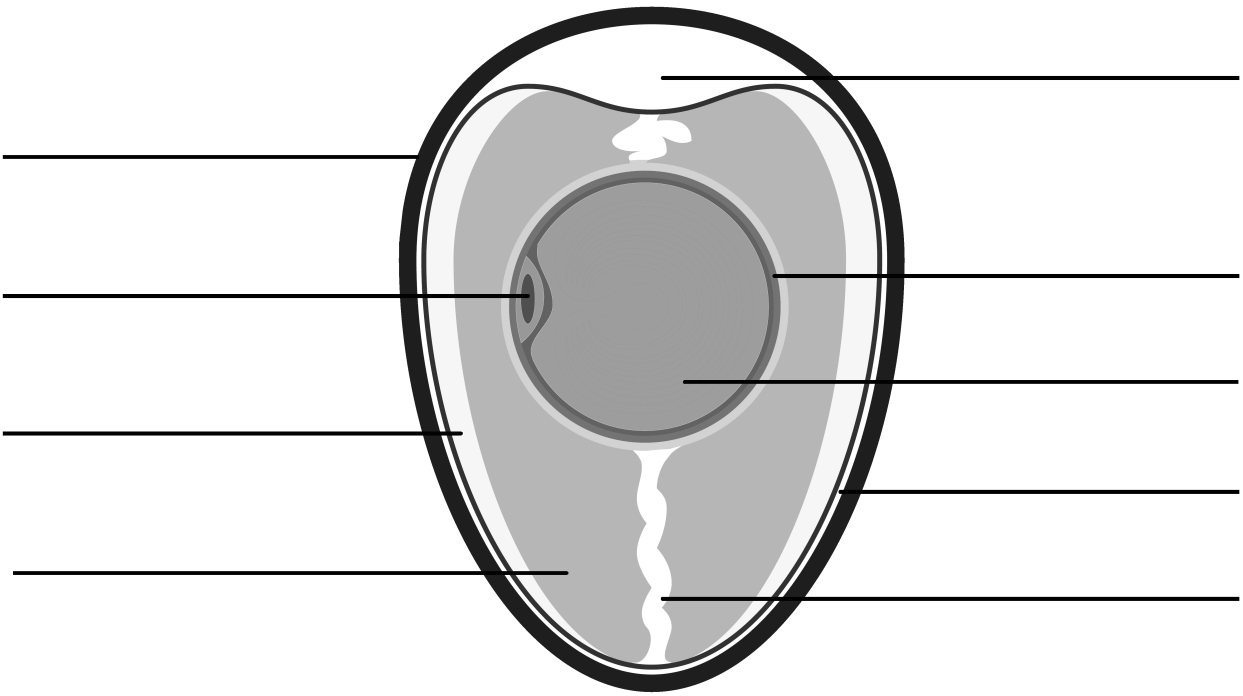
Watch the “Food Lab: How to Make a Perfect Poached Egg” video posted on Canvas.

1. Explain how to make a poached egg based on the steps in the video.

Egg Composition

To start learning about eggs, it is helpful to understand egg composition and components.

Component	Whole Egg	Egg White	Egg Yolk
Weight	55 grams	38 grams	17 grams
Protein	12%	10%	16%
CHO, carbs	Trace	Trace	none
Fat	11%	None	35%
Cholesterol	213 mg	None	213mg
Calories	84 cal	20 cal	64 cal



Fill in the diagram with the given terms:

- shell
- germinal disk
- thick white
- thin white
- membrane
- yolk
- chalaza
- vitelline membrane
- air cell

Observe the Effects of Storage Time and Temperature Upon Fresh Eggs

Condition	Appearance of Yolk	Appearance of White	Air Cell Size
Fresh			
Stored for two weeks in a refrigerator			
Stored for two weeks at room temperature			

Food Safety of Eggs

It is important to cook eggs fully before consuming them. The main risk is getting sick from salmonella.

- **Crack eggs on a flat surface** to avoid shell pieces getting into bowls or pans.
- Do not eat raw cookie dough or lick cake batter off of the beaters.
- Consume cooked egg products promptly or refrigerate for 2–3 days.

When eggs are cooked, the egg proteins will denature and coagulate. This can be seen in fried eggs, poached eggs, omelets, scrambled eggs, and hard-cooked eggs. The goal is typically to coagulate the proteins without overcooking, which can result in tough, rubbery, and dry eggs.

Eggs are used to thicken custards. **Custards** can either be stirred or baked and are made up of eggs, milk or cream, and sugar.

8.2 Eggs: Custards

Objectives

- **Determine the influence of sugar, dilution, amount of stirring, and rate of heating on the coagulation temperature of egg protein.**
- **Demonstrate that stirring custards during coagulation results in a sol, and that baking a custard without stirring results in a gel.**
- **Use the standard procedure for preparing stirred and baked custards.**

Procedures

Baked and Stirred Custards: **One recipe** of the custard mix will be divided to make one baked custard and a stirred custard sauce from the same mix.

Preheat oven to 375°F and prepare pans:

For the baked custard

Prepare a water bath for the baked custard by putting a custard cup on a wire rack in a pan of very hot water. Water in the pan should be nearly the same depth as the custard in the cup.

For the stirred custard

Prepare the double boiler by pouring only enough water into the lower pan of the double boiler so that the top pan will not touch the water. Bring the water to a boil, and then adjust the heat to maintain simmering temperature.

Custard Mix

Ingredients

- 2 cups milk
- 2 or 3 eggs
- ¼ cup sugar
- ⅛ teaspoon salt

Instructions

To speed up preparation, heat milk to 75°C.

Break eggs into a custard cup one at a time. Remove chalazae with a fork or clean fingers. Beat eggs in a medium or large bowl with a whisk, just enough to blend yolk and white but not enough to form a foam. Add sugar and salt and blend. Stir in warmed milk.

Proceed to cook custard—baked or stirred custard sauce.

Baked Custard

Ingredients

- 2 cups milk
- 2 or 3 eggs
- ¼ cup sugar
- ⅛ teaspoon salt

Instructions

Fill one custard cup with custard mix (approximately ½ cup mix). Add ⅛ tsp. vanilla.

Set the custard in the preheated water bath and bake until no custard sticks to a clean metal knife inserted ½ inch under the surface near the center of the cup. The minimum baking time is 1 hour for the 2-egg recipe and 50 minutes for the 3-egg recipe.

When the custard tests done, remove it from the hot water and chill in ice water. Unmold the chilled custard onto a plate for serving.

Stirred Custard Sauce

Ingredients

- 2 cups milk
- 2 or 3 eggs
- ¼ cup sugar
- ⅛ teaspoon salt

Instructions

Heat the water in the bottom of the double boiler to a simmer. Prepare an ice bath in a large bowl with ice and water. Then, nestle a medium-sized bowl into the ice water.

Cook the remaining custard mix in the top of the double boiler over simmering water, stirring constantly with a rubber spatula. When stirring,

be careful to remove the custard from the sides of the pan. While the custard is cooking, chill a bowl in ice water.

Continue cooking the sauce until the mixture forms a coating on a clean metal spoon **(82–84°C for the 2-egg recipe and 77–79°C for the 3-egg recipe)**.

Cook slowly. (Try the spoon coating test on the uncooked sauce so that the change in consistency can be recognized.) The thickness will be similar to a thin white sauce.

Immediately pour the finished custard into the chilled bowl and blend in ¼ tsp. vanilla. Continue stirring until custard is cooled (steam stops rising).

Applied Custard Recipes

Creamy Eggnog

Ingredients

- 3 egg yolks
- 1¼ cups milk
- 3 Tablespoons sugar
- ½ cup heavy cream
- ½ teaspoon vanilla

Instructions

Heat the water in the bottom of the double boiler to a simmer. Prepare an ice bath in a large bowl with ice and water. Then, nestle a medium-sized bowl into the ice water.

Whisk together egg yolk, milk, and sugar. Cook while constantly stirring in the top of the double boiler until the mixture reaches 77°C.

Remove from heat and pour into a bowl placed in an ice bath. Once cool, add the heavy cream and vanilla. Mix together. Cover and chill until ready to serve.

Chocolate Pot de Crème

Ingredients

- 1½ cups heavy cream
- ¾ cup semi-sweet chocolate chips
- ¼ cup sugar
- ¼ cup egg yolk, pasteurized
- ¾ tsp vanilla

Instructions

In a double boiler, mix together heavy cream, chocolate chips, and sugar. Cook while constantly stirring until all of the chocolate melts and the mixture reaches approximately 85°C. Remove from heat.

In a small bowl, whisk together the pasteurized egg yolk and vanilla extract.

While whisking, slowly add the hot chocolate mixture into the egg yolk. Place pot de crème in an ice bath to cool before serving.

Lemon Curd

Ingredients

- 3 eggs
- 2/3 cup sugar
- 1/8 tsp salt
- 1/2 cup fresh lemon juice (2–3 lemons)
- 2 teaspoons lemon zest
- 6 Tablespoons butter, softened to room temperature
- 1/2 tsp vanilla

Instructions

Fill the bottom pot of your (shiny, newer-looking) double boiler with ~2 inches of water. Place on medium-high heat. Once the water begins to boil, reduce to medium-low heat to keep the water at a simmer.

Prepare an ice bath in a large bowl with ice and water. Then, nestle a medium-sized bowl into the ice water.

Break eggs into a custard cup one at a time. Remove chalazae with a fork. Beat eggs in a medium or large bowl with a whisk, just enough to blend yolk and white but not enough to form a foam. Add sugar and salt and blend. Stir in lemon juice and zest.

Place the mixture in the top pot of the double boiler and add the butter in chunks. Whisk while heating the lemon curd mixture. Heat the mixture until it reaches 77–79°C. Use the infrared thermometer to measure temperature (ask for help on how to use it before you start).

Remove pan from heat. Immediately pour the lemon curd into the chilled bowl and blend in 1/2 tsp. vanilla. Continue stirring until the lemon curd is cooled (steam stops rising). Place the bowl in the fridge to finish cooling before serving.

Crème Brûlée

Ingredients

- 2/3 cup half & half
- 2 Tablespoons sugar
- 2 egg yolks
- ½ teaspoon vanilla
- 2-4 teaspoons sugar

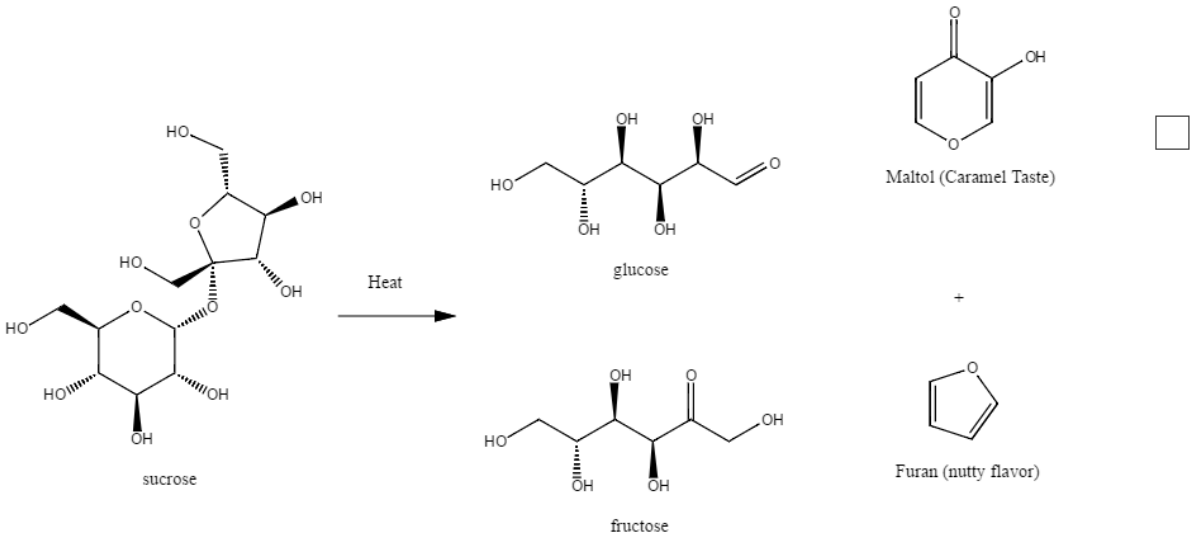
Instructions

Preheat oven to 350°F. Place two water baths with racks in the oven while it is preheating, filled approximately half full with hot water.

In a small saucepan, heat half & half and 2 tablespoons of sugar over medium heat until the mixture reaches approximately 80°C. Remove from heat.

In a small bowl, whisk together the egg yolks and vanilla extract. While whisking slowly, add the hot half & half and sugar into the egg mixture. Pour mixture into two 1-pint baking dishes and place one dish in each of the hot water baths.

Bake for 45–55 minutes until a knife inserted comes out clean. Remove from oven and the hot water baths. Place the 1-pint baking dishes in an ice bath to cool rapidly. Sprinkle 1-2 teaspoons of sugar on top of each of the crème brûlée cups. Ask the instructor to help broil the sugar on top.



This is the reaction that occurs when broiling the sugar layer on the crème brûlée.

Flan

Ingredients

- ½ Tablespoon caramel sauce (instead of caramelizing sugar on the bottom)
- ½ cup milk
- 2 Tablespoons sugar
- 1 egg (remove chalaza)
- ½ tsp vanilla

Instructions

Preheat oven to 350°F. Place two water baths with racks in the oven while it is preheating, filled approximately half full with hot water.

Spread 1–2 teaspoons of caramel sauce into the bottom of each of two custard cups.

In a small saucepan, heat milk and sugar over medium heat until the mixture reaches approximately 80°C. Remove from heat.

Meanwhile, in a small bowl, whisk together egg and vanilla extract. While whisking, slowly add the hot milk and sugar into the egg mixture. Pour mixture into 2 custard cups and place one cup in each of the hot water baths. Bake for 45–55 minutes until a knife inserted comes out clean. Remove from oven and the hot water baths. Place the custard cups in an ice bath to cool rapidly. Once cool, run a knife around the custard and invert it onto a plate to serve.

Pumpkin Custard

Ingredients

- ¼ cup + 2 Tablespoons sugar
- ¼ teaspoons salt
- ½ teaspoon cinnamon
- ¼ teaspoon ginger
- 1/8 teaspoon cloves
- 1 egg
- ¾ cup canned pumpkin puree
- ¾ cup evaporated milk

Instructions

Preheat oven to 350°F. Mix dry ingredients together in a small bowl (sugar, salt, cinnamon, ginger, and cloves) and set aside.

Crack an egg into the mixing bowl and remove the chalazae. Then, beat the egg briefly. Stir in pumpkin puree, evaporated milk, and dry ingredients.

Pour mixture into 4 custard cups. Put in a square pan and add hot water. Bake for 45–55 minutes until the custard sets. Remove from the hot water bath and cool on ice before serving.

Sensory Evaluation

Product	Appearance	Texture	Flavor
2-Egg Stirred Custard			
3-Egg Stirred Custard			
2-Egg Baked Custard			
3-Egg Baked Custard			
Egg nog			
Chocolate Pot de Creme			
Lemon Curd			
Crème Brûlée			
Flan			
Pumpkin Custard			

8.3 Eggs: Quality and Cookery

Objectives

- **Apply principles of protein coagulation in egg cookery.**
- **Determine the effects of various time-temperature treatments on the characteristics of coagulated egg proteins.**
- **Identify characteristics of high-quality egg products.**
- **Identify signs of deterioration in stored eggs.**

Recipes

Fried Eggs

A. Large amount of fat

Melt 1 tbsp. butter in a non-stick skillet. Carefully slip the egg into the skillet. Cook slowly, basting (pour hot fat over the egg with a spoon) frequently, until done.

B. *Small amount of fat*

Melt 1 tsp. butter in a non-stick skillet. Carefully slip the egg into the skillet. Add 2 tsp. water and cover. (Steam helps to coagulate the white over the yolk.) Cook over low heat until done, approximately 3 minutes.

Poached Eggs

Fill the bottom of a small saucepan with enough water to cover the egg. Do not salt water. Heat to simmering. Break one egg into a custard cup and slip the egg into the water. If poaching more than one egg, tip the dish so that the egg slides toward the edge of the pan rather than toward the center. Keep water hot but just below simmering. Cook until the white is evenly coagulated, approximately 3–5 minutes. Remove carefully with a slotted spoon.

Scrambled Eggs

Ingredients

- 2 eggs
- 2 Tablespoons liquid (water, milk, or tomato juice)
- ⅛ teaspoon salt
- 1 teaspoon butter or other cooking fat

Instructions

Beat eggs with liquid and salt until blended but not foamy. Melt butter in a non-stick skillet.

Add egg mixture and cook slowly. As the egg begins to coagulate, lift and turn with a spatula until all of the egg is coagulated but still glossy.

Allow sufficient coagulation in one place before turning so that the finished product contains large masses of soft eggs rather than small pieces.

French Omelet

Ingredients

- 2 eggs
- 2 Tablespoons water
- ⅛ teaspoon salt
- 1 Tablespoon butter

Instructions

Beat together eggs, water, and salt until well blended. In a non-stick omelet pan over medium-high heat, heat butter until just hot enough to sizzle a drop of water. Pour in egg mixture.

The mixture should set quickly at the edges. With a rubber spatula, push cooked portions from the edges of the pan toward the center so uncooked portions can spill onto the hot pan surface. Tilt the pan as necessary, keeping the bottom covered with egg.

When the top is thickened and no visible liquid egg remains, fill one half of the omelet with fillings. (Put filling on the left side if you're right-handed and the right if you're left-handed.)

With a spatula, fold the omelet in half. Invert to serve — turn the pan upside down over the plate, and the omelet will land with its prettiest side up.

Hard-Cooked Eggs

Hard-Cooked Eggs	Appearance	Texture	Acceptable?
A. Add egg to enough cold water to come at least 1” above egg. Bring to boil. Cover pan; remove from heat. Let egg stand in water 15–20 minutes. Cool immediately in ice water. When egg is cold, remove from shell.			
B. Bring egg to room temperature quickly by placing egg in hot tap water. Add warmed egg to simmering water and simmer for 20 minutes. Remove from heat and cool immediately in ice water. When egg is cold, remove from shell.			
C. Repeat B, but at end of cooking period, leave egg in cooking water 10 additional minutes. Remove shell.			
D. Bring egg to room temperature quickly by placing egg in hot tap water. Add warmed egg to boiling water and continue to boil for 30 minutes. Remove pan from heat, and leave egg in water 10 additional minutes. Remove shell.			

Sensory Evaluation

Cooking Method	Appearance	Tenderness	Flavor
Fried Egg, large amount of fat			
Fried Egg, small amount of fat			
Poached			
Scrambled			
Scrambled, overcooked & over stirred			
French Omelet			

8.4 Eggs Conclusion

1. What parts of the egg contain protein?

2. Why does the egg white coagulate at a lower temp compared to the egg yolk?

3. Which custard products were an egg sol and which were an egg gel?

4. What steps were taken to prevent coagulation while making the stirred custard?

5. What method was used to prevent over-coagulation while making the baked custard?

6. Why don't we hard-boil eggs in food preparation?

9. Egg White Foams in Angel Food Cake and Souffles

9.1 Introduction to Egg White Foams

Before You Come to Lab

Name: _____

Watch the “Science: The Magic of Meringue — Why Timing Matters When Whipping Egg Whites and Sugar” posted on Canvas.

1. When is the ideal time to add sugar to egg whites when making a sweetened egg white foam (meringue)?

Watch the Chocolate Soufflé Recipe video posted on Canvas.

2. How is the egg white foam combined with the chocolate mixture?

Egg White Foams

Egg white proteins can foam when beaten, allowing them to be the structure in recipes such as angel food cakes, souffle, and meringues.

Egg whites foam because proteins denature upon beating and form a film around air bubbles.

The first step of making an egg white foam is to separate the white from the yolk using an egg separator (not the shells due to food safety concerns).

Then the egg whites are beaten to the stage listed in the recipe. There are 5 stages:

1. **Foamy**: large air bubbles, very soft, used as an egg wash.
2. **Soft peak**: peaks hold their shape but fold over easily, the point at which other ingredients are introduced.
3. **Upper soft peak**: peaks hold shape and fold over slightly, endpoint for meringues and angel cakes.
4. **Stiff peak**: peaks hold shape and do not fold over, used in macaroons and hard meringues.
5. **Dry**: dry, resulting from overbeating, the protein in the foam has been denatured too much, resulting in a dry foam and water layer in the bottom of the bowl.

Important Ingredients and Steps to Consider

- **Cream of tartar** is an acid that helps stabilize the foam.
- **Folding** is a gentle mixing step that allows egg white foam to be incorporated into recipes without breaking down the foam
- **Fat** needs to be avoided when making egg white foams. Fat of any kind (from yolk or other sources) inhibits or limits foam formation. The fat interferes with protein foam on the air bubbles' surface.

9.2 Egg Foam Products: Angel Food Cake

Objectives

- **Develop skills in the preparation and evaluation of various foam products.**
- **Determine the relationship of manipulative techniques in both preparing the foam and incorporating the flour to the characteristics of the final product.**

Individually, prepare your own angel food cake.

Recipes

Angel Food Cake

Ingredients

⅓ cup sifted cake flour

⅛ teaspoon salt

¼ cup sugar

½ cup egg whites

½ teaspoon cream of tartar

½ teaspoon vanilla flavoring

¼ teaspoon almond extract

¼ cup sugar

Instructions

Preheat oven to 375°F. Sift together flour, salt, and ¼ cup sugar three times; set aside.

In a medium (7" 1½ qt.) bowl, beat egg whites and cream of tartar to the beginning of the soft peak stage. Add vanilla and almond flavorings. Gradually add remaining ¼ cup sugar, 2 teaspoons at a time, and continue beating to the upper limits of the soft peak stage.

Sift one-fourth of the flour-sugar mixture over the meringue; fold in gently until the flour just disappears. Repeat 3 times. Gently place batter into an ungreased 7⅜ × 3⅝-inch loaf pan. Bake at 375°F until the cake springs back when lightly touched, about 25 minutes. Invert the pan and let the cake hang until cool. Cut the cake carefully with a serrated knife.

Characteristics of the Standard Angel Food Cake

Appearance	Grain	Eating Quality
• Dark golden brown crust, flat or slightly rounded surface, may be cracked. • Volume approximately 1½ times that of batter.	• Small to medium-size air cells with thin cell walls.	• Tender, moist.

Sensory Evaluation

Foam Cakes	Volume	Grain (Cell & Cell Wall Size, & Uniformity)	Tenderness	Flavor & Mouth Feel
Angel Food Cake				

9.3 Foam Products: Soufflés

Objectives

- **Continue to develop skills in the preparation and evaluation of egg foam products.**

In pairs, prepare a soufflé according to the assigned recipe below.

Broccoli Soufflé

Ingredients

½ cup cooked chopped broccoli*

2 eggs

1 Tablespoon + 1 teaspoon butter

1 Tablespoon + 1 teaspoon flour

¼ teaspoon salt

⅓ cup milk

1/16 teaspoon nutmeg

½ teaspoon lemon juice

¼ teaspoon cream of tartar

**If using frozen broccoli, thaw and chop finely to make ½ cup.*

Instructions

Heat a water bath with a rack and 1-pint baking dish; preheat oven to 350°F. Drain cooked broccoli well on a paper towel and chop finely. Separate eggs, putting whites into a medium bowl and yolks into a medium or small bowl.

Make a thick white sauce from the butter, flour, salt, and milk listed above. Melt fat in a saucepan. Blend in flour and salt; remove from heat. Add milk, stirring to blend; return to heat and stir gently while heating quickly to a full boil. Add nutmeg and lemon juice to the sauce, stirring to blend. Add white sauce mixture gradually to egg yolks, mixing well; then add chopped broccoli.

Beat egg whites with cream of tartar to the upper limit of the soft peak stage. Fold about one-fourth of the foam into the broccoli mixture; spread the broccoli mixture over the remaining egg white foam and fold until well blended.

Pour mixture into a heated 1-pint baking dish in a pan of hot water (water bath). Bake uncovered at 350° F. for 35–45 minutes until none of the mixture sticks to a clean metal knife inserted into the center of the soufflé.

Cheese Soufflé

Ingredients

- 2 eggs
- 1 Tablespoon + 1 teaspoon butter
- 1 Tablespoon + 1 teaspoon flour
- ¼ teaspoon salt
- ⅓ cup milk
- 40 grams shredded sharp Cheddar Cheese (⅓ cup)
- ¼ teaspoon cream of tartar

Instructions

Heat a water bath with a rack and 1-pint baking dish; preheat oven to 350°F. Separate eggs, putting whites into a medium bowl and yolks into a medium or a small bowl.

Make a thick white sauce from the butter, flour, salt, and milk listed above. Melt fat in a saucepan. Blend in flour and salt; remove from heat. Add milk, stirring to blend; return to heat and stir gently while heating quickly to a full boil. Blend cheese into white sauce, and then add white sauce mixture gradually to egg yolks, mixing well.

Beat egg whites with cream of tartar to the upper limit of the soft peak stage. Fold about one-fourth of the foam into the cheese mixture; spread the cheese mixture over the remaining egg white foam and fold until well blended.

Pour mixture into a heated 1-pint baking dish in a pan of hot water (water bath). Bake uncovered at 350°F for about 35 minutes until none of the mixture sticks to a clean metal knife inserted into the center of the soufflé.

Chocolate Soufflé

Ingredients

- 2 eggs
- 2 Tablespoons butter
- ½ oz. unsweetened chocolate, cut up
- 2 Tablespoons flour
- ⅓ cup milk
- ½ teaspoon vanilla
- ⅛ teaspoon cream of tartar
- 3 Tablespoons sugar

Instructions

Heat a water bath with a rack and 1-pint baking dish; preheat oven to 375°F. Separate eggs, putting whites into a medium bowl and yolks into a medium or a small bowl.

Melt butter and chocolate in a saucepan. Remove from heat; stir in flour, and add milk. Cook over medium heat stirring constantly until mixture thickens. Gradually add the chocolate sauce to the egg yolks, mixing well. Stir in vanilla.

Beat egg white with cream of tartar to the beginning of the soft peak stage. Gradually add the sugar and beat to the upper limit of the soft peak stage. Fold about one-fourth of the foam into the chocolate mixture; spread the chocolate mixture over the remaining egg white foam, and fold until well blended.

Pour mixture into a heated 1-pint baking dish in a pan of hot water (water bath). Bake uncovered at 375°F for 35–40 minutes until none of the mixture sticks to a clean metal knife inserted into the center of the soufflé.

Lemon Soufflé

Ingredients

- 2 eggs
- 2 Tablespoons butter
- 2 Tablespoons flour
- ⅓ cup milk
- 2 Tablespoons fresh lemon juice
- 1½ teaspoons grated lemon zest
- ¼ teaspoon cream of tartar
- 3 Tablespoons sugar

Instructions

Heat a water bath with a rack and 1-pint baking dish; preheat oven to 375°F. Separate eggs, putting whites into a medium bowl and yolks into a medium or a small bowl.

Make a thick white sauce from the butter, flour, and milk listed above. Melt butter in a saucepan. Blend in flour; remove from heat. Add milk, stirring to blend; return to heat and stir gently while heating quickly to a full boil. Blend the white sauce mixture gradually into the egg yolks, mixing well. Stir in lemon juice and zest.

Beat egg whites with cream of tartar to the beginning of the soft peak stage. Gradually add the sugar and beat to the upper limit of the soft peak stage. Fold about one-fourth of the foam into the lemon mixture; spread the lemon mixture over the remaining egg white foam, and fold until well blended.

Pour mixture into a heated 1-pint baking dish in a pan of hot water (water bath). Bake uncovered at 375°F for 30–45 minutes until none of the mixture sticks to a clean metal knife inserted into the center of the soufflé.

Salmon or Tuna Soufflé

Ingredients

- 2 eggs
- 1 Tablespoon + 1 teaspoon butter
- 1 Tablespoon + 1 teaspoon flour
- ¼ teaspoon salt
- ⅛ teaspoon dry mustard
- ⅓ cup milk
- ⅓ cup flaked salmon or tuna
- ¼ teaspoon cream of tartar

Instructions

Heat a water bath with a rack and 1-pint baking dish; preheat oven to 350°F. Separate the eggs, putting the whites into a medium bowl and the yolks into a medium or small bowl.

Make a thick white sauce from the butter, flour, salt, mustard, and milk listed above. Melt butter in a saucepan. Blend in flour, salt, and mustard; remove from heat. Add milk, stirring to blend; return to heat and stir gently while heating quickly to a full boil. Add the white sauce mixture gradually to egg yolks, mixing well. Rinse fish with hot water, drain well, and add to sauce.

Beat egg whites with cream of tartar to the upper limit of the soft peak stage. Fold about one-fourth of the foam into the white sauce mixture; spread the white sauce mixture over the remaining egg white foam, and fold until well blended.

Pour mixture into a heated 1-pint baking dish in a pan of hot water (water bath). Bake uncovered at 350°F for about 35 minutes until none of the mixture sticks to a clean metal knife inserted into the center of the soufflé.

Sensory Evaluation of Soufflés

Soufflé	Appearance	Texture	Eating Quality
Broccoli			
Cheese			
Chocolate			

Soufflé	Appearance	Texture	Eating Quality
Lemon			
Salmon or Tuna			

9.4 Common Defects in Egg Foam Products and Their Probable Causes

Angel Food Cakes

Low-volume, tough, gummy, thick cell walls

- Under beating
- Excessive folding or mixing
- Low volume with streaks
- Too much sugar or flour added at once
- Underfolded

Low volume, coarse texture

- Not enough folding of flour and sugar
- Low volume, yellow color, coarse texture, thick cell walls, tough
- Not enough cream of tartar

Low volume, fine grain, broken (collapsed) cells

- Overbeating
- Low volume, tough, compact
- Overfolding
- Fallen, sugary, crystalline, dry
- Excess sugar

Shrunken (Slight shrinkage from the highest volume in the oven is expected.)

- Pan is not free from fat
- Underbaking
- Extreme overbaking
- Failure to invert the pan
- Extreme overmixing

Coarse cells, uneven texture, but tender

- Underfolded
- Top crust separates
- Excessive overbaking
- Dry and tough
- Overbaking

The cake falls from the pan

- Underbaking
- Traces of fat in the pan

Soggy, excessively moist cake

- See causes of low volume
- Underbaked

Tough

- Overfolding (often because of overbeating egg whites)
- Insufficient sugar

Holes and tunnels

- Insufficient folding
- The batter was not pushed against the sides and bottom of the pan
- Overbeating egg whites

Soufflés

Low volume, uneven texture

- Overbeating
- Egg yolks coagulated when blended with thick white sauce.

Shrinkage

- Overbeating whites

Collapse

- Underbaking

Layer in bottom

- Too thin white sauce
- Inadequate folding
- Delayed baking, oven not preheated
- Water bath was not preheated
- Underbeaten egg whites
- Underfolding

9.5 Egg White Foam Conclusion

1. Whipping egg whites _____ protein; while oven heating _____ the protein.

2. Why is the pan not greased when making an angel food cake?

3. Why is the pan inverted after baking?

4. What is the origin (history) of the word “soufflé”?

5. Explain why a soufflé is an example of a sol, emulsion, and foam.

10. Dry Heat Methods to Cook Tender Cuts of Meat

10.1 Dry Heat Methods Introduction

Before You Come to Lab

Name: _____

Watch “Ask the Meat Scientist: Beef Cuts Available in the Marketplace” posted on Canvas.

1. Why is meat from the rib, short loin, and sirloin naturally tender?

Watch the short clip of Julia Child’s French Chef chicken video posted on Canvas.

2. How is she going to prepare one of the chickens later in the video?

Watch “The Food Lab Breaks Down a Chicken” posted on Canvas.

3. How long does it take him to cut up a chicken?

Dry Heat Methods for Tender Cuts of Meat

This lab will focus on dry heat methods used to prepare tender cuts of meat. Here are 5 dry-heat methods.

- **Roasting**: to oven-cook food in an uncovered pan. The high heat browns the surface and seals in the juices.
- **Pan Frying**: to cook meat in a sauté pan with added fat.
- **Pan Broiling**: to cook meat in a sauté pan with minimal added fat, removing additional fat as it accumulates.
- **Broiling**: cooking method using direct dry heat. The broiler pan with meat is set a short distance (2–5 inches) below the broiler heat, and the oven door is left slightly open.
- **Deep Fat Frying**: to cook food in hot fat or oil deep enough so that the food is completely covered.

Degrees of Doneness by Temperature and Description

Degree of Doneness	Temperature	Sensory Observations of Steaks by Doneness
Medium rare	145°F	Bright pink throughout the interior
Medium	160°F	Pink center, gray toward edges
Medium Well	165°F	Slightly pink center
Well Done	170°F	Cooked throughout, gray, slightly drier

Minimum Internal Temperatures for Safe Consumption of Meat, Poultry, and Fish

Minimum Internal Temperature for	Temperature
Whole muscle cuts of beef, veal, lamb, pork	145°F
Ground meat (beef, veal, lamb, pork)	160°F
Poultry	165°F
Fish	145°F, flaky

Wholesale and Retail Cuts Prepared in Lab

	Wholesale Cuts	Retail Cuts	Observations of Raw Meat
Beef	Short Loin	Club, T-bone, Porterhouse Steaks	
Beef	Rib	Rib Steak	
Pork	Loin	Loin Chop, Rib Chop	
Lamb	Loin	Loin Chop	
Lamb	Rib	Rib Chop	

Meat Terms

- **Loin muscle**: Longissimus dorsi
- **Tenderloin muscle**: Psoas major
- **Epimysium**: Connective tissue around the muscle, acts like a rubber band and tightens as it is cooked if not cut. Cut perpendicular in a few places to cook a flat steak.
- **Marbling**: Intramuscular fat, adds juiciness and flavor
- **Myoglobin**: Meat pigment, related to hemoglobin
- **Oxymyoglobin**: Myoglobin exposed to oxygen, bright red in color

10.2 Dry Heat Methods Recipes

Objectives

- **Identify cuts of meat appropriate for dry heat.**
- **Prepare and recognize three stages of doneness in dry heat meat cookery.**
- **Determine the effect of the degree of doneness on flavor, juiciness, and tenderness of broiled and roasted tender cuts of meat.**

Cook beef steaks to the assigned degree of doneness.

	°C	°F	Resting Time	Interior Color
Medium-Rare	63	145	3 minutes	Bright pink throughout the interior
Medium	71	160	3 minutes	Pink center, gray toward edges
Medium-Well	74	165	3 minutes	A small amount of pink in center
Well Done	77	170	3 minutes	Gray

Searing and Oven Cooking Steaks

Ingredients

1 Steak — as assigned.

1 Tablespoon Vegetable Oil

Salt and Pepper for seasoning

Instructions

Remove steaks from the fridge at least 20 minutes before starting if possible. Preheat oven to 400°F.

Place the steak on a cutting board and cut perpendicularly through the epimysium connective tissue in a few places to ensure that the steak stays flat as it cooks. Rub steak with vegetable oil and season with salt and pepper. Insert the thermometer probe into the steak. The thermometer should go in parallel with the steak to get an accurate reading.

Heat a large sauté pan over medium-high heat (make sure your steak fits in the sauté pan. If it doesn't, ask for a larger sauté pan.) Brown for 2–3 minutes per side and place the pan in the oven.

Bake ~10–15 minutes until steaks reach the desired doneness. Be careful when removing the steak from the oven. The handle will be very hot. Remove steaks from the sauté pan and let rest on a cutting board for at least 5 minutes before cutting and serving.

Pan-fry assigned cuts of meat

1. Cut through epimysium (the connective tissue surrounding the muscle) at one-inch intervals.
2. Brown meat on both sides in a small amount of vegetable oil or shortening. Use enough fat to cover the surface of the saute pan.
3. Turn meat occasionally to ensure even browning. Adjust heat so that meat is cooked to the desired doneness without over- or under-browning surface.
4. To check doneness, make a small cut with a sharp knife along the bone, or in the center of a boneless cut. Confirm the doneness by taking the temperature with a thermometer.

Pan-broil assigned cuts of meat

1. Cut through epimysium (the connective tissue surrounding the muscle) at one-inch intervals.
2. Brush the saute pan surface with vegetable oil or shortening to prevent sticking. (Omit this step if the pan you use has a non-stick surface.)
3. Place meat in the saute pan.
4. Cook slowly, turning occasionally. Adjust heat so that meat is cooked to the desired doneness without over- or under-browning of the surface.
5. Pour off fat as it accumulates so that meat is not fried.
6. Test for doneness by making a small cut with a sharp knife close to the bone, or in the center of a boneless cut. Confirm the doneness by taking the temperature with a thermometer.

Sensory Evaluation

Recipe	Doneness Degree & Temperature	Sensory Observations
Beef Rib Steak		
Beef Club Steak		
Beef T-Bone Steak		
Beef Porterhouse Steak		

Recipe	Doneness Degree & Temperature	Sensory Observations
Pork Rib Chop, Pan-Fried		
Pork Loin Chop, Pan-Broiled		
Lamb Rib Chop, Pan-Fried		
Lamb Loin Chop, Pan-Broiled		
Hamburger Patty, Pan-Fried		
Hamburger Patty, Pan-Broiled		

10.3 Poultry and Fish

Objectives

- **Demonstrate basic breakdown techniques for portioning poultry.**
- **Prepare recipes utilizing dry heat methods.**

Chicken Breakdown Demonstration

1. Disjointing into halves, quarters, and individual portions.
2. Cleaning.

The following directions show one method of disjointing poultry. This method will result in **ten** individual pieces.

1. Place the chicken, backside down, on an easily cleaned surface. Pull the leg and thigh away from the body; cut through the skin and between the muscles toward the hip joint.
2. Cut through the joint. (If the chicken is less tender, e.g., a stewing hen for fricassee, it may be necessary to break the joint with the hands.) Cut through the muscle and skin close to the body. Repeat on the other side.
3. To separate the thigh from the leg, bend the thigh and leg together to locate the joint and cut through the joint.
4. Pull the wing away from the body to locate the wing joint. Cut through the joint; repeat on other side.
5. To separate the breast from the back, locate the junctions of the back and front ribs. On each side, cut through the skin and ribs from the tail end toward the neck. Bend the breast away from the back to break the joint, and then cut the pieces apart.
6. Cut the back crosswise into two sections. Cut the breast lengthwise or crosswise into two sections.
7. Check the individual pieces to see that the chicken was adequately eviscerated; if necessary, remove the kidneys.

Prepare poultry according to recipes utilizing dry heat

Minimum cook temp 165°F

Broiled Chicken

Ingredients

- 2–3 pieces broiler-fryer chicken
- 2 Tablespoons butter, melted
- 2 Tablespoons lemon juice

Instructions

Brush the chicken with a mixture of butter and lemon juice. Place skin side down on broiler pan and broil 6-7" from heat. Turn and baste every 5 to 10 minutes.

Chicken is done when the thickest pieces are 165ºF, and the juices run clear, ~20 minutes.

Oven-Baked Chicken

Ingredients

- 2 Tablespoons butter
- ¼ cup flour
- ½ teaspoon salt
- ½ teaspoon paprika
- dash of pepper
- 2–3 pieces broiler-fryer chicken

Instructions

Heat oven to 350°F. In the oven, melt butter in an 8" square baking pan. Mix flour, salt, paprika, and pepper. Coat chicken pieces thoroughly with the flour mixture, then roll in butter.

Place chicken, skin side down, in the pan. Cook uncovered for 30 minutes.

Turn chicken; cook 15-20 minutes longer or until the thickest pieces are 165°F and the juices run clear.

Characteristics of the Standard Product for Fish and Shellfish

The appearance, texture, and flavor of the product are highly dependent upon the quality of the fresh fish as well as preparation techniques. Fish should separate easily into flakes; when cooked beyond this stage, it shrinks and becomes tough and dry. Overcooking shellfish likewise toughens the muscle.

Salmon Steak with Lemon Parsley Sauce

Ingredients

1 salmon steak

1½ teaspoons butter

dash paprika

dash salt

½ teaspoon Worcestershire sauce

1 teaspoon minced onion

Lemon Parsley Sauce:

¼ cup butter

2 teaspoons lemon juice

½ teaspoon grated lemon zest

2 teaspoons chopped parsley

Instructions

Preheat oven to 350°F. Place salmon in greased baking dish. Melt butter; add seasonings, Worcestershire sauce, and onion. Spread over salmon.

Bake at 350°F for 25–30 minutes or until fish is opaque and can be separated into flakes. Serve with Lemon Parsley Sauce.

For the Sauce:

Heat butter and lemon juice in a saucepan. Add grated lemon zest and parsley.

Sensory Evaluation

Recipe	Sensory Observations
Broiled Chicken	
Oven Baked Chicken	
Salmon Steak	

10.4 Dry Heat Methods Conclusion

1. Why should ground meat be cooked to a greater degree of doneness than a steak or chop?

2. What changes in the beef steaks did you observe as the degree of doneness goes up (higher internal temperature endpoint)?

3. Name 4 parts of a chicken.

4. What is the benefit of buying a whole chicken versus individual cuts?

5. What can you use the back and ribs for at home? What are back and ribs used for on an industrial scale?
    a. Home:

    b. Industrial Scale:

6. What is spatchcocking, and why is it used?

7. What type of salmon do you think we prepared — wild-caught or farm-raised? Why?

11. Moist Heat Methods for Less Tender Cuts of Meat

11.1 Moist Heat Methods Introduction

Before You Come to Lab

Name: _____

Watch the “Moist Heat Cooking—Braising and Stewing” video on Canvas. Describe the process for braising and stewing and explain the difference between the two.

- Braising:

- Stewing:

- Difference between methods:

- Compare moist heat methods to dry heat methods. Which takes more time?

Moist Heat Methods for Less Tender Cuts of Meat

Moist heat methods are used for less tender cuts of meat. Less tender cuts need to be cooked by moist heat methods because less tender cuts of meat have:

- Larger muscle fibers
- Less fat or marbling
- More heavily used muscles and connective tissues

Connective tissues in less tender cuts of meat:

- **Collagen**: Connective tissue that is softened with heat and moisture, breaks down into gelatin
- **Elastin**: Connective tissue that does not break down with heat or moisture, referred to as gristle or "chewing the fat," tends to be cut off and discarded.

Three common ways to tenderize meat before cooking:

- **Physical**: grinding, swiss iron, mechanical tenderizer
- **Chemical**: marinade
- **Enzyme**: bromelain and papain

Wholesale and Retail Cuts Used in Lab

	Wholesale Cut	Retail Cut	Raw Meat Observations
Pork	Boston Shoulder	Blade Steak	
Lamb	Shoulder	Arm Chop	
Beef	Chuck	Stew Meat	

	Wholesale Cut	Retail Cut	Raw Meat Observations
Beef	Chuck	Blade Steak	
Beef	Flank	Flank Steak	
Beef	Round	Round steak	

11.2 Moist Heat Methods of Meat Cookery

Objectives

- **Prepare less tender cuts of meat by various methods of moist heat cookery.**
- **Determine the combined effects of heat and moisture on various meat proteins.**

Moist Heat Recipes for Less Tender Cuts of Meat

Beef Stew

Ingredients

½ lb. beef stew meat

3 Tablespoons vegetable oil, divided

¼ teaspoon salt

⅛ teaspoon pepper

2 cups water

½ teaspoon Worcestershire sauce

very small piece of bay leaf

¼ cup cubed carrots

¼ cup potatoes, cut into ¾ -inch cubes

¼ cup chopped onions

Instructions

Cut stew meat into ¾" cubes. In a saucepan, add 1 tablespoon vegetable oil and heat. Brown meat cubes thoroughly.

Add salt, pepper, water, Worcestershire sauce, and bay leaf. Simmer, covered, until tender, approximately 1–1½ hours. Check liquid levels and add more water as needed.

Remove the bay leaf. Skim most of the vegetable oil from the stew liquid. Add vegetables to the stew; continue to simmer for about 30 minutes.

While the stew is simmering, prepare a roux. When vegetables are done cooking, add roux* a small amount at a time, bringing to a boil after each addition, until adequately thickened.

**Roux:* Measure 2 tablespoons of vegetable oil into a saucepan and blend in 3 tablespoons of cornstarch. Cook for 1–2 minutes over medium heat until lightly browned.

Creamy Flank Steak and Mushrooms

Ingredients

- ½ lb. flank steak
- ¾ teaspoon beef bouillon
- 1 cup water
- ¼ teaspoon dried thyme, crushed
- 1/8 teaspoon salt
- ½ bay leaf
- 4 ounces pearl onions, peeled*
- 4 ounces small mushrooms, sliced
- 1 oz egg noodles
- ½ cup evaporated milk
- 2 Tablespoons flour
- 1/8 teaspoon ground nutmeg
- 1 teaspoon lemon juice

Instructions

Cut flank steak into 1-inch pieces. Lightly coat a saucepan with cooking spray. Preheat the saucepan over medium heat. Brown flank steak in a hot saucepan.

Add beef bouillon, water, thyme, salt, and bay leaf. Bring to boiling; reduce heat. Cover and simmer for 35 minutes.

Peel* and halve any large fresh pearl onions. Stir onions and mushrooms into the flank steak mixture. Return to boiling; reduce heat. Cover and simmer for 15 minutes more or until onions and mushrooms are tender.

In a separate small saucepan, prepare egg noodles: Bring 3 cups water to boil in a saucepan, add 1 teaspoon salt and noodles. Stir gently, return to a boil, and cook uncovered for 6–8 min. Drain.

Combine evaporated milk, flour, and nutmeg. Add to the flank steak mixture. Cook and stir until thickened and bubbly. Cook and stir for 1 minute more. Remove from heat. Discard bay leaf. Stir in cooked noodles and lemon juice.

*Blanch onions in boiling water for about 10 seconds. Drain, chill, trim, and slip off skins.

Swissed and Braised Beef Round Steak

Ingredients

- ¼ lb. round steak, 1-inch thick
- ¼ cup cornstarch
- 1 teaspoon oregano
- ½ teaspoon salt
- ¼ teaspoon pepper
- 1–2 Tablespoons vegetable oil
- ⅓ -⅔ cup tomato juice or water

Instructions

Cut through the epimysium at 1-inch intervals around the piece of meat. Mix cornstarch, oregano, salt, and pepper. Place meat on a cutting board, sprinkle with seasoned cornstarch, and pound with swissing iron. Turn meat, add more seasoned cornstarch, and pound. Repeat this process until the meat is about ½ of its original thickness.

Heat vegetable oil in a large sauté pan; brown meat on both sides. Add juice or water, cover tightly, and simmer on low heat for approximately 90 minutes, or until fork tender. Add more water as needed.

Braised Breaded Pork

Ingredients

- 1 egg, beaten
- 1 Tablespoon milk
- 2 Tablespoons flour
- ¼ teaspoon salt
- 2 Tablespoons fine cracker crumbs
- 1 Tablespoon vegetable oil
- ¼ lb. pork blade chop

Instructions

Mix egg and milk. Coat meat with a mixture of flour and salt. Dip meat in egg wash and then in cracker crumbs.

Heat vegetable oil in a large sauté pan. Brown meat on both sides in vegetable oil, being careful not to loosen the breading. Use a spatula as needed to keep the breading on the meat.

Cover and cook on low heat until fork tender, approximately 45–60 minutes.

Pressure Pan Pot Roast

Ingredients

½ lb. heel of round beef or shank

2 Tablespoons vegetable oil

¼ teaspoon salt

⅛ teaspoon pepper

¼ cup chopped onions

3 cups water

For Gravy:

1 Tablespoon + 1 1/2 teaspoon cornstarch

3/4 cup beef broth

Instructions

Brown meat slowly in vegetable oil in a pressure pan. Pour off drippings into a liquid measuring cup, save for gravy. Set the rack into the pressure cooker and place browned meat on the rack. Season with salt and pepper; add onions and water.

Cook for 30 minutes at 15 lbs. pressure. Cool the pan at room temperature until the pressure indicator has dropped. Serve with gravy.

To Make Gravy:

Allow the fat to separate from retained drippings in the liquid measuring cup. Skim off the fat and add to a saucepan. The fat or oil amount should be ~1 tablespoon + 1 1/2 teaspoons. If needed, add vegetable oil to get to that amount.

Stir in the cornstarch and heat for 1–2 minutes. Add beef broth to the remaining liquid in the measuring cup to make 1 cup; add to the saucepan. Stir constantly until the mixture boils. Continue to boil for one minute. Season to taste with salt and pepper.

Oven Pot Roast with Vegetables

Ingredients

½ lb. blade roast (beef)

1–2 Tablespoons vegetable oil

½ cup tomato juice

1 medium carrot, peeled, chopped in 1-inch pieces

½ teaspoon salt

⅛ teaspoon pepper

2 medium potatoes, peeled & cut into 1-inch pieces

1 medium carrot, peeled, chopped into 1-inch pieces

Instructions

Brown roast in vegetable oil in a sauté pan that can be put into the oven. Add tomato juice and onions; season with salt and pepper. Cover tightly and cook in a 300°F oven for 1½ to 2 hours.

If the liquid evaporates, add water during the baking period. About 45 minutes to one hour before serving time, add potatoes and carrots.

Remove meat from the saute pan and cut it into bite-size pieces. Serve the meat and vegetables with the reduced tomato sauce from the pan.

Lamb Chops with Sour Cream

Ingredients

- 2 blade or arm lamb chops
- 2 Tablespoons vegetable oil
- dash salt and pepper
- ½ cup water
- ½ chicken bouillon cube
- ⅛ teaspoon thyme
- ¼ cup chopped celery
- 2 Tablespoons sliced green onions
- 2 Tablespoons dairy sour cream
- 2 teaspoons sliced green onion tops
- ½ teaspoon fresh chopped parsley

Instructions

In a large sauté pan, brown lamb chops in vegetable oil. Drain vegetable oil if excess exists after browning.

Sprinkle chops with salt and pepper. Add the next 5 ingredients (water, chicken bouillon, thyme, chopped celery, and sliced green onions) to saute pan.

Cover; simmer for 30–45 minutes until meat is tender.

Remove from heat, and cover the chops with sour cream; cover and heat through without curdling sour cream.

Top with green onion tops and parsley before serving.

Chicken in Chili Sauce

Ingredients

- 2 chicken thighs
- ⅓ cup tomato sauce
- ½ teaspoon parsley
- ½ teaspoon chili powder
- ¼ teaspoon sugar
- ⅛ teaspoon salt
- ⅛ teaspoon Tabasco sauce

Instructions

Place chicken thighs, skin side up, in a 1-pint microwave-safe casserole, with the thickest parts toward the outside edge of the dish. Mix remaining ingredients; spread over chicken.

Cover dish and microwave on medium-high setting (385 watts) until the thickest parts of the chicken are 165°F and juices run clear, approximately 9 to 11 minutes.

Chicken Cacciatore

Ingredients

- 2–3 pieces chicken
- 1 Tablespoon olive oil
- ⅓ cup sliced fresh mushrooms
- ¼ medium onion, sliced
- 1 garlic clove, minced
- ½ cup canned diced tomatoes, with liquid
- 2 Tablespoons tomato paste
- ¼ cup chicken broth
- ¼ teaspoon sugar
- ⅛ teaspoon salt
- ¼ teaspoon dried rosemary, crushed
- ¼ teaspoon dried thyme
- ⅛ teaspoon dried oregano
- ⅛ teaspoon black pepper
- 1 teaspoon fresh parsley, chopped

Instructions

In a sauté pan, cook chicken in hot olive oil for about 10 minutes or until light brown, turning to brown evenly. Remove chicken, and set aside.

Add mushrooms, onion, and garlic to the drippings in the sauté pan. Cook for about 5 minutes or until vegetables are just tender. Return the chicken to the saute pan.

In a small bowl, combine tomatoes, paste, broth, sugar, and dried spices. Pour over chicken in the sauté pan.

Bring to boiling; reduce heat, cover, and simmer for 30–35 minutes or until chicken is no longer pink. Sprinkle with parsley.

Sausage Gravy

Ingredients

- ½ pound breakfast sausage
- 2 Tablespoons cornstarch
- ½ teaspoon salt
- ¼ teaspoon black pepper
- ¼ teaspoon garlic
- 1 ½ cups milk

Instructions

Cook the breakfast sausage in a sauté pan. Break up the sausage into small pieces as it cooks. Once thoroughly cooked, take the sausage out of the pan and set it aside.

Leave the fat and grease from the sausage in the sauté pan. Add the cornstarch while continuously stirring to break up any lumps. Season with salt, pepper, and garlic powder, then mix the ingredients thoroughly. While stirring slowly, add the milk and continue to heat the mixture until it becomes thick. Let the mixture bubble (boil thickly) for 1 minute.

Put the sausage back into the gravy and mix it all together. Serve hot (to be eaten with biscuits).

Sensory Evaluation

Recipe	Moist Heat Method	Sensory Observations
Beef Stew		
Creamy Flank Steak and Mushrooms		
Swissed and Braised Beef Round Steak		
Braised Breaded Pork Blade Chop		
Pressure Pan Pot Roast		
Oven Pot Roast with Vegetables		
Lamb Chops with Sour Cream		
Chicken in Chili Sauce		

Recipe	Moist Heat Method	Sensory Observations
Chicken Cacciatore		
Sausage Gravy		

11.3 Biscuit Introduction

Objectives

- **For each standard bakery product made in the lab, know:**
  - **the ingredients**
  - **the functions of those ingredients**
  - **the basic steps of the recipe**

Biscuit Ingredients and Functions

Ingredient	Function
All-purpose flour	Structure
Milk	Hydrate
Shortening	Tenderization/Flakiness
Baking powder	Leavening
Salt	Taste/Flavor

Biscuit Method Steps

1. Whisk together dry ingredients.
2. Cut in the fat.
3. Add wet ingredients.
4. Knead and roll out dough.
5. Shape dough and bake.

11.4 Biscuit Recipe

Objectives

- **To apply principles of gluten development in the preparation of soft doughs.**
- **To develop techniques of light kneading and rolling.**

Biscuits

Yield: 6 Biscuits

Ingredients

1 cup sifted all-purpose flour

1½ teaspoons baking powder

¼ teaspoon salt

3 Tablespoons shortening

⅓ cup milk (approximate)

Instructions

Preheat oven to 425°F.

Sift flour, baking powder, and salt together three times.

Cut the fat into dry ingredients, scraping and cleaning the pastry blender as needed until the mixture resembles coarse cornmeal or small peas.

Make a well in the center of the dry ingredients; add milk and stir with a fork vigorously and quickly until blended (about 20–30 strokes) or until dough follows the fork.

Sprinkle about 1 teaspoon of flour onto the counter. Form dough into a ball and knead lightly with fingertips 10–15 times.

Roll to **½-inch thickness** for 6 biscuits. Handle carefully to avoid distorting the shape. Dip cutter or knife into flour. Hold the cutter so that the pressure while cutting is even.

Place cut biscuits on an ungreased baking sheet.

Bake at 425°F until golden brown, about 12–15 minutes.

Characteristics of a Standard Product for Biscuits

Appearance	Texture	Flavor
• Symmetrical shape, vertical sides with a fairly smooth level top. • Golden brown exterior. • Biscuits should double in volume during baking, and seem light in relation to volume.	• Medium-fine grain with relatively thin cell walls. • Light, creamy white crumb that peels off in layers. • Crisp yet tender crust.	• Moist, tender crumb with a mild, pleasing flavor.

Sensory Evaluation for Your Biscuits

Product	Appearance	Texture	Flavor
Biscuits			

11.5 Moist Heat Methods and Biscuits Conclusion

1. What appliances in a home kitchen might be used to cook less tender cuts of meat?

2. What meat cuts get used for processed meat like hot dogs, deli meat, and sausage?

3. What are the advantages of these processed meat products in terms of sensory characteristics and cooking time?

4. What are the four things required for gluten development?
    - 1.
    - 2.
    - 3.
    - 4.

5. What is the flour-to-liquid ratio in biscuits?

6. Why is only an approximate measure given for the liquid in biscuits?

7. How does the flour-to-liquid ratio affect gluten development?

12. Muffins Method and Conventional Yellow Cake Method

12.1 Muffin and Shortened Cake Introduction

Before You Come to Lab

Name: _____

Read the "Serious Eats Types of Flour: A Guide" article posted on Canvas. The article has a lot of great information in it, but focus on the four flours below.

1. Describe the characteristics, protein content, and uses for the following types of flour:
    - whole wheat:
    - bread:
    - all-purpose:
    - cake:

Watch the "Science: What is Gluten" video posted on Canvas to learn more about gluten structure from different wheat flours.

2. Which type of wheat flour produced a gluten ball strong enough to be blown up with an air tank?

Examine Various Kinds of Flour and Gluten Balls

Characteristics of Various Kinds of Flour

Type of Flour	Volume of Gluten Ball	Explanation
Whole Grain Flours		
Whole Wheat		
Refined Wheat Flours		
Bread		
All-Purpose		
Cake		

Comparing Muffins and Shortened Cake

The lab will compare and contrast the ingredients and methods of making muffins and shortened cakes. It is easier to start with muffins because there are fewer ingredients and fewer steps to prepare them.

Ingredients and Functions in Muffins

Ingredients	Function
All-purpose flour	Structure
Milk	Hydration
Oil	Tenderization
Egg	Structure, flavor
Sugar	Sweetness, tenderization
Baking powder	Leavening
Salt	Taste

Basic Steps of the Muffin Method

1. Stir dry ingredients together.
2. Mix wet ingredients together.
3. Blend wet ingredients into dry ingredients and stir briefly.
4. Fill greased muffin tins 2/3 full of batter and bake.

Ingredients and Functions in Shortened Cake

Ingredients	Function
Cake flour	Structure
Milk	Hydration
Egg	Structure, emulsification, leavening
Butter	Tenderization (creaming air)
Shortening	Tenderization (creaming air)
Sugar	Tenderization, sweetness
Baking powder	Leavening
Salt	Taste
Vanilla	Flavor

Basic Steps of the Shortened Cake or Conventional Cake Method

1. Sift dry ingredients and set aside.
2. Cream fat and sugar.
3. Beat the egg. Then add the foamed egg to creamed mixture.
4. Alternate adding dry ingredients and milk (start and end with flour).
5. Mix an additional 100 strokes after all of the flour has been incorporated.
6. Fill the greased and lined pan, snap once, and bake.

12.2 Muffin Method Recipe

Objectives

- **Apply standard techniques for gluten formation by preparing a product in which gluten forms very readily.**

Recipe

Muffins

Yield: 6 medium muffins

Ingredients

1 cup sifted all-purpose flour

1 Tablespoon sugar

1½ teaspoons baking powder

¼ teaspoon salt

½ egg (2 Tablespoons)

½ cup milk

2 Tablespoons + 1½ teaspoons oil

Instructions

Heat oven to 425°F; grease the bottoms of muffins cups in the tin.

Sift flour, sugar, baking powder, and salt together 3 times to mix thoroughly.*

Add half an egg to the milk and blend thoroughly with a whisk. Add oil and mix.*

Make a well in the dry ingredients in a large mixing bowl; add the liquid ingredients all at once to the dry. With a rubber spatula or wooden spoon, immediately start to stir as quickly as possible without splashing the mixture out of the bowl. Try to mix in 10 seconds; do not mix longer than 20 seconds. Stop stirring the instant the dry ingredients are just dampened. The batter should be lumpy but should not show particles of dry flour.

To place the muffin batter in the muffin tin, use a spoon and cut against the side of the bowl with one clean stroke. Fill each greased muffin cup 2/3 full. Place the spoon directly in the muffin tin and push the batter from it with another spoon or rubber spatula.

Bake at 425^{o}F until golden brown, approximately 12–15 minutes. Let stand for 1–2 minutes before removing from pan.

To compare gluten development amount, attempt to make two under-stirred, two perfectly stirred, and two over-stirred muffins.

*If you want to add mix-ins to your muffins, reference the amounts below. Add-ins will be based on lab availability. Make sure to decide on add-ins before you make the muffins. Dry add-ins need to be added to the dry ingredients, and wet add-ins need to be added to the wet ingredients. (Adding a streusel or cinnamon and sugar on top of the muffin would be the exception.)

Add-Ins for Muffins and Amounts to Use

Ingredient	Amount
Chocolate or other flavor chips	¼ cup
Nuts, chopped	¼ cup
Raisin or other dried fruit	¼ cup
Blueberries	½ cup
Coconut, shredded	¼ cup
Apple, chopped with spices	¼ cup apple ½ tsp cinnamon + ¼ tsp nutmeg
Lemon Poppy Seed	1 Tbsp Poppy Seeds + 1 tsp lemon extract
Jam/Jelly Muffins	Fill muffin cups a third full, add a tsp of jelly or jam, cover with muffin batter
Cinnamon Sugar to sprinkle on top of the muffin batter	2 Tbsp sugar + ½ tsp cinnamon
Streusel	2 Tbsp flour + 2 Tbsp brown sugar + ¼ tsp cinnamon, cut in 1 Tbsp cold butter

Characteristics of a Standard Product for Muffins

Appearance	Texture	Flavor
Symmetrical shape. Golden brown top with a pebbled surface resembling cauliflower. Creamy white interior. No tunnels.	Moderate grain as evidenced by even, medium-sized holes and fairly thin cell walls. Moist and tender	Mild, pleasing flavor.

Sensory Evaluation

Muffin	Appearance	Texture	Flavor
Under-stirred			
Optimally stirred			
Over-stirred			

12.3 Shortened Cake: Conventional Method Recipe

Objectives

- **Illustrate the function of gluten in another baked product.**
- **Demonstrate the effect of increased sugar and fat on gluten development by preparing a shortened cake by the conventional method.**

Recipe

Shortened Cake

Ingredients

¾ cup sifted cake flour

¾ teaspoons baking powder

1/16 teaspoon salt

¼ teaspoon vanilla

1 Tablespoon butter

1 Tablespoon vegetable shortening

¼ cup + 2 Tablespoons sugar

½ egg (2 Tablespoons)

¼ cup milk

Instructions

Heat oven to 375°F. Line the bottom of 6 × 3¼ inch loaf pan with waxed paper; lightly grease the paper.

Sift cake flour, baking powder, and salt together three times. Set aside.

Measure vanilla flavoring, butter, and vegetable shortening into a medium bowl; mix well using an electric mixer. If the fats get too soft, chill the bowl in ice.

Creaming:

Add measured sugar by teaspoons to butter and shortening with an electric mixer, creaming each time until light and fluffy. After all the sugar is added, beat for one minute with an electric mixer.

Wash mixer beaters, and in another small to medium bowl, beat half an egg for 3–5 minutes at high speed with an electric mixer until thick and

foamy. Add foamy egg by thirds to creamed sugar, butter, and shortening, beating for ½ minute with an electric mixer after each addition.

Alternate Additions of Flour and Milk:

Add ¼ of the flour mixture; hand stir (don't beat) just until the flour is blended, about 10–15 strokes. Add ⅓ of the milk and hand stir just until the milk is blended, approximately 8–10 strokes. Repeat alternate additions of flour and milk. After the final flour addition, stir the batter 100 strokes.

Immediately push the batter into the pan and snap the pan once. (Raise pan 6 inches from tabletop, then set it down sharply.) Bake at 375°F until cake springs back when touched lightly in the center, about 25–30 minutes.

Cool on a rack for 10 minutes, then remove from pan. Do not cut until the cake has cooled to room temperature.

Characteristics of a Standard Product for Cake

Appearance	Texture	Flavor
Uniform golden brown. Slightly rounded top with a smooth, fine-grained surface. Fine, uniform grain evidenced by small air cells with thin cell walls.	Very tender crumb—practically no resistance when bitten. Smooth, light mouthfeel.	Mild, sweet flavor.

Sensory Evaluation

Characteristics	Appearance	Texture	Flavor
Shortened Cake			

12.4 Muffin and Shortened Cake Conclusion

1. Describe the characteristics of an under-stirred muffin (explain why):

2. Describe the characteristics of an over-stirred muffin (explain why):

3. What other bakery products can be made with the muffin method?

4. What is the flour-to-liquid ratio in muffins?

5. What is the flour-to-liquid ratio in a shortened cake?

6. What are the effects of increased sugar and fat on gluten development in a cake formula?

7. What are the characteristics of the final product if the cake batter is under-stirred?

8. How can cake mix cakes be made so quickly (compared to the shortened cake you just made) and still turn out as expected?

Baked Product Review

Product	Flour : Liquid	Structural Ingredients	Tenderizing Ingredients	Leavening Ingredients	Preparation "Method"	Characteristic of a "Standard Product"
Biscuits						
Shortened Cake						
Muffins						
Pastry						
Yeast Bread						

13. Pies and Pastry Method

13.1 Pie and Pastry Introduction

Before You Come to Lab

Name: _____

Watch the "Binging with Babish—Making Apple Pie" video posted on Canvas.

1. What appliance does he use to cut the fat into the flour?

2. What does he put the pie **on** before he bakes it?

Pastry Method

The pastry method is similar to the biscuit method because it includes a step of cutting solid fat into the flour mixture. It is important to use a solid fat when making pastry to get a flaky and tender crust. In the lab, we will compare lard (refined pork fat) and vegetable shortening (made from soy and palm oil). It is also possible to use butter or margarine when making pastry.

Pastry Ingredients and Functions

Ingredients	Function
Flour	Structure
Shortening/ Lard	Limits gluten development
Water	Hydration
Salt	Taste

Pastry Method Steps

1. Mix flour and salt together in a bowl.
2. Cut in fat using a pastry blender until the fat resembles small peas.
3. Sprinkle water over the flour mixture and toss to form a dry dough.
4. Add more water if necessary to form a ball of dough.
5. Roll out based on the type of pie being made.

Shortening Power: Ability to limit gluten development

Oil > lard > shortening > butter/margarine

Less lard is needed than shortening in the pastry recipe due to its greater shortening power.

Shortening Power seems like it is a superpower, so a superhero is needed. A past student kindly drew a shortening power superhero for us!

13.2 Pie Recipes Using the Pastry Method

Objectives

- **Develop skillful manipulative techniques in handling pastry.**
- **Identify the role of each ingredient in pastry.**
- **Apply the principles involved in making fruit-filled double-crust and cream-filled single-crust pies.**

Pastry Recipe: *Single Crust for Cream Pies*

Ingredients

½ cup sifted flour

¼ tsp. salt

2 tbsp. lard **OR**
2 tbsp. + 1½ tsp. vegetable shortening

1 tbsp. (approx.) cold water

Instructions

Preheat oven to 425°F. Mix flour and salt; cut in fat until the size of small peas. Sprinkle water over the flour mixture while tossing lightly with a fork. Work dough against the side of the bowl until it holds together. Shape the dough into a ball.

On a lightly floured board or countertop, roll dough into a circle about 8 inches in diameter, less than ⅛-inch thick, or until only a slight dent remains when a finger is pressed into the dough. Optional: use pastry guides to keep the thickness even.

Carefully lift and ease into a 6-inch pie pan without stretching. Trim off excess dough, leaving a ¼-1/2 inch overhang; fold this under itself and crimp crust without stretching.

Prick the bottom and side of the crust with a fork. Bake at 425°F for 8–10 minutes or until golden brown. If crust bubbles in the oven, prick with a fork. Cool before filling.

Follow the instructions to make the meringue with the egg white and cream filling with the egg yolk below.

Soft Meringue

Ingredients

- 1 egg white
- 1/8 teaspoon cream of tartar
- 2 Tablespoons and 1½ teaspoon sugar

Instructions

Separate one egg using an egg separator. Reserve the yolk for the cream filling.

Add the cream of tartar to the egg white.

Beat to the beginning of the soft peak stage.

Gradually add sugar by teaspoons while beating. Beat to the upper limit soft peak stage. Use immediately.

Vanilla Cream Pie

Ingredients

- ¼ cup sugar
- 2 Tablespoons + 1½ teaspoon flour
- dash salt
- 1 cup milk
- 1 egg yolk, slightly beaten
- 2 teaspoons butter
- ½ teaspoon vanilla

Instructions

Reduce oven temperature to 350° F.

Stir together sugar, flour, and salt in a saucepan. Combine milk and egg yolk and gradually stir into the sugar mixture. Cook over medium heat, stirring constantly, until the mixture thickens and boils. Boil while stirring for one minute.

Remove from heat; stir in butter and vanilla. Cover while making the meringue. See above.

Pour hot filling into the pie shell. Do not overfill; leave enough pie crust above the filling to allow the meringue to seal.

Spread all of the meringue evenly over the filling, sealing it to the crust. Make swirls with a spatula, but avoid making sharp peaks or ridges.

Bake at 350°F until golden brown, 10–15 minutes.

Chocolate Cream Pie

Ingredients

- ⅓ cup sugar
- 2 Tablespoons + 1½ teaspoons flour
- dash of salt
- 1 cup milk
- ⅓ oz. unsweetened chocolate, cut up
- 2 teaspoons butter
- ¼ teaspoon vanilla

Instructions

Reduce oven temperature to 350°F.

Combine sugar, flour, and salt in a saucepan. Stir in milk and chocolate. Cook over medium heat, stirring constantly, until the mixture boils and the chocolate is melted. Boil while stirring for 1 minute.

Gradually add about half the hot mixture to the egg yolk while stirring; then add to the mixture in the saucepan. Stir while bringing to a boil.

Remove from heat; stir in butter and vanilla. Cover while making meringue.

Pour hot filling into the pie shell. Do not overfill; leave enough pie crust above the filling to allow the meringue to seal.

Spread all of the meringue evenly over the filling, sealing it to the crust. Make swirls with a spatula, but avoid making sharp peaks or ridges.

Bake at 350°F until golden brown, 10–15 minutes.

Lemon Meringue Pie

Ingredients

- ⅓ cup sugar
- 1 Tablespoon cornstarch
- 1 egg yolk, slightly beaten
- ½ cup water
- 1 Tablespoon butter
- 1 teaspoon grated lemon zest
- 1 Tablespoon lemon juice

Instructions

Reduce oven temperature to 350°F.

Stir together sugar and cornstarch in a small saucepan. Blend egg yolk with water; gradually stir into sugar mixture. Cook over medium heat, stirring constantly, until the mixture boils. Boil while stirring for 1 minute.

Remove from heat; stir in butter, lemon zest, and lemon juice. Cover while making meringue.

Pour hot filling into the pie shell. Do not overfill; leave enough pie crust above the filling to allow the meringue to seal.

Spread all of the meringue evenly over the filling, sealing it to the crust. Make swirls with a spatula, but avoid making sharp peaks or ridges.

Bake at 350°F until golden brown, 10–15 minutes.

Butterscotch Cream Pie

Ingredients

- ⅓ cup brown sugar
- 2 Tablespoons cornstarch
- ⅛ teaspoon salt
- ½ cup water
- ½ cup milk
- 1 egg yolk, slightly beaten
- 2 teaspoons butter
- ½ teaspoon vanilla

Instructions

Reduce oven temperature to 350°F.

Combine sugar, cornstarch, and salt in a saucepan. Mix water, milk, and egg yolk; gradually add to the starch-sugar mixture. Cook over medium heat, stirring constantly, until the mixture thickens and boils. Boil while stirring for one minute.

Remove from heat. Stir in butter and vanilla. Cover while making meringue.

Pour hot filling into the pie shell. Do not overfill; leave enough pie crust above the filling to allow the meringue to seal.

Spread all of the meringue evenly over the filling, sealing it to the crust. Make swirls with a spatula, but avoid making sharp peaks or ridges.

Bake at 350°F until golden brown, 10–15 minutes.

Fruit Pie Recipes

Pastry Recipe: *Double Crust for Fruit Pies*

Ingredients

- 1 cup sifted flour
- ½ tsp. salt
- ¼ cup lard **OR**
  ⅓ cup Vegetable shortening
- 2 tbsp. (approx.) cold water

Instructions

Preheat oven to 450°F.

Mix flour and salt; cut in fat until the size of small peas. Sprinkle water over the flour mixture while tossing lightly with a fork. Work dough against the side of the bowl until it holds together. Shape the dough into a ball.

Divide dough in half. Roll one half into a circle 8 inches in diameter, less than ⅛ inch thick, or until only a slight dent remains when a finger is pressed into the dough. Optional: use pastry guides to keep the thickness even.

Fit into a 6-inch pie pan without stretching; trim off the excess close to the edge of the pan. Roll out the top crust and cut steam vents.

Place filling (based on recipes below) in the pie shell; moisten the edge of the bottom crust with water. Place the top crust on; press gently around the edge. Cut excess crust, leaving ¼–½-inch overhang; fold this under the bottom crust and crimp the edge.

Place the pie pan on a baking sheet and bake at 450°F for 10 minutes. Reduce heat to 400°F and bake 20–30 minutes, or until crust is golden brown and fruit, if raw when placed in pie shell, is cooked.

Apple Pie

Ingredients

Pastry for 6-inch double-crust pie

1½ cups sliced, peeled cooking apples

1¼ teaspoon flour

⅛ teaspoon cinnamon

1 teaspoon butter

¼ cup sugar

1 teaspoon lemon juice

Instructions

Prepare the pastry recipe above.

Combine apples with dry ingredients and place in a pie shell.

Sprinkle with lemon juice and dot with butter (put small pieces of butter on top of the fruit) before placing the top crust on.

Proceed as directed for a double-crust pie.

Peach Pie

Ingredients

- Pastry for 6-inch double-crust pie
- 1½ teaspoon cornstarch
- 2 Tablespoons sugar
- 1/6 teaspoon cinnamon
- dash nutmeg
- 2 Tablespoons peach juice from the can
- ¾ cup drained, canned, sliced freestone peaches
- 1 teaspoon butter

Instructions

Prepare the pastry recipe above.

Mix cornstarch, sugar, cinnamon, and nutmeg. Blend in peach juice.

Cook in a saucepan over medium heat until thickened. Remove from heat and add peaches and butter. Pour cooked filling into the pie shell.

Proceed as directed for a double-crust pie.

Blueberry Pie

Ingredients

- Pastry for 6-inch double-crust pie
- 1½ teaspoons cornstarch
- 3 Tablespoons sugar
- 2 Tablespoons of berry juice from the can
- ¾ cup drained, canned berries
- ½ teaspoon lemon juice
- 1 teaspoon butter

Instructions

Prepare the pastry recipe above.

Mix cornstarch and sugar; blend in berry juice.

Cook in a saucepan over medium heat until thickened. Remove from heat and add berries, lemon juice, and butter. Pour cooked filling into the pie shell.

Proceed as directed for a double-crust pie.

Cherry Pie

Ingredients

¾ cup drained, canned sour cherries

⅛ teaspoon almond extract

2 Tablespoons cherry juice from the can

¼ cup sugar

2 teaspoons quick-cooking tapioca

Pastry for 6-inch double-crust pie

1 tsp. butter

Instructions

Prepare the pastry recipe above.

Combine all filling ingredients except butter. Let stand 20 minutes.

Pour filling into pie shell and dot with butter (put small pieces of butter on top of the fruit) before placing on top crust.

Proceed as directed for a double-crust pie.

Characteristics of the Standard Product

Pastry

Appearance	Texture	Flavor
• Light golden brown color. • Slightly blistered surface.	• Thin layers of baked dough. • Crisp, dry, and tender.	• Delicate flavor influenced by the type of fat used.

Fruit Filling

Appearance	Texture	Flavor
• Filling contained within pie shell (should not cook out of vents excessively or out of edges). • Filling thickened, but flowing slightly when cut. Little or no soaking of the bottom crust.	• Tender, soft fruit pieces.	• Cooked flavor appropriate for the type of fruit.

Cream Filling

Appearance	Texture	Flavor
• Delicate gel structure that shows a slight bulge on cut edge.	• Smooth, uniform texture that feels light.	• Delicate flavor appropriate for the type of pie.

Meringue

Appearance	Texture	Flavor
• Glossy, puffy, slightly irregular surface. Golden brown raised areas, depressions lighter in color. • No beading or leakage.	• Easily cut, not sticky. Tender and slightly moist. • Fine-grained interior, thoroughly baked.	• Delicate, sweet flavor.

Sensory Evaluation

Kind of Pie	Pastry Fat Type	Pastry Appearance	Pastry Texture	Pastry Flavor	Filling Appearance	Filling Texture
Vanilla Cream						
Chocolate Cream						
Lemon Meringue						

Kind of Pie	Pastry Fat Type	Pastry Appearance	Pastry Texture	Pastry Flavor	Filling Appearance	Filling Texture
Butterscotch Cream						
Apple						
Peach						
Blueberry						
Cherry						

13.3 Common Defects in Pastry and Pies and their Probable Causes

General Defects

Tough Pastry

- High protein flour
- Substitution of an equal amount of butter or margarine for fat
- Insufficient fat
- Fat is not distributed well enough
- Too much water
- Uneven distribution of water, requiring more manipulation
- Over stirring after water is added
- Dough not rolled immediately
- Re-rolling
- Excess flour on the rolling board

Crumbly, Mealy (not flaky) Crust and//or Too Tender to Remove from Rolling Board

- Low protein flour
- Too much fat
- Fat too soft (warm) or melted
- Fat cut in too finely
- Too little water
- Under-mixing after water is added

Reduced flakiness, or flakes not separated

- Low protein flour
- Not enough water to provide steam

Excess shrinking or misshapen crust

- Dough stretched when shaping in pan
- Dough rolled to uneven thickness
- Excess re-rolling or patching dough

- Under-mixing
- Over-mixing

Puffing of a pie shell baked without filling

- Insufficient crust perforations

Crust too brown or browned very rapidly

- Rolled too thin
- Very dry

Uneven browning

- Dough rolled to uneven thickness
- Edges too high
- Pie placed too high or too low in the oven
- Pie placed too close to oven walls or to another pan
- Not enough filling

The crust doesn't brown

- Too little fat
- Over-mixing
- Too much flour is used when rolling dough
- The crust is rolled too thick
- Wet dough

*Soaked lower crust**

- Shiny pie tin
- Filling allowed to stand in crust before baking
- Placing pie pan on foil or baking sheet
- Too low oven temperature
- Too short baking time
- Cold filling
- *Custard pies:*
  - Overcooked filling (syneresis)
- *Two-crust fruit pies:*

** Suggestions to prevent soaked lower crust*

- Use a high initial baking temperature
- *Custard pies:*
  - Brush crust with slightly beaten egg white and bake at high temperature for a few minutes to coagulate egg white
  - Use a filling with a high egg-to-milk ratio
  - Preheat milk for filling
  - Chill pie crust for 1 hour before filling

    - Fruit filling not thickened before baking
    - Insufficient vents
    - Break or tear in the bottom crust
    - Partially pre-bake the crust before adding the filling
- *Fruit pies:*
    - Coat with melted butter

Defects in Two-Crust Fruit Pies

Top crust "tents"

- Inadequate vents in the top crust
- Fresh fruit was not packed firmly

Pie filling boils over

- Too much filling
- The top and bottom crusts are not sealed together well
- Insufficient thickening of filling
- Inadequate vents in the top crust
- Vents too close to the edge of the pie
- Oven shelf is not level
- Uneven thickness of the top crust
- Over-baking

13.4 Pie and Pastry Conclusion

1. What is the flour-to-liquid ratio in pastry dough?

2. What problems occur if the fat melts early in the preparation of pie dough?

3. What preparation technique is responsible for:
   a. tenderness?

   b. flakiness?

   c. crispness?

4. What are common defects that occur in pastry?

5. List the three ingredients and their functions in a soft meringue:
   1.
   2.
   3.

6. What additional recipes use the pastry method?

14. Yeast Bread

14.1 Yeast Bread Introduction

Before You Come to Lab

Name: _____

Watch the "Yeast: Geeky Food" video posted on Canvas and fill in the blanks below.

- Food for yeast: _____
- In bread, yeast produces _____ and _____.
- Yeast needs 3 things to grow: _____, _____, and _____

Yeast Leavened Products

Yeast bread and pizza finish the bakery section. These recipes will focus on developing gluten and using yeast to leaven the bread and pizza instead of baking powder chemical leavening.

Yeast Bread Ingredients and Functions

Ingredients	Function
Bread flour	Structure (a lot)
Salt	Taste, regulates yeast activity
Water	Hydrates yeast
Yeast	Biological leavening
Milk (scalded)	Hydration
Sugar	Yeast food, tenderizing (minimal), sweetness (minimal)
Shortening	Tenderizing

Yeast Bread Standard Method Steps

1. Hydrate Yeast with warm water. Use Rapid Rise Yeast for speed.
2. Warm milk to 81°F
3. Blend shortening, sugar, salt, and milk. The milk is already scalded (a heating process needed to ensure dough and bread quality).
4. Add the hydrated yeast and ½ of the bread flour.
5. Mix until batter falls off a spoon in “sheets.”
6. Add the second half of the bread flour a bit at a time to form a soft dough.
7. Rest the dough for 5 minutes.
8. Knead for 10–15 minutes (manipulation of dough for proper gluten formation).
9. Let rise for 30 minutes somewhere warm in an oiled and covered bowl. The ideal temperature for yeast fermentation: 81–100 degrees Fahrenheit
10. Punch Down, shape, and proof in the pan for 15 minutes.
11. Bake & watch for the Oven Spring.
12. Remove from pan right away and let cool before cutting.

Important terms for the yeast bread standard method

- **Yeast Fermentation Temperature**: 81°F to 110°F
- **Rapid Rise Yeast**: Also known as bread machine yeast, comprised of more active yeast strains and may also contain enzymes and other additives to shorten the rising and proofing times by half.
- **Scalding**: Heating the milk to 180°F before used in bread making. If this step is skipped, the dough is slack and sticky, and the bread is coarse and has low volume.
- **Kneading**: Manipulation of bread dough for proper gluten formation, generally done by pressing and folding of dough until a smooth, not sticky dough is formed.
- **Oven spring**: Large increase in the volume of bread dough when placed in the oven caused by rapid yeast fermentation as the temperature increases in the oven. After this large increase in volume occurs, the fermentation stops, and the yeast is dead.

14.2 Yeast Bread and Pizza Recipes

Objectives

- **Demonstrate the principles of yeast leavening.**
- **Determine the distinctive characteristics of yeast bread in relation to other batter and dough products.**

Recipes

Yeast Bread

Ingredients

1¼ teaspoons active dry yeast
*or fast-acting yeast**

2 Tablespoons warm water (46°C, 115°F)

½ cup scalded milk** (92°C, 198°F for 1 min.)

2 teaspoons shortening

2 teaspoons sugar

½ teaspoon salt

1½ – 1¾ cups bread flour

Instructions

Hydrate yeast in 46°C (115°F) water. If milk is refrigerated, warm it to 27°C (81°F).

Blend milk with shortening, sugar, and salt in a medium bowl. It is okay if not all of the shortening melts.

Add all the hydrated yeast and approximately ¾ cup bread flour to the milk mixture. Beat with a spoon until batter falls from the spoon in "sheets."

Stir in enough bread flour to make a soft, easily handled dough. This is typically 3/4 to 1 cup of bread flour. Turn the dough out onto a floured surface and let rest for 5 minutes.

Knead until the surface of the dough is smooth with small blisters, about 10–15 minutes.

Place dough in an oiled bowl, turning once to grease the top of the dough.

Cover with a clean, moist towel and let rise in a warm place (26–32°C, 79–90°F) until the dough doubles in size, 45–60 minutes, or **30 minutes if using fast-acting yeast**.

Punch down and shape the dough into a loaf.

With fingers, flatten the dough and work out any large bubbles. Press flattened dough into a rectangle about 5" × 10". Starting at the narrow end, roll the dough toward you; seal the end of the dough to roll, pinching the seam. Seal the ends of the roll with the edge of your hand to form a thin strip about ½ inch wide. Tuck the ends of the roll under and place the loaf, seamed side down, in a greased 6 × 3¼ -inch pan.

Cover and let rise in a warm place (85°F or 29°C) until almost doubled, 25–30 minutes or **15 minutes if using fast-acting yeast**.

Bake loaf at 425°F for 25 minutes. Remove from pan immediately and let cool on a cooling rack. Once cool, slice carefully with a serrated knife.

***Some examples of fast-acting yeast:**

- RED STAR® QUICK-RISE™ Yeast
- RED STAR® Bread Machine Yeast
- Fleischmann's RapidRise™ Yeast
- Fleischmann's Bread Machine Yeast
- SAF® Bread Machine Yeast

****Milk for the entire class may be scalded, then measured for individual recipes.**

Pizza Dough Recipe

Ingredients

1 teaspoon fast-acting yeast

1/3 cup warm water (46°C, 115°F)

1 teaspoon sugar

½ teaspoon salt

1 Tablespoon vegetable oil

3/4–1 cup all-purpose flour

Optional Seasonings:

1 teaspoon garlic powder, dried basil, or dried oregano

Instructions

Dissolve yeast in water in a medium-size bowl.

Add sugar, salt, oil, and optional seasonings, if desired. Mix well. Gradually beat in flour to form a stiff dough.

Turn out on a floured surface and knead until smooth (10 min). Add flour as needed. Cover and let rest for 10 min.

Pat into an 8-inch pizza pan. Spread dough with sauce and toppings based on ingredient options available in the lab. Top with shredded mozzarella cheese. Bake at 425°F 12–15 minutes until bubbly and lightly browned.

Characteristics of a Standard Loaf of White Bread

Appearance	Texture	Flavor
• Large volume in relation to weight, symmetrically shaped. • Light golden brown surface, creamy white interior. • Moderately fine, even grain.	• Interior springy to the touch. • Fairly tender with relatively little resistance to the bite.	• Bland, pleasing, and somewhat nut-like flavor.

Sensory Evaluation

Recipe	Appearance	Texture	Flavor
Yeast Bread			
Pizza			

14.3 Yeast Bread Conclusion

1. What is the flour-to-liquid ratio in yeast bread?

2. A yeast bread loaf is low in volume. What could have gone wrong?

3. How is sourdough bread made?

4. What are the four things needed for gluten development?

15. Final Exam and Botanical Beverage Sensory Activity

15.1 Final Lab Exam Review

Lab 1 Measurements, Temperature & Sensory Evaluation

- Know how to convert recipes; double, triple, half, divide in thirds, etc.
- Review equipment used in lab
- Be able to describe foods made in lab with sensory terms

Lab 2 Varietal Differences

- Potatoes: Yukon—AP, Russet—Mealy, Red Pontiac—Waxy. Be able to ID potatoes and match them with best uses (mashed, baked, roasted, potato salad)
- Apples: Best Baking, Pie, Eating. Be able to ID apples
- Enzymatic Browning and Osmosis

Lab 3 Vegetable Preparation

- Pigments: Anthoxanthin, Anthocyanin, Chlorophyll, and Carotenoid
- Flavor Categories: Mild, Brassica, Allium
- Cooking Categories: Small amount water lid on, large amount water lid off

Lab 4 Starch-thickened Mixtures and Cereals

- Definitions from the worksheet including gelatinization, retrogradation, and syneresis
- ID parts of whole grains
- Identify cereals (which are refined and which are whole grains)
- Identify starch products from lab
- How to avoid lumps: starch + cold liquid or fat + starch (roux), etc.

Lab 5 Cereal and Legumes

- Identify cereal and legumes used in lab
- Cooking methods: how to shorten the cooking time for legumes

- Why does it take longer to cook legumes
- Definitions from worksheet

Lab 6 Fats and Oils

- Frying safety: add a lid to a grease fire, don't use water
- Types of oil to use and why
- Benefits of deep fat frying: time efficiency and crispy/crunchy texture
- Salad dressing: Temporary (True French), Semi Permanent (Modified French, Fruit salad), Permanent (Mayo, Cooked dressing); Emulsifying agents
- Understand how emulsions work

Lab 7 Dairy Products: Milk and Cheese

- Protein definitions
- Isoelectric point: wanted and unwanted scenarios
- Cheese and Dairy Charts
- Mac and cheese, grilled cheese, tomato soup (red into white or you'll be blue)

Lab 8 Eggs and Egg Cookery

- Egg composition: be able to fill in the diagram and explain changes in aging eggs
- Egg cooking methods: fried in large amount of fat, small amount of fat; hard-cooked eggs
- How to keep stirred custards from having lumps
- Difference between stirred (sol) and baked (gel) custards

Lab 9 Egg White Foams

- Know the purpose of stages of foams
- Angel Food cake: why avoid fat? purpose of cream of tartar
- Soufflé: Egg white (foam), White sauce (sol), emulsion (yolk)
- Difference between denatured (foam) and coagulated (baking cake) egg white

Lab 10 Meat: Dry Heat

- Instructions on how to cut up chicken
- Dry methods: Roasting, pan frying, pan broiling, broiling, grilling, and deep fat frying

- ID meat steaks (based on the worksheet chart)
- Pigments and types of connective tissues
- Muscles to know: Longissimus dorsi, Psoas major
- Know retail cuts used in class (see worksheet table), as well as its cooking methods
- Temperatures for the degree of doneness in whole muscle meats (beef, pork, lamb & veal), + poultry and ground meat

Lab 11 Meat: Moist Heat and Biscuits

- Reasons meat needs to be cooked with moist methods
- Moist methods: braising & stewing
- Tenderizing meats: physical, chemical, and enzyme methods
- Biscuits: ingredients and what each ingredient does. Know the method.

Lab 12 Muffins and Shortened Cakes

- % of protein in each flour
- Muffins: ingredients and what each ingredient does. Know the method.
- Shortened cakes: ingredients and what each ingredient does. Know the method.

Lab 13 Pastry Pies

- Pastry: ingredients and what each ingredient does. Know the method.
- Shortening Power + why a solid fat is needed in pastry
- Soft meringue: stabilizers are sugar (delays foaming) and cream of tartar (helps denatures egg white and increase the air in foam)

Lab 14 Bread and Pizza

- How does yeast leaven bread (C02): biological / fermentation
- Bread: ingredients and what each ingredient does. Know the method.
- Ferment (first rise), Proof (second rise once the dough is shaped), and Oven Spring (a large increase of volume at the beginning of baking)
- How to treat the yeast (not too hot)
- Importance of bread flour (high protein content) and kneading: know the 4 things needed for gluten development

15.2 Botanical Beverage Tasting

What are botanicals?

"A **botanical** is a plant or plant part that is claimed to have medicinal or therapeutic properties, flavor, and/or scent, according to the National Institute of Health. Their claimed benefits can hit health need states from consumers, filling the gap for their heightened search for functional health and wellness products that taste great." [1]

Why are they showing up in foods and beverages now?

As FONA International states in their Ingredient Hot List review of botanicals:

> "Even before COVID-19, people were seeking out botanical ingredients for their claimed health benefits, a trend that has only strengthened since the beginning of the pandemic. With a long history of being used in natural medicine, botanicals cater to consumers' current push towards improved health and wellness and a wide range of tasty new product introductions have made it easy for consumers to implement into their diet. While botanicals shouldn't be used in place of doctor-recommended treatments, their claimed benefits such as stress relief, immunity support, relaxation, and more are enticing consumers."[2]

What are some common botanicals?

It appears many things can count as botanicals, ranging from the common to the unusual. Here are the botanicals found in a local specialty grocery store (Wheatsfield, Ames, Iowa):

Mint	Ginger	Basil	Licorice/ Anise	Rose	Tumeric
Cayenne	Hibiscus	Hops	Elderflower	Jasmine	Lavender

1. FONA. (2021, April 16). *Ingredient Hot List: Botanicals*. Retrieved from https://www.mccormickfona.com/articles/2021/04/ingredient-hot-list-botanicals
2. FONA. (2021, April 16). *Ingredient Hot List: Botanicals*. Retrieved from https://www.mccormickfona.com/articles/2021/04/ingredient-hot-list-botanicals

Name: _____

Today's Tasting

These beverages were chosen to show a range of botanical beverage types and flavors. Beverages, where the botanical flavor was distinct or at least noticeable were chosen over beverages where the flavor appeared to be muted or covered up. If consuming a botanical beverage for potential health benefits, it may not be important for the flavor to be noticeable (but what fun is that?).

Taste a few of the beverages and see what you think. Be ready to share a little at the end!

Beverage _____

Sensory Notes:

Beverage _____

Sensory Notes:

Beverage _____

Sensory Notes:

Beverage _____

Sensory Notes:

Beverage _____

Sensory Notes:

Beverage _____

Sensory Notes:

Beverage _____

Sensory Notes:

Beverage _____

Sensory Notes:

Appendices

Appendix A

Terms Used in Evaluating Food Products

Visual Evaluation

***Appearance*: aspect or contour**

broken	clear	curdled
frothy	lustrous	opaque
rough	sediment	shriveled
smooth	stringy	dull
cloudy	crumble	plump
greasy	muddy	shrunken
scum	shiny	
sparkling	translucent	

***Color*: normal for substance, pleasing to the eye**

bright	gray	dull
faded	off-color	golden
normal	yellow	brown
snowy	discolored	rich
white	greenish	
creamy	pale	

***Shape*: proportionate dimensions**

broken	even	flat
irregular	oval	round
thick	thin	uneven

Size

irregular	uniform	small
medium	large	

***Grain*: structural quality; such as crystals in candies and ice creams, size of pores in cake and bread, thickness of cell walls in breads or cakes**

amorphous	coarse	crystalline
fine	foamy	grainy
granular	heavy	porous

Flavor Characteristics

***Odor*: volatile substances affecting sense of smell**

acid	weak	strong
burnt	acrid	
fragrant	delicate	

***Taste*: sensations produced by substances listed**

bitter	sweet
salty	sour

***Flavor*: a quality that affects the relish, zest, or savor. Combination of taste and odor**

astringent	rich	brisk
delicate	stimulating	pungent
raw	blended	stale
starchy	mellow	tasteless
bland	scorched	burned
flat	strong	

Mouthfeel and Texture Characteristics

***Consistency*: degree of firmness, density, viscosity, fluidity, plasticity, resistant to movement**

brittle	hard	stiff
frothy	crumbly	thin
runny	gummy	firm
soggy	solid	rubbery
crisp	mealy	soft
full-bodied	curdled	
syrupy	liquid	

***Lightness*: well-leavened, not dense; having low specific gravity**

fluffy	light in weight for size	porous

***Moistness*: degree of moisture. In fruits and meats called juiciness**

dry	moist	water

***Tenderness*: ease with which can be cut, broken, pulled apart or masticated**

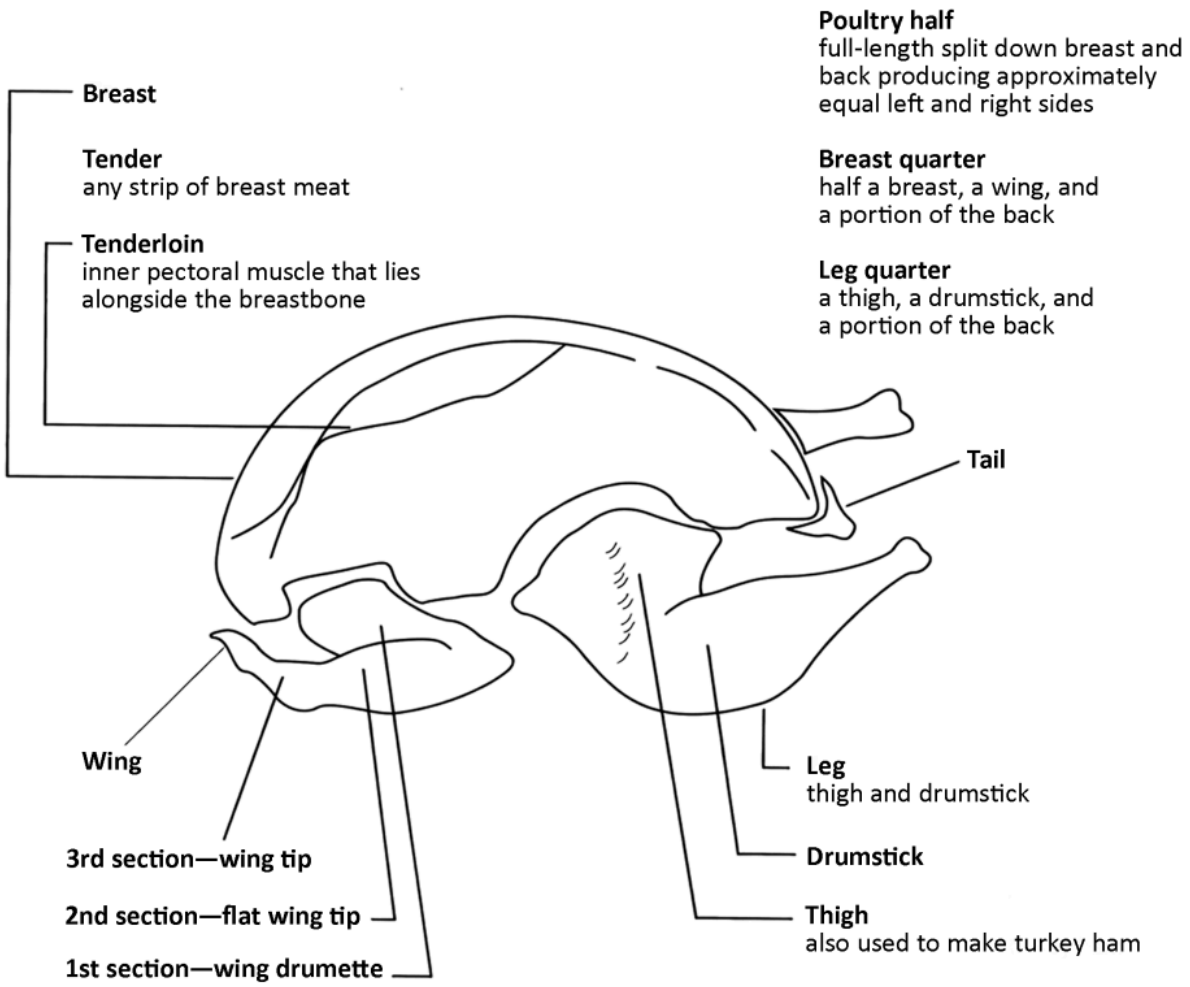
tender	tough

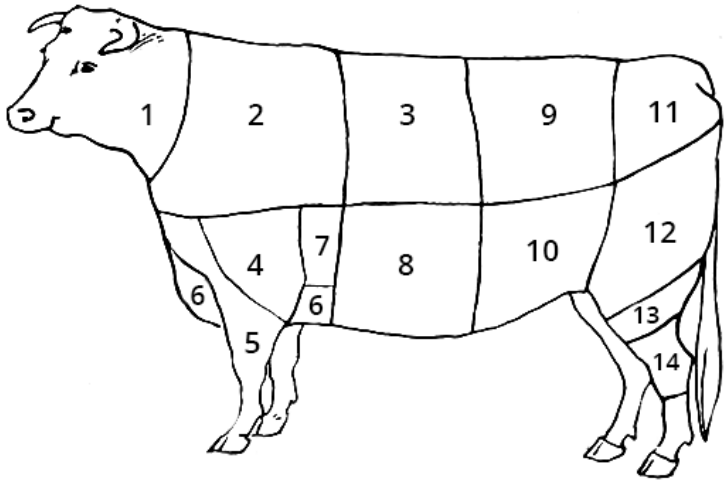
***Texture*: feel of substance between fingers or in the mouth; differences caused by grain, tenderness, moisture content, etc.**

brittle	pasty	firm
granular	soggy	mealy
oily	fibrous	slimy
smooth	lumpy	stringy
chewy	rubbery	grainy
limp	sugary	mushy

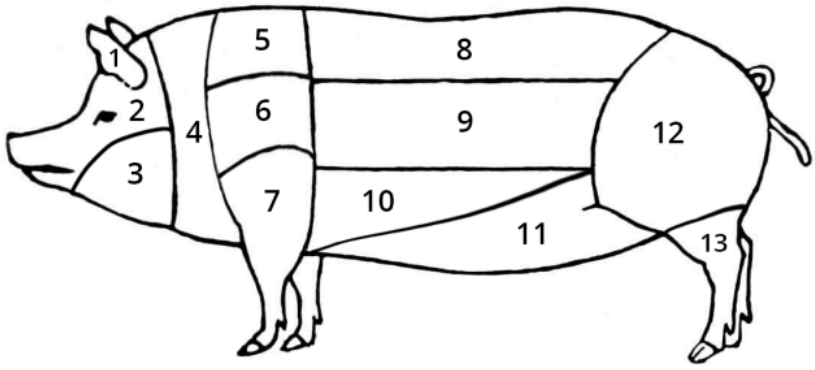
Appendix B

Meat Charts





1. Neck
2. Chuck
3. Ribs
4. Shoulder clod
5. Fore shank
6. Brisket
7. Cross ribs
8. Plate
9. Loin
10. Flank
19. Rump
12. Round
13. Second cut-round
14. Hind shank



1. Ear
2. Head
3. Cheek
4. Neck
5. Clear plate
6. Boston butt
7. Picnic ham
8. Back fat
9. Loin
10. Spare ribs
11. Bacon
12. Leg / Ham
13. Hock

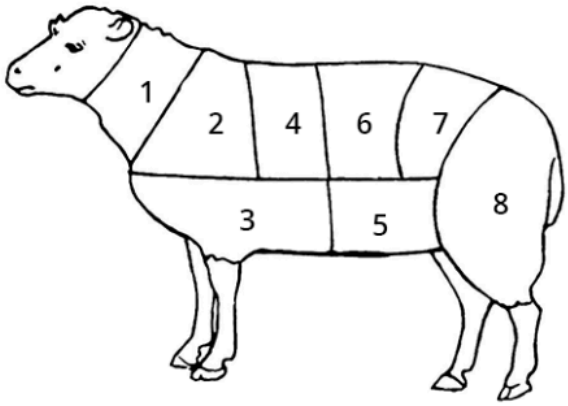


Diagram A.

1. Neck
2. Shoulder
3. Breast
4. Rib
5. Flank
6. Loin
7. Sirloin
8. Leg

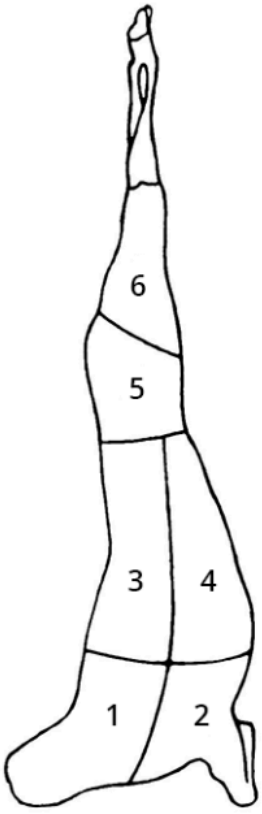


Diagram B.

1. Neck
2. Shoulder
3. Rack or Chops
4. Breast
5. Loin
6. Leg

Appendix C

Glossary of Cooking Terms

-A-

Aerate – To pass dry ingredients through a fine-mesh sifter so large pieces can be removed. The process also incorporates air to make ingredients like flour, lighter. Sifting dry ingredients aerates them while distributing small amounts of chemical leaveners or dry seasoning evenly through the mixture. Use sifters, sieves or tamis to both aerate and sift.

Al dente – Italian for "to the tooth." It describes pasta that is cooked until it offers a slight resistance when bitten into, rather than cooked until soft.

-B-

Bake – To cook food, covered or uncovered, using the direct, dry heat of an oven. The term is usually used to describe the cooking of cakes, other desserts, casseroles, and breads.

Bard – To tie fat around lean meats or fowl to keep them from drying out during roasting. The fat bastes the meat while it cooks, keeping it moist and adding flavor. The fat is removed a few minutes before the meat is finished, allowing the meat to brown. Barding is necessary only when there is no natural fat present.

Baste – To brush or spoon food as it cooks with melted fat or the cooking juices from the dish. Basting prevents foods from drying out and adds color and flavor. That's because basting tools, such as brushes and bulb basters, could be sources of bacteria if contaminated when dipped into uncooked or undercooked meat and poultry juices, then allowed to sit at room temperature and used later for basting.

Batter – An uncooked, wet mixture that can be spooned or poured, as with cakes, pancakes, and muffins. Batters usually contain flour, eggs, and milk as their base. Some thin batters are used to coat foods before deep frying.

Beat – To make a mixture smooth by briskly whipping or stirring it with a spoon, fork, wire whisk, rotary beater, or electric mixer.

Bias-slice – To slice a food crosswise at a 45-degree angle.

Blackened – A popular Cajun cooking method in which seasoned fish or other foods are cooked over high heat in a super-heated heavy skillet until charred, resulting in a crisp, spicy crust. At home, this is best done outdoors because of the large amount of smoke produced.

Blanch – To cook raw ingredients in boiling water briefly. Blanched vegetables are generally "shocked" i.e. plunged immediately and briefly into an ice water bath to stop the cooking process and preserve color and crunch.

Blend – To combine two or more ingredients together with a spoon, beater or blender.

Broil – To heat a liquid to its boiling point, until bubbles break the surface. "Boil" also means to cook food in a boiling liquid.

Bone – To remove the bones from meat, fish or fowl. Use a sharp boning knife and angle the blade toward the bone to avoid tearing or nicking the flesh.

Braise – To cook food, tightly covered, in a small amount of liquid at low heat for a long period of time. Sometimes, the food is first browned in fat. The long, slow cooking tenderizes meats by gently breaking down their fibers. The braising liquid keeps meats moist and can be used as a basis for sauce. Use wine, stocks or water as components in braising liquid.

Brine – Heavily salted water used to pickle or cure vegetables, meats, fish, and seafood.

Broil – To cook food a measured distance below direct, dry heat. When broiling, position the broiler pan and its rack so that the surface of the food (not the rack) is the specified distance from the heat source. Use a ruler to measure this distance.

Broth – The strained clear liquid in which meat, poultry, or fish has been simmered with vegetables and herbs. It is similar to stock and can be used interchangeably with it. Reconstituted bouillon can also be used when broth is specified.

Brown – To cook a food in a skillet, broiler, or oven to add flavor and aroma and develop a rich, desirable color on the outside and moistness on the inside.

Brush – To apply a liquid, like a glaze, to the surface of food using a pastry brush.

Butterfly – To split food (meat, fish, fowl) down the center, cutting almost, but not completely through. The two halves are then opened flat to resemble a butterfly.

-C-

Canel – To create small V-shaped grooves over the surface of fruits or vegetables for decorative

purposes using a canelle knife. The fruit or vegetable is then sliced, creating a decorative border on the slices.

Caramelize – To heat sugar until it liquefies and become a clear caramel syrup ranging in color from golden to dark brown. Fruits and vegetables with natural sugars can be caramelized by sautéing, roasting or grilling, giving them a sweet flavor and golden glaze.

Carve – To cut or slice cooked meat, poultry, fish, or game into serving-size pieces.

Chiffonade – To slice into very thin strips or shreds. Literally translated from French, the term means "made of rags". Often used on fresh herbs or lettuce.

Chill – To cool food to below room temperature in the refrigerator or over ice. When recipes call for chilling foods, it should be done in the refrigerator.

Chop – To cut food into bite-size pieces using a knife. A food processor may also be used to chop food. Chopped food is more coarsely cut than minced food.

Clarify – To remove sediment from a cloudy liquid, thereby making it clear. To clarify liquids, such as stock, egg whites and/or eggshells are commonly added and simmered for approximately 15 minutes. The egg whites attract and trap particles from the liquid. After cooling, strain the mixture through a cloth-lined sieve to remove residue. To clarify rendered fat, add hot water and boil for about 15 minutes. The mixture should then be strained through several layers of cheesecloth and chilled. The resulting layer of fat should be completely clear of residue. Clarified butter is butter that has been heated slowly so that its milk solids separate and sink, and can be discarded. The resulting clear liquid can be used at a higher cooking temperature and will not go rancid as quickly as unclarified butter.

Cream – To beat a fat, such as butter or shortening either alone or with sugar, to a light, fluffy consistency. May be done by hand with a wooden spoon or with an electric mixer. This process incorporates air into the fat so baked products have a lighter texture and a better volume.

Crimp – To pinch or press pastry or dough together using your fingers, a fork, or another utensil. Usually done for a piecrust edge.

Crisp-tender – A term that describes the state of vegetables that have been cooked until just tender but still somewhat crunchy. At this stage, a fork can be inserted with a little pressure.

Curdle – To cause semisolid pieces of coagulated protein to develop in a dairy product. This can occur when foods such as milk or sour cream are heated to too high a temperature or are combined with an acidic food, such as lemon juice or tomatoes.

Cure – To treat food by one of several methods for preservation purposes. Examples are smoking, pickling – in an acid base, corning – with acid and salt, and salt curing – which removes water.

Cut-in – To work a solid fat, such as shortening, butter, or margarine, into dry ingredients. This is usually done with a pastry blender, two knives in a crisscross fashion, your fingertips, or a food processor.

-D-

Dash – Refers to a small amount of seasoning that is added to food. It is generally between 1/16 and 1/8 teaspoon. The term is often used for liquid ingredients, such as bottled hot pepper sauce.

Deep-fry – To cook food in hot fat or oil deep enough so that it is completely covered. The temperature of the fat is extremely important and can make the difference between success and failure. When the fat is not hot enough, the food absorbs fat and becomes greasy. When the fat is too hot, the food burns on the exterior before it has cooked through. Fat at the correct temperature will produce food with a crisp, dry exterior and moist interior. An average fat temperature for deep-frying is 375 degrees, but the temperature varies according to the food being fried. Use a deep fryer, an electric fry pan or a heavy pot and a good kitchen thermometer for deep-frying.

Deglaze – To remove browned bits of food from the bottom of a pan after sautéing, usually meat. After the food and excess fat have been removed from the pan, a small amount of liquid is heated with the cooking juices in the pan and stirred to remove browned bits of food from the bottom. The resulting mixture often becomes the base for a sauce.

Devein – To remove the blackish-gray vein from the back of a shrimp. The vein can be removed with a special utensil called a deveiner or with the tip of a sharp knife. Small and medium shrimp need deveining for aesthetic purposes only. However, because the veins in large shrimp contain grit, they should always be removed.

Dice – To cut food into tiny cubes (about 1/8- to 1/4-inch).

Double Broiler – A two-pan arrangement where one pan nests partway inside the other. The lower pot holds simmering water that gently cooks heat-sensitive food in the upper pot.

Drain – To pour off fat or liquid from food, often using a colander.

Dredge – To lightly coat food that is going to be fried with flour, breadcrumbs or cornmeal. The coating helps to brown the food and provides a crunchy surface. Dredged foods need to be cooked immediately, while breaded foods, those dredged in flour, dipped in egg then dredged again in breading, can be prepared and held before cooking.

Drizzle – To randomly pour a liquid, such as powdered sugar icing, in a thin stream over food.

-E-

Emulsify – To bind together two liquid ingredients that normally do not combine smoothly, such as water and fat. Slowly add one ingredient to the other while mixing rapidly. This action disperses tiny droplets of one liquid in the other. Mayonnaise and vinaigrettes are emulsions. Use a good whisk for steady, even emulsification.

Extracts, Oils – Products based on the aromatic essential oils of plant materials that are distilled by various means. In extracts, the highly concentrated oils are usually suspended in alcohol to make them easier to combine with other foods in cooking and baking. Almond, anise, lemon, mint, orange, peppermint, and vanilla are some commonly available extracts.

Some undiluted oils are also available, usually at pharmacies. These include oil of anise, oil of cinnamon, oil of cloves, oil of peppermint, and oil of wintergreen. Do not try to substitute oils for ground spices in recipes. Oils are so concentrated that they're measured in drops, not teaspoons. Oil of cinnamon, for example, is 50 times stronger than ground cinnamon. You can, however, substitute 1 or 2 drops of an oil for 1/2 teaspoon extract in frosting or candy recipes.

-F-

Fillet – verb – To create a fillet of fish or meat by cutting away the bones. Fish and boning knives help produce clean fillets.

Noun – A piece of meat or fish that has no bones.

Flake – To gently break food into small, flat pieces

Flour (verb) – To coat or dust a food or utensil with flour. Food may be floured before cooking to add texture and improve browning. Baking utensils sometimes are floured to prevent sticking.

Flute – To make a decorative impression in food, usually a piecrust.

Fold – To combine a light mixture like beaten egg whites with a much heavier mixture like whipped cream. In a large bowl, place the lighter mixture on top of the heavier one. Starting at the back of the bowl, using the edge of a rubber spatula, cut down through the middle of both mixtures, across the bottom of the bowl and up the near side. Rotate the bowl a quarter turn and repeat. This process gently combines the two mixtures.

Fry – To cook food (non-submerged) in hot fat or oil over moderate to high heat. There is very little difference between frying and sautéing although sautéing is often thought of as being faster and using less fat.

-G-

Grate – To reduce a large piece of food to coarse or fine threads by rubbing it against a rough, serrated surface, usually on a grater. A food processor, fitted with the appropriate blades, can also be used for grating. The food that is being grated should be firm. Cheese that needs to be grated can be refrigerated first for easier grating.

Grease – To coat a utensil, such as a baking pan or skillet, with a thin layer of fat or oil. A pastry brush works well to grease pans. Also refers to fat released from meat and poultry during cooking.

Grill – To cook food on a grill over hot coals or other heat source. The intense heat creates a crust on the surface of the food which seals in the juices. The grill should be clean and must be heated before the food is laid on it. The food can also be basted and seasoned.

Grind – To reduce food to small pieces by running it through a grinder. Food can be ground to different degrees, from fine to coarse.

-H-

Homogenize – To create an emulsion by reducing all the particles to the same size. The fat globules are broken down mechanically until they are evenly distributed throughout the liquid. Homogenized milk and some commercial salad dressings are two examples of homogenized foods.

-I-

Infuse – To steep an aromatic ingredient in hot liquid until the flavor has been extracted and absorbed by the liquid. Teas are infusions. Milk or cream can also be infused with flavor before being used in custards or sauces.

-J-

Joint – To cut meat and poultry into large pieces at the joints using a very sharp knife.

Julienne – To cut food into thin sticks. Food is cut with a knife or mandoline into even slices, then into strips.

-K-

Knead – To mix and work dough into a smooth, elastic mass. Kneading can be done either manually or by machine. By hand, kneading is done with a pressing-folding-turning action. First the dough is pressed with the heels of both hands and pushed away from the body so the dough stretches out. The dough is then folded in half, given a quarter turn, and the process is repeated. Depending on the dough, the kneading time can range anywhere from 5 to 15 minutes. During kneading, the gluten strands stretch and expand, enabling dough to hold in gas bubbles formed by a leavener, which allows it to rise.

-L-

Lard – To insert strips of fat (lardons) or bacon into a dry cut of meat using a utensil called a larding needle. Larding makes the cooked meat more succulent and tender.

Line – To cover the bottom and sides of a cassoulet, mold or terrine with a thin layer of bacon, pork fat, flavorings or pastry. Cake pans are frequently lined with parchment paper to prevent the cake from sticking to the pan after baking.

-M-

Macerate – To soak foods, usually fruit, in liquid so they absorb the liquid's flavor. The macerating liquid is usually alcohol, liqueur, wine, brandy or sugar syrup. Macerate is also frequently applied to fruits sprinkled with sugar, which intensifies natural flavor of the fruit by drawing out its juices.

Marble – To gently swirl one food into another. Marbling is usually done with light and dark batters for cakes or cookies.

Marinate – To soak food in a seasoned liquid mixture for a certain length of time. The purpose of marinating is to add flavor and/or tenderize the food. Due to the acidic ingredients in many marinades, foods should be marinated in glass, ceramic or stainless steel containers. Foods should also be covered and refrigerated while they are marinating. When fruits are soaked in this same manner, the process is called macerating.

Mash – To crush a food into smooth and evenly textured state. For potatoes or other root vegetables, use a ricer, masher or food mill. While food processors provide a smooth texture more like a puree or a paste, they should not be used for potatoes.

Mince – To cut food into very tiny pieces. Minced food is cut into smaller, finer pieces than diced food.

Mirepoix – A seasoning composed of finely diced sautéed vegetables and herbs and sometimes diced ham, bacon, or salt pork.

Mix – To stir or beat two or more foods together until they are thoroughly combined. May be done with an electric mixer, a rotary beater, or by hand with a wooden spoon.

Moisten – To add enough liquid to a dry ingredient or mixture to make it damp but not runny.

Mount – To whisk cold butter, piece by piece, into a warm sauce for smooth texture, flavor and sheen. Each piece of butter must be thoroughly incorporated before a new piece is added so that the sauce does not break (or separate into liquid and fat).

Mull – To slowly heat a beverage, such as cider, with spices and sugar.

-N-

Nap – To completely coat food with a light, thin, even layer of sauce.

-O-

Open Faced – A sandwich prepared with just one piece of bread which is topped with a wide variety of meats, vegetables, cheeses and heated or not.

-P-

Pan-broil- To cook a food, especially meat, in a skillet without added fat, removing any fat as it accumulates.

Parboil – To boil food briefly in water, cooking it only partially. Parboiling is used for dense food like carrots and potatoes. After being parboiled, these foods can be added at the last minute to quicker-cooking ingredients. Parboiling ensures that all ingredients will finish cooking at the same time. Since foods will continue to cook once they have been removed from the boiling water, they should be shocked in ice water briefly to preserve color and texture. Cooking can then be completed by sautéing or the parboiled vegetable can be added to simmering soups or stews.

Pare – To remove the thin outer layer of foods using a paring knife or a vegetable peeler.

Peel – To remove the rind or skin from a fruit or vegetable using a knife or vegetable peeler.

Pinch – A small amount of a dry ingredient (the amount that can be pinched between a finger and the thumb).

Poach – To cook food by gently simmering in liquid at or just below the boiling point. The amount of the liquid and poaching temperature depends on the food being poached.

Pot Roast – To cook meat slowly by moist heat in a covered pot. The meat is first browned, then braised either on top of the stove or in the oven. Pot roasting is good for tougher cuts of meat which require longer cooking times to break down connective tissue.

Pound – Pounding thinner cuts of meat tenderizes it by breaking down muscle. Kitchen mallets are generally used for pounding, but it can be done using a small frying pan as well. First place the piece of meat between two pieces of plastic wrap or wax paper.

Preheat – To heat an oven or a utensil to a specific temperature before using it.

Process – To preserve food at home by canning, or to prepare food in a food processor.

Purée – To grind or mash food until completely smooth. This can be done using a food processor or blender or by pressing the food through a sieve.

-Q-

Quadriller – To mark the surface of grilled or broiled food with a crisscross pattern of lines. The scorings are produced by contact with very hot single grill bars which brown the surface of the food. Very hot skewers may also be used to mark the surface.

Quench – To quickly place a heated object in cold water. This is usually done to either stop the cooking process or to separate the skin of an object from the meat. This process is sometimes referred to as “shocking.”

-R-

Reconstitute – To bring a concentrated or condensed food, such as frozen fruit juice, to its original strength by adding water.

Reduce – To decrease the volume of a liquid by boiling it rapidly to cause evaporation. As the liquid evaporates, it thickens and intensifies in flavor. The resulting richly flavored liquid, called a reduction, can be used as a sauce or as the base of a sauce. When reducing liquids, use the pan size specified in the recipe, as the surface area of the pan affects how quickly the liquid will evaporate.

Rice – To push cooked food through a perforated kitchen tool called a ricer. The resulting food looks like rice.

Roast – To oven-cook food in an uncovered pan. The food is exposed to high heat which produces a well-browned surface and seals in the juices. Reasonably tender pieces of meat or poultry should be used for roasting. Food that is going to be roasted for a long time may be barded to prevent drying out.

Roux (roo)- A French term that refers to a mixture of flour and a fat cooked to a golden- or rich-brown color and used for a thickening in sauces, soups, and gumbos.

-S-

Sauté – To cook food quickly in a small amount of fat or oil, until brown, in a skillet or sauté pan over direct heat. The sauté pan and fat must be hot before the food is added, otherwise the food will absorb oil and become soggy.

Scald – To dip fruits or vegetables in boiling water in order to loosen their skins and simplify peeling. The produce should be left in the water for only 30 seconds to prohibit cooking, and should be shocked in an ice water bath before the skin is removed

Scale – To remove the scales from the skin of a fish using a dull knife or a special kitchen tool called a fish scaler.

Score – To cut narrow slits, often in a diamond pattern, through the outer surface of a food to decorate it, tenderize it, help it absorb flavor, or allow fat to drain as it cooks.

Sear – To brown meat or fish quickly over very high heat either in a fry pan, under a broiler or in a hot oven. Searing seals in the food's juices and provides a crisp tasty exterior. Seared food can then be eaten rare or roasted or braised to desired degree of doneness.

Season – To add flavor to foods. To coat the cooking surface of a new pot or pan with vegetable oil then heat in a 350 degree oven for about an hour. This smoothes out the surface of new pots and pans, particularly cast-iron, and prevents foods from sticking.

Section – To separate and remove the membrane of segments of citrus fruits. To section oranges, use a paring knife to remove the peel and white rind. Working over a bowl to catch the juice, cut between one orange section and the membrane, slicing to the center of the fruit. Turn the knife and slide it up the other side of the section along the membrane, cutting outward. Repeat with remaining sections.

Seed – To remove the seeds from fruits and vegetables.

Shred – To cut food into thin strips. This can be done by hand or by using a grater or food processor. Cooked meat can be shredded by pulling it apart with two forks.

Shuck – To remove the shells from seafood, such as oysters and clams, or the husks from corn.

Sieve – To strain liquids or particles of food through a sieve or strainer. Press the solids, using a ladle or wooden spoon, into the strainer to remove as much liquid and flavor as possible.

Sift – To pass dry ingredients through a fine mesh sifter so large pieces can be removed. The process also incorporates air to make ingredients like flour, lighter. Synonymous with AERATE.

Simmer – To cook food in liquid over gentle heat, just below the boiling point, low enough so that tiny bubbles just begin to break the surface.

Skewer – To spear small pieces of food on long, thin, pointed rods called skewers.

Skim – To remove the scum that rises to the surface from a liquid when it is boiled. The top layer of the liquid, such as the cream from milk or the foam and fat from stock, soups or sauces, can be removed using a spoon, ladle or skimmer. Soups, stews or sauces can be chilled so that the fat coagulates on the surface and may be easily removed before reheating.

Skin – To remove the skin from food before or after cooking. Poultry, fish and game are often skinned for reasons of appearance, taste and diet.

Slice – A flat, usually thin, piece of food cut from a larger piece. Also the process of cutting flat, thin pieces

Snip – To cut food, often fresh herbs or dried fruit, with kitchen shears or scissors into very small, uniform pieces using short, quick strokes.

Smoke – To expose fresh food to smoke from a wood fire for a prolonged period of time. Traditionally used for preservation purposes, smoking is now a means of giving flavor to food. Smoking tends to dry the food, kills bacteria, deepens color and gives food a smoky flavor. The duration of smoking varies from 20 minutes to several days. The most commonly used woods are beech, oak and chestnut to which aromatic essences are often added. Small home smokers are now available.

Springform Pan – A round pan with high sides and a removable bottom. The bottom is removed by releasing a spring that holds the sides tight around it. This makes it easy to remove food from the pan.

Steam – Steaming retains flavor, shape, texture, and nutrients better than boiling or poaching.

Steep – To allow a food, such as tea, to stand in water that is just below the boiling point in order to extract flavor or color.

Stew – To cook food in liquid for a long time until tender, usually in a covered pot. The term also refers to a mixture prepared this way.

Stir – To mix ingredients with a spoon or other utensil to combine them, to prevent ingredients from sticking during cooking, or to cool them after cooking.

Stir-fry – A method of quickly cooking small pieces of food in a little hot oil in a wok or skillet over medium-high heat while stirring constantly.

Stock – The strained clear liquid in which meat, poultry, or fish has been simmered with vegetables or herbs. It is similar to broth but is richer and more concentrated. Stock and broth can be used interchangeably; reconstituted bouillon can also be substituted for stock.

Supreme – To remove the flesh sections of citrus fruit from the membranes. Using a sharp knife, cut away all of the skin and pith from the outside of the fruit. Place the knife between the membrane and the flesh of one section and slice down. Turn the knife catching the middle of the fruit. Slice up, removing each section sans membrane.

Sweat – To cook vegetables in fat over gentle heat so they become soft but not brown, and their juices are concentrated in the cooking fat. If the pan is covered during cooking, the ingredients will keep a certain amount of their natural moisture. If the pan is not covered, the ingredients will remain relatively dry.

-T-

Temper – 1. To slowly bring up the temperature of a cold or room temperature ingredient by adding small amounts of a hot or boiling liquid. Adding the hot liquid gradually prevents the cool ingredient, such as eggs, from cooking or setting. The tempered mixture can then be added back to hot liquid for further cooking. This process is used most in making pastry cream and the like. 2. To bring chocolate to a state in which it has snap, shine and no streaks. Commercially available chocolate is already tempered but this condition changes when it is melted. Tempering is often done when the chocolate will be used for candy making or decorations. Chocolate must be tempered because it contains cocoa butter, a fat that forms crystals after chocolate is melted and cooled. Dull grey streaks form and are called bloom. The classic tempering method is to melt chocolate until it is totally without lumps (semisweet chocolate melts at a temperature of 104 degrees F.) One third of the chocolate is then poured onto a marble slab then spread and worked back and forth with a metal spatula until it becomes thick and reaches a temperature of about 80 degrees F. The thickened chocolate is then added back to the remaining 2/3 melted chocolate and stirred. The process is repeated until the entire mixture reaches 88-92 degrees for semisweet chocolate, 84-87 degrees for milk or white chocolate.

Tenderize – To make meat more tender by pounding with a mallet, marinating for varying periods of time, or storing at lower temperatures. Fat may also be placed into a piece of meat to make it more tender during cooking.

Toast – The process of browning, crisping, or drying a food by exposing it to heat. Toasting coconut, nuts, and seeds helps develop their flavor. Also the process of exposing bread to heat so it becomes browner, crisper, and drier.

Toss – To mix ingredients lightly by lifting and dropping them using two utensils.

Truss – To secure food, usually poultry or game, with string, pins or skewers so that it maintains a compact shape during cooking. Trussing allows for easier basting during cooking.

-U-

Unleavened – Any baked good that has no leavener, such as yeast, baking powder or baking soda.

-V-

Vandyke – To cut zigzags in edges of fruit and vegetables halves, usually oranges, tomatoes or lemons. The food is usually used as a garnish to decorate a dish.

-W-

Weeping – When liquid separates out of a solid food, such as jellies, custards, and meringues.

Whip – To beat ingredients such as egg whites or cream until light and fluffy. Air is incorporated into the ingredients as they are whipped, increasing their volume until they are light and fluffy.

Whisk – To beat ingredients together until smooth, using a kitchen tool called a whisk.

-X-

XXX, XXXX, 10X – An indicator on a box of confectioners' sugar of how many times it has been ground. The higher the number of X's the finer the grind.

-Y-

Yakitori – A Japanese term meaning "grilled."

-Z-

Zest – To remove the outermost skin layers of citrus fruit using a knife, peeler or zester. When zesting, be careful not to remove the pith, the white layer between the zest and the flesh, which is bitter.

Sources

1. *Better Homes and Gardens Glossary of Cooking Terms, 2009.* *http://www.bhg.com/recipes/how-to/cooking-basics/glossary-of-cooking-terms/*
2. http://www.international-gourmet.net/glossary.htm

Appendix D

Image Sources

Introduction

- “US Volume measures” is by Ldecola on Wikimedia Commons, licensed CC BY SA 4.0: https://commons.wikimedia.org/wiki/File:US_volume_measures.png

Chapter 1

- “Dawn-man-people-woman” by Vlada Karpovich on Pexles, licensed for public domain. https://www.pexels.com/photo/dawn-man-people-woman-6755609/

Chapter 2

- “Osmosis experiment” is by Rlawson at English Wikibooks on Wikemedia Commons, licensed CC BY SA 3.0: https://commons.wikimedia.org/wiki/File:Osmosis_experiment.JPG .

Chapter 3

- “Photo Of Sliced Vegetables On Wooden Chopping Board” is by Polina Tankilevitch on Pexles, licensed for public domain.https://www.pexels.com/photo/photo-of-sliced-vegetables-on-wooden-chopping-board-3872434/

Chapter 4

- “Wheat-kernel nutrition” is by Jkwchui on Wikimedia Commons, licensed CC BY SA 3.0: https://commons.wikimedia.org/wiki/File:Wheat-kernel_nutrition.svg; Image adapted by Abbey Elder to focus on content applicable for this chapter.

Chapter 7

- “Assorted cheese platter” by freefoodphotos.com, licensed CC BY 3.0 Unported: https://www.freefoodphotos.com/imagelibrary/dairy/slides/cheeses_selection.html

Chapter 8

- “Anatomy of an egg” is by Vkkodali on on Wikimedia Commons, licensed CC BY SA 3.0: https://commons.wikimedia.org/wiki/File:Anatomy_of_an_egg_labeled.jpg; Image adapted by Abbey Elder to black and white version with labels simplified for lab activity.
- “Caramelization (2)” is by Rehman on Wikimedia Commons, licensed CC BY SA 4.0: https://commons.wikimedia.org/wiki/File:Caramelization_(2).png.

Chapter 9

- “Souffle” is by Pierre-alain dorange on Wikimedia Commons, licensed by CC BY SA 3.0: https://commons.wikimedia.org/wiki/File:Souffl%C3%A9.JPG

Chapter 14

- “Close-Up Shot of Slices of Bread in a Wooden Tray” is by Cats Coming, licensed for public domain. https://www.pexels.com/photo/close-up-shot-of-slices-of-bread-in-a-wooden-tray-8811598/

Appendix B

- “USDA Poultry Cuts” is by BetacommandBot (United States Department of Agriculture employee) on Wikimedia Commons, licensed for public domain. https://commons.wikimedia.org/wiki/File:USDA_poultry_cuts.png