Icings and Glazes

Unit: Preparing Foods

Problem Area: Baking and Pastry

Lesson: Icings and Glazes

Student Learning Objectives.

Instruction in this lesson should result in students achieving the following objectives:

1. **Summarize basic icing and glaze ingredients and equipment.**
2. **Prepare icings and glazes.**
3. **Analyze physical changes and chemical reactions that occur in icing and glaze preparation.**

Resources.

The following resources may be useful in teaching this lesson:

E-unit(s) corresponding to this lesson plan. CAERT, Inc. http://www.mycaert.com.

"Cake Decorating Tips," *Wilton.* Accessed Sep. 6, 2017. http://www.wilton.com/learn-decorating-techniques/.

"Caramelization," *BAKERpedia.com*. Accessed Sep. 6, 2017. http://bakerpedia.com/processes/caramelization/.

"Frosting, Icing, & Glazes," *C&H Sugar.* Accessed Sep. 6, 2017. https://www.chsugar.com/recipe-result?filter_by_tid=906&type=recipe&sort_by=search_api_relevance&search_term=.

"Gelatin Handbook," *Gelatin Manufacturers of American (GMIA)*. Accessed Sep. 6, 2017. http://www.gelatin-gmia.com/images/GMIA_Gelatin_Manual_2012.pdf.

Huff, Tessa. "How to Use a Piping Bag," *Kitchn.* Accessed Sep. 6, 2017. http://www.thekitchn.com/how-to-use-a-piping-bag-224064.

Larsen, Linda. "Frosting Types," *The Spruce.* Accessed Sep. 6, 2017. https://www.thespruce.com/frosting-types-481233.

"Types—Frosting or Icing, Fillings and Glazes," *CraftyBaking.com*. Accessed Sep. 6, 2017. https://www.craftybaking.com/learn/baked-goods/frosting-icing-etc/types.

"What Are the Seven Main Types of Icing?" *wiseGeek.com.* Accessed Sep. 6, 2017. http://www.wisegeek.com/what-are-the-seven-main-types-of-icing.htm.

Wilson, Dede. "Cake Decorating Tips 101: A Guide to Frosting Decorations," *Bakepedia.* Accessed Sep. 6, 2017. http://www.bakepedia.com/tipsandtricks/cake-decorating-tips-101-guide-frosting-decorations/.

Equipment, Tools, Supplies, and Facilities

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials

Key Baking Terms.

The following terms are presented in this lesson (shown in bold italics):

- albumen
- bain-marie
- baker's percentage
- bittersweet chocolate
- buttercream icing
- caffeine
- cacao
- chocolate
- chocolate liquor
- coating
- cocoa
- condensed milk
- coupler
- crème fraîche
- crumb coating
- crumb the cake
- decorating tips
- double boiler
- Dutched chocolate
- emulsified shortening (cake, icing, or high-ratio shortening)
- emulsifiers
- flat icing
- foam/boiled/meringue icings
- formula
- fondant
- French buttercream
- frost
- frosting
- fudge icing
- ganache icing
- glaze (glacé)
- glazing
- ice
- icing
- icing comb
- Italian meringue buttercream
- lipids
- marzipan
- meringue powder
- milk chocolate
- mise en place
- pastry bag
- petit fours
- poured fondant
- powdered sugar (confectioners' sugar, icing sugar)
- recipe
- rolled fondant
- rose or flower nail
- royal icing
- saccharide
- salt

- salted sweet cream butter
- scaling
- semisweet chocolate
- seven minute icing/ frosting
- simple buttercream
- simple syrup
- sweet dark chocolate
- Swiss meringue buttercream
- tip brush
- unsalted sweet cream butter
- unsweetened chocolate (baking chocolate)
- vegetable shortening
- whipped cream icing
- white chocolate

Key Science Terms.

The following terms are presented in this lesson (shown in bold italics):

- absorption
- alkaloid
- antioxidant
- caramelization
- chemical reaction
- coagulate
- coagulation
- colloids
- colloidial dispersion
- condensation
- conduction
- convection
- denature
- denaturation
- emulsion
- endothermic reaction
- exothermic reaction
- evaporation
- firm-ball stage
- foam
- hard-ball stage
- hard-crack stage
- heat transfer
- homogenous mixtures
- hydrolysis
- hygroscopic
- immiscible
- invert sugar
- lecithin
- physical change
- radiation
- soft-ball stage
- soft-crack stage
- surface tension
- suspension
- thread stage
- Tyndall effect
- viscosity

Interest Approach.

Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

> *Project pictures of various cakes from the Pinterest website (or others) that are iced, frosted, and/or glazed. Then, ask students what the following phrase mean? "That's the icing on the cake!" Next, begin a conversation about the purposes of cake and dessert "coatings" using VM–A.*

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Summarize basic icing and glaze ingredients and equipment.

Anticipated Problem: What is icing? What is glaze? What are basic icing and glaze ingredients? What are the functions of basic icing and glaze ingredients? What are standard icing and glaze equipment and tools?

I. Icing and glaze ingredients and equipment

A. A ***coating*** is a covering for a dessert or other foodstuff. There are nine icing and glaze coating categories: flat, butter, foam/boiled/meringue, royal, fondant, fudge, ganache, whipped cream, and glaze (glacé). Each type is differentiated by its consistency (texture). The three main functions of icing and glaze coatings are to:

1. Add flavor and richness to the dessert and interest to the surface.
2. Develop the dessert's appearance and suggest special occasions.
3. Improve the keeping quality of the dessert (moisture and flavor) with the protective coating. [NOTE: The most common way cakes and other pastries are moistened following baking is by the application of simple syrup. ***Simple syrup*** is a mixture of 1-part sugar (by weight) to 1-part water (by weight), boiled for 1 minute. When cooled or lukewarm, simple syrup is brushed onto dry cakes (usually sponge types) to moisten and flavor. It is also used to make ice creams and sorbets, to glaze pastries, to thin liquors, to dilute chocolate or food colorings, and to make meringues, caramels, raspberry mousse, and more. Simple syrup can be stored refrigerated for 1 to 2 weeks.]
4. ***Icing*** is a sugar coating used to decorate cakes, buns, cookies, bars, etc. In its most basic form, an icing is a mixture of sugar and liquid. It is that missing element, "the icing on the cake," that provides the artistry and the finishing touch to a perfect baked good. ***Frosting*** is the American term for icing: a thick and fluffy sweet mixture, cooked or uncooked, for coating or filling cakes, cookies, and other baked items.
5. ***Glazing*** is a broad term for several dessert coatings: sugar-icing-syrup coatings cooked to the 'crack' stage that harden when cold, water icings (sugar and liquid), melted chocolate with cream or other additives (think of ganache), or sieved jams and jellies that gelatinize on the dessert's surface (think aspic and other fruit-based glazes). Glazes are the thinnest of the coatings when prepared, however, the baker must work quickly when preparing sugar-icing-syrup glazes as these glazes "set-up" rapidly when removed from heat.

B. Baking is science. Bakers use formulas to ensure consistent products. A baking ***formula*** measures ingredients by weight in pounds and ounces or kilograms or milligrams: a general science and math construct that shows the relationship

between given quantities. Weight measurement is essential when flours and sugars (anything sifted) are added to a baking formula. In contrast, a baking ***recipe*** measures ingredients by volume: teaspoons, tablespoons, cups, dashes, and pinches, which are perfectly fine for small batches. For example:

1. ***Scaling*** is the baker's term for weighing out ingredients. Accurately measuring 4.54 cups of cake flour by volume is, at best, a guess, whereas accurately weighing 1 pound of cake flour is very precise. In baking and pastry formulas all ingredients are based on percentages (ratios), and the percentages are what allow one to scale the batter or dough up or down (doubling, tripling, etc.).
2. ***Baker's percentage*** (or formula percentage) is a conventional way to list ingredients in dough in which the quantity of each ingredient is expressed as a percentage of the total amount of flour. For example: 1000g flour, 660g water, 20g salt, 10g yeast is expressed in baker's percentage as 100% flour, 66% water, 2% salt, 1% yeast. In a baker's formula all amounts are expressed in percent of the total flour weight, although the correct term is "ratio" as the percentages always add up to more than 100%. If a formula calls for 4 pounds of flour, then 4 pounds = 100%. In the same formula, two ounces of baking powder = 3.1% of the total flour weight. The reasons to use baker's percentage include:
    a. Enables the baker to work with precision using only one unit of measure;
    b. Easy to scale a formula up or down (doubling, tripling, etc.);
    c. Easy to compare which formula is drier, sweeter, or saltier;
    d. More accurately measures uniformly an ingredient—such as eggs—in which the quantity per unit may vary; and,
    e. Serves as a common language among all bakers and baking operations. [NOTE: For a standard "Ingredient Weight Chart," see the King Arthur Flour website at http://www.kingarthurflour.com/learn/ingredient-weight-chart.html.] [NOTE: A drawback to baker's percentages is that the formula does not reflect any impact of the amount of gluten-forming proteins in the flour on the final product and therefore may need to be adjusted.]

C. Sugar (sucre)

1. DESCRIPTION: Sugar (sucre) is the most commonly used ingredient in icings and glazes. Sugar is a sweet substance made from carbon, hydrogen, and oxygen molecules; a carbohydrate that is soluble in water that produces with a sweet taste. ***Saccharide*** is the scientific name for the organic compound sugar. Sugars are produced from various types of plants: cane (sucrose), beet, sugar maple, and palm. In fact, all fruits and vegetables contain sugar (sucrose, fructose). Solid sugars include cane and beet and the "grind" impacts the baked good, icing, and glaze: granulated, superfine, brown, powdered, sanding, pearl or nib, etc. Most baked goods are produced with the solid sugars.
    a. Raw cane sugars—turbinado, demerara, and muscovado—are popular unrefined, molasses-soaked sugars. The most refined is turbinado, then

demerara, and finally, muscovado: each indicates its molasses strength by its color (turbinado is lightest and muscovado is darkest).

b. Liquid sweeteners include honey, molasses, corn syrup, and various manmade liquid sugars produced initially for dietary purposes. Liquid sugars do not react in baked goods in the same fashion as solid sugars. Consult a reference to substitute liquid for solid sugars.

c. ***Powdered sugar (confectioners' sugar, icing sugar)*** is granulated sugar crushed to a fine powder, bright white, and contains 3% cornstarch to prevent clumping. When powdered sugar is measured, rather than weighed, it is measured as for flour (e.g., Spoon into a measuring cup and level, rather than scooping into the cup.)

d. Sugar by volume (cups) may seem comparable (e.g., a cup is a cup) but sugar by weight is not. For example:

(1) 1 cup granulated sugar weighs about 7 ounces

(2) 1 cup confectioners' (powdered) sugar weighs about 4 ounces

(3) 1 cup packed brown sugar weighs about 7½ ounces

(4) 1 cup molasses, honey, or corn syrup weighs about 12 ounces

2. FUNCTIONS: Sugar provides the following functions to icings, and glazes:

a. Flavor

b. Tenderizes

c. Colors (caramelizes; aids in browning meringues)

d. Moisture retention (sweetened baked goods, icings, and glazes stay moist longer than unsweetened types)

e. Cause icings and glazes to spread [NOTE: Artificial sweeteners do not provide the browning, tenderizing, and moisture retention characteristics of natural sugars.]

3. NUTRIENT: Sugar is 100% carbohydrate.

D. Liquid

1. DESCRIPTION: Liquid is the second most commonly used ingredient in icings and glazes. Icings and glazes use various types of liquids, including: water, milk, heavy cream, sour cream, crème fraîche, fruit purées, and fruit juices. Sour cream has a fat content of about 20% and may include additives, such as gelatin, rennin, and vegetable enzymes to stabilize the mixture and thicken it. ***Crème fraîche*** is naturally thickened and soured cow's cream that consists of 30% fat and no added thickeners. It is thicker, richer in flavor, and less tangy than sour cream. It can be whipped in the same manner as heavy cream and does not curdle when heated (as does sour cream).

a. Milk is often used to thin frostings and glaze.

b. Heavy cream is used to make ganache.

2. FUNCTIONS: The functions of liquid in icings and glazes are:

a. Moisture (also used to "thin" icings and glazes to appropriate consistency)

b. Flavor (dairy (adds tartness), fruits, juices, liquors, etc.)

c. Color (from milk and fruit sugars, fruit juices, etc.)

d. Steam leavening (from the conversion of liquid to steam in cooked icings)
e. Binds icing and glaze ingredients together

E. Fat (graisse)

1. DESCRIPTION: Fats are greasy ingredients that melt at low temperatures. They are the third most commonly used ingredient in icings and glazes. Fats are compounds of carbon, hydrogen, and oxygen (the same three molecules as sugar). ***Lipids*** are dietary fats that include fatty acids, triglycerides, and cholesterol: lipid is the scientific term for fat. Fats are very concentrated body fuel and help to supply energy and build body tissue. Fat is found in animal (butter, lard) and vegetable (peanut, palm, corn, canola, olive, shortening) tissue. Solid fats (butter, margarine, hydrogenated products) remain solid at about room temperature. Oils remain liquid at about room temperature and may solidify when refrigerated. The process to create hydrogenated shortenings also produces trans fatty acids that may cause a health risk. Shortenings are 100% fat. Common fats used in the production of icings and glazes include:
   a. ***Vegetable shortening*** is a solid (plastic) fat made from purified oils (soybean, peanut, corn, and cottonseed) that have been hydrogenated. Hydrogenation is a process of adding hydrogen molecules under pressure that 1) solidify the liquid vegetable oils, 2) absorb the oxygen in the oil's free fatty acids to convert them to fats that are solid at room temperature. Some shortening may have added animal fats, emulsifiers, colorings, and flavorings (butter). Hydrogenated fats provide more volume for baked goods than butter.
   b. ***Emulsified shortening (cake, icing, or high-ratio shortening)*** is an all-purpose hydrogenated shortening with one or two combinations of emulsifiers added. Emulsifiers blended into a shortening help in the formation of an emulsion by allowing the baker to add more liquid and sugar to the icing mixture than all-purpose non-emulsified hydrogenated vegetable shortenings would allow. They promote a finer texture, help keep products moist, and stabilize the icing mixture. ***Emulsifiers*** are additives that reduce the tension between oil and water and improve softness, texture, stability, volume, and shelf life. As butter contains no emulsifiers, its fat is more difficult to hold in suspension than icings and glazes made with emulsified shortenings.
   c. ***Salted sweet cream butter*** is a product of churning (agitating cream to separate fat and water) fresh, sweet cream and is 80% fat with some added salt. European butters contain up to 86% fat. ***Unsalted sweet cream butter*** has the same make-up as salted butter with no added salt. Water and some milk solids comprise the remainder of butter's content. Butter is different from shortening in two major ways: it enhances flavor and also the quality of "melting in the mouth."
2. FUNCTIONS: The functions of fats in icings and glazes are:
   a. Flavor and richness from butter (hydrogenated shortenings are often tasteless)
   b. Moisture

c. Shortens (tenderizes)
d. Traps air (during creaming) that adds volume and a fine texture to the mixture
e. Emulsifies two liquid ingredients
f. Carries an added flavor (vanilla, almond, etc.) throughout the icing [NOTE: For more information about the properties of fat, see MyCAERT lesson and e-unit CA B3–5.]

3. NUTRIENTS: Hydrogenated shortening is 100% fat. Commercially prepared butter is about 82% fat, 16% water, and 2% milk solids (and some contain salt). Butter also contains vitamin A.

F. Eggs (oeufs)

1. DESCRIPTION: Egg whites (***albumen***) are the portion of the egg most often used in icing recipes/formula, but some do call for whole eggs or egg yolks.
   a. Grade AA large chicken eggs (about 2 ounces each or 8/pound) are the most common size used in baking and pastry products. Eggshell color does not affect the functions eggs provide in baking and pastry products.
   b. Weighing eggs (separated fresh, liquid egg whites, and powdered egg whites (meringue) is more accurate than measuring.
      (1) 1 large egg white = about 1 oz. = about 2 tablespoons
      (2) 1 large egg yolk = about ½ oz. = about 1 tablespoon
      (3) Powdered egg whites are reconstituted as: 1 fresh egg white = 2 teaspoons egg white powder + 2 tablespoons warm water. ***Meringue powder*** is pasteurized powdered egg whites with sugar and additives used to make long-lasting, hard-drying royal icing (e.g., strengthens and stabilizes gingerbread house decorations, uncooked icings, meringues, and mousses, buttercream and whipped cream icings and decorations, and sugar molds).
   c. A fresh egg sinks to the bottom of a bowl of water and has a nicely rounded yolk that is well centered in the white.
   d. Cracked eggs present a danger of *Salmonella* entrance and should be discarded.
2. FUNCTIONS: The functions of eggs in icings and glazes are to:
   a. Leaven (via trapping air bubbles)
   b. Structural framework for some cooked icings (Egg whites contain lecithin, a protein that lines the outside of the air bubbles created during beating and prevents them from collapsing during baking)
   c. Emulsification (eggs act as a binding agent, a structure that holds other ingredients together; eggs are second to flour in providing structure to baked goods)
   d. Moisture
   e. Color (egg yolks and whole eggs provide color)
   f. Flavor (eggs add a distinctive taste)

g. Texture
h. Thickening

3. NUTRIENTS: Eggs are a valuable source of vitamins A and B and a fair source of vitamin D. The protein "albumin" is found in egg whites. The egg white contains the majority of the egg's nutrients: niacin, riboflavin, magnesium, potassium, and sodium. There is no fat in an egg white.
4. CHEMISTRY: Eggs are easiest to separate when they are cold. To beat whole eggs or egg whites to their greatest volume bring to an internal temperature of 65° to 75°F.

G. Flavoring (parfum)

1. DESCRIPTION: Flavorings and aromatics are used in icings and glazes in small quantities to "give relish" to foods. Flavorings include extracts (concentrated oils or essences diluted with alcohol) and concentrated oils that are derived from liquid natural flavors (vanilla, almond, cherry), seeds and beans (vanilla, nutmeg, chocolate, coffee), and spices (epices: cinnamon, ginger, cloves, etc.).
   a. ***Chocolate*** is the general term used for the products of the cacao bean. All chocolate is made from ***cacao*** (kah-KOW) beans that are fermented, roasted, and hulled to produce numerous chocolate varieties. During the production process, cacao nibs are ground until the fat in them liquefies. Then ***chocolate liquor*** is unsweetened chocolate consisting of cocoa solids and cocoa butter. It is a semisolid mass that is cooled and placed into molds called "slabs." [NOTE: Liquor is not to be confused with a distilled alcoholic substance. It represents the traditional meaning of the word: "liquid."]
      (1) Chocolate contains two saturated fatty acids (palmitic and stearic) and one monounsaturated fatty acid (oleic). [NOTE: See Objective 3 for more about these acids.)
      (2) An ***antioxidant*** (polyphenol) is a substance that inhibits the effects of oxidation than can damage cells in the body. They are a health benefit of chocolate and wine consumption.
   b. ***Cocoa*** is the substance left after the cocoa butter has been extracted from the chocolate mass and powdered. It is used to add chocolate flavor to baked goods, candies, custards, puddings, icings, and glazes. Cocoa is less expensive than slab chocolates and equal in nutrition. Very little sugar is found in natural cocoa; most is added during manufacture.
      (1) Cocoa contains a mild stimulant, theobromine an alkaloid. An ***alkaloid*** is a large group of organic substances found in plants that are colorless, bitter tasting alkaline substances; the most common of which is caffeine. ***Caffeine*** is an alkaloid found in seed plants such as cacao. Cacao beans, made into cocoa, naturally contain one percent theobromine or a low amount of caffeine.
      (2) Nutrients in cocoa and chocolate include essential minerals such as small quantities of magnesium, calcium, iron, zinc, copper,

potassium, and manganese. Cocoa and chocolate also contain vitamins A, B-complex, C, and E.

c. ***Unsweetened chocolate (baking chocolate)*** is 100 percent pure chocolate liquor made from ground cacao beans with no added sugar. It contains 45 to 55% fat. Because the cacao beans are half cocoa butter (the vegetable fat from cacao bean) and half cacao solids, unsweetened chocolate has a deep and rich flavor. However, it is bitter in taste, and is best combined with sugars and milks to produce a palatable product. It is the base of all chocolate products except white chocolate.

d. ***Bittersweet chocolate*** is the darkest eating chocolate, with a deeper flavor than sweet dark or semisweet chocolate. Bittersweet's sugar content is not regulated by the government, which may make some varieties sweeter than semisweet chocolate. Bittersweet chocolate is 35% cacao solids and 50 to 80% chocolate liquor. Its fat content is 33 to 45%.

e. ***Semisweet chocolate*** is an American term associated with chocolate chips and other bars. It is generally presumed to be sweeter than bittersweet varieties and "darker" than sweet dark chocolate varieties. Semisweet chocolate contains 35% cacao solids and is 20 to 35% fat.

f. ***Dutched chocolate*** is produced from chocolate liquor or cocoa powder that has been treated with alkaline salts to give it a darker color and a milder flavor. There are two types of cocoa powder: natural and Dutched. Natural cocoa is pressed until all butterfat is removed, leaving a bitter and slightly acidic product. Dutch-processed cocoa adds an alkali that removes the acidity. Dutched chocolate is chocolate liquor or cocoa powder treated with alkaline salts and its fat content is about 15% on average and less than 50% overall.

g. ***Sweet dark chocolate*** is produced with very few milk solids and a high cocoa butter content. It is composed of 15 to 35% chocolate liquor, 20 to 40% cacao solids, and less than 12 percent milk solids. Sweet dark may contain ***condensed milk*** (milk thickened by evaporation and sweetened), cocoa butter, sugar, and vanilla. Its fat content is 50 to 70%.

h. ***Milk chocolate*** is chocolate liquor that is lighter in color than other chocolates with a weaker chocolate flavor. It is 20% cocoa butter, 14% milk solids (condensed milk or dry milk), and up to 55% sugar. Milk chocolate has a fat content of 10 to 12%. [NOTE: In the U.S., the minimum fat content for chocolate products is 3.39%.]

i. ***White chocolate*** is a baking and candy product that contains no cacao solids or chocolate liquor and as a result has no chocolate taste. It gets its name from the cocoa butter it contains. White chocolate contains a blend of 20% (minimum) cocoa butter, 14% milk solids, and up to 55% sugar, plus flavorings. Its fat content is 20% or more.

2. FUNCTIONS: The functions of flavoring in icings and glazes are to:
   a. Enhance or fundamentally change the taste of icings and glazes
   b. Chocolate adds flavor, texture, and shine

H. Salt (sel)

1. DESCRIPTION: ***Salt*** is a crystalline compound (NaCl sodium chloride) primarily used as a condiment that comes in two types: sea salt distilled from seawater and rock salt found in the earth. Sodium chloride is the first salt discovered by humans and is typically called table salt. Iodized salt (table salt with added iodine) is the type most often utilized in baked goods.
2. FUNCTIONS: The functions of salt in icings and glazes are to:
   a. Flavor (adds complexity (without it one would primarily taste sugar) and heightening the flavor of other ingredients)
   b. Toughen the texture of soft fat-and-sugar mixtures
3. NUTRIENT: The nutrient in salt is sodium.

I. Leavening

1. DESCRIPTION: Leavening is the production of a gas in an icing using an agent: air and eggs (a natural leavener). A leavening agent is a substance that causes expansion. In the case of icings and glazes, leavening is primarily due to air incorporation during creaming of fat and sugar and the whipping of eggs and cream or crème fraîche. Mechanical incorporation of air occurs during creaming, beating, whipping, folding, etc. and results in greater volume for icings and some glazes. Vigorous mixing entraps air and creates bubbles that produce foam. [NOTE: Leavening agents are discussed in detail in MyCAERT lesson CA C8–2, Leavening Agents.]
2. FUNCTION: The function of air leavening in icings and glazes is to cause greater volume to mixtures that are creamed, beaten, whipped, folded, etc.

J. Other common ingredients and toppings include:

1. Citrus and other juices, nuts, chips, coconut, fresh and puréed fruit juices, etc.
2. Cream cheese is a soft mild-tasting fresh cheese made from milk, cream, and stabilizers (carob bean gum and carrageenan). It is often used in icings for carrot, zucchini, banana, coconut, chocolate, pumpkin, etc., cakes and quick breads. It is often added to icings and glazes for its distinct flavor and texture. Cream cheese nutrients include vitamin A, potassium, and sodium.
3. Common icing and glaze toppings include: nuts, sprinkles, candies, coconut, fruit, chocolate curls, edible flowers, etc.

K. Basic hand tools and equipment

1. Stand mixer with paddles and whips—Stand mixers sit on a tabletop or on the floor and have several attachments (flat beater, dough hook, wire whip). Icings and glazes primarily use the flat beater (creaming) and the wire whip (whipping, beating) attachments.
2. Scales—Platform, digital, or balance types are used to accurately measure ingredients. Platform scales are often used to measure moist ingredients, balance scales to measure dry ingredients, and digital scales to measure small amounts (spices, herbs, leavening agents, etc.) and for portion control (e.g., each cupcake requires 2 ounces of icing).

3. Double boiler and bain-marie—A ***double boiler*** is two pans that nestle together: the bottom pan is filled half full or less with simmering water and the top pan holds the ingredients. Typically, the top pan does not touch the simmering water. A ***bain-marie*** is a hot water bath (bain is the French term for "bath") used to keep foods warm. In many icing and glaze preparations (especially cooked icings and glazes) a bain-marie is used to hold or melt an ingredient "over" simmering water, such as chocolate, fruit purée, or glaze toppings. [NOTE: See The Spruce website for an example of a bain-marie at https://www.thespruce.com/definition-of-bain-marie-480588.]
4. Candy or sugar thermometers (for cooked frosting)—Candy thermometers are used to accurately measure the temperature stages of cooked sugar for icings and glazes: thread, soft-ball, firm-ball, hard-ball, soft-crack, and hard crack.
5. Pastry brush—Bakers use scrupulously clean pastry brushes to remove crumbs from cakes and other baked goods before icing or glazing.
6. Spatulas—Numerous spatula types are available, most are used for stirring, scraping, placing icing in pastry bags, and/or icing.
    a. Wooden spatulas are very practical for stirring cooked icings. Bakers often prepare chocolate mixtures, sauces, and glazes with a wooden spoon/spatula.
    b. Rubber scrapers are used to remove all traces of icing and glaze mixtures from a bowl or vessel. They are also used to gently fold beaten egg whites and/or meringue into an icing or some glazes.
    c. Metal icing spatulas (e.g., palette knives; straight and offset) are broad, flat tools used to ice (frost) all types of cakes and pastries.
7. Long-handled spoons—Long-handled spoons, usually wooden or silicone types, are used for stirring icings and glazes as metal spoons easily transfer heat and become too hot to hold.
8. Hand whips—A metal-handled, multi-wire whisk is used to incorporate air into various products such as eggs or heavy cream.
9. Cake decorating equipment
    a. Pastry bags (cloth, paper, plastic)—A ***pastry bag*** (decorating bag or piping bag) is a cone-shaped device with two openings, one large opening at the top to deposit icing, and one smaller opening at the bottom, to fit a decorating tip. The point of the cone is snipped off to accommodate a decorating tip. It is used to pipe (apply) decorations to a cake or pastry. Decorative shapes are created by the size and configuration of the decorating tip (e.g., plain, star, leaf, rose, etc.) [TIP: For a substitute pastry bag, use a heavy plastic food storage bag, snipping the corner to perform basic plain decorations or drizzle. Select small or large holes to accommodate the thickness of drop design or drizzle required.]
    b. A ***coupler*** is a grooved insert and retainer ring that attaches decorating tips to the pastry bag. The coupler consists of two sections: the base and the ring. The coupler base is placed inside the pastry bag, a decorating tip is attached, and the ring holds the tip in place. To change tips, the ring is removed and a new tip attached.

c. ***Decorating tips*** (piping tips) are small specially shaped metal cones with open ends to form icing designs and decorations when icing is pressed through them. Each tip has a different number and common numbering formats are from Ateco® and Wilton®. For example, Ateco® tips 16 through 22 are star shapes in various sizes. These tips come in several categories:
   (1) Round tips are for outlining, figure piping, making dots, and for writing.
   (2) Leaf tips are used to produce leaves on floral sprays and arrangements.
   (3) Drop flower tips create a flower with "one squeeze" and can produce individual plain flowers or swirled flowers.
   (4) Star tips, both open and closed style, create borders of many types, rosettes, shells, reverse shells, icing a cupcake or cookie, and small star tips can be used for lettering.
   (5) Rose tips create multi-petal roses, daisies, daffodils, pansies, rose buds, ribbons, bows, and ruffle borders. A rose tip is typically used in conjunction with a rose nail. A ***rose or flower nail*** is a round, flat surface attached to a "nail" that is finger-held and rotated enabling the baker to turn an icing flower while creating it. [NOTE: For examples of decorating tip varieties, see the Wilton website at http://www.wilton.com/cms-decorating-tips.html.]

d. An ***icing comb*** is a metal (or plastic) triangle-shaped tool with toothed or serrated edges (of various widths and depths) used to decorate/texturize cake sides or tops.

e. A ***tip brush*** is a device used to remove clogged icing from tips prior to washing.

f. Airbrush—An airbrush is an artist's paint gun used to spray food coloring finely and evenly over cakes, cupcakes, cookies, etc. Airbrush technique is often used to create a photographic representation of a person, place, or thing.

10. Parchment or waxed paper placed on a cake plate or cake stand and is removed after decorating to keep the bottom edge "clean." It is also attached to a flower nail for easy release of floral decorations from the nail. Triangular-shaped parchment paper is also used to create a disposable pastry bag.
11. Cake boards and cake rounds—Cake boards are corrugated cardboard sized to provide a base for standard size cakes. Rounds are available in common sizes (6-, 7-, 8-, 9, 10-, 12-inch) and rectangular and square boards are available for sheet cakes. Cake boards and circles are available in waxed, unwaxed, patterned, or ruffled styles.
12. Turntable, lazy Susan, or an inverted bowl—All of these tools are revolving cake stands that assist the baker to more easily ice and decorate a cake, cookie, cupcake, or other dessert.
13. Cake dome—A domed-shaped cover fastened to a base that holds iced/glazed cakes in airtight room temperature or refrigerated storage.

14. Culinary torch—A culinary torch is typically 5 to 7-inches tall and powered by butane or propane gas. This device browns meringue icing and sugar crusts immediately prior to service. (Meringue icings and broiled toppings can also be browned in a 400°F or higher oven.)

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–A to introduce the concept of cake "coatings." Use VM–B to illustrate various dessert coatings: icings and glazes. Use VM–C to facilitate a discussion and review basic icing and glaze ingredients and functions. Use VM–D to illustrate basic icing and glaze equipment and then show examples of equipment and tools available in the foods lab. Use VM–E to illustrate a rose and pearl cake design created with just two decorating tips: a plain tip and a rose tip. Notice the exceptionally fine "dusting sugar" that highlights the rose petals.*

Objective 2: Prepare icings and glazes.

Anticipated Problem: What are icing and glaze types? How are the nine main types of icings and glazes prepared?

II. Prepare icing and glazes

A. Icing and glaze coatings

1. To ***ice*** is to cover a cake or pastry with icing/frosting, usually using an offset spatula and/or using piping bag with tips or poured. To ***frost*** is to cover a cake or pastry with icing/frosting, usually using a spatula or spoon. To ***glaze (glacé)*** is to cover a cake or pastry with a smooth and/or shiny finish, usually by pouring or by drizzling. Culinary websites differentiate between icing, frosting, and glaze based on the coating's thickness, base ingredients, and consistency. [NOTE: Any icing prepared with confectioners' (powdered) sugar is sweeter and requires more sugar than icings prepared with granulated sugar or cooked syrup.]
2. Icing and glaze base and consistency
   a. Frosting is the thickest, creamiest, and sweetest coating. The base for frosting is butter or cream: it has a buttery taste. The consistency is thick and fluffy.
   b. Icing may be applied with a spatula and/or "poured over" a cake to coat. The base for icing is sugar. Icings have a sugary taste and a smoother appearance than frosting and use cake decorating tools and tips. The consistency is firmer than frosting and thicker than glaze.
   c. Glaze is the thinnest coating: typically a syrup consistency. The base is sugar syrup; also aspic, sieved jams, jellies, egg wash (plus heat), etc. serves as glaze for cakes and pastries. Bakers work quickly with cooked sugar glazes, as some set-up almost immediately upon being applied. Glazes give food a smooth, shiny, often transparent finish. The consistency is thinner than frosting and icing mixtures.

B. Nine basic coating types

1. FLAT: ***Flat icing*** is a simple coating prepared with just a few ingredients: often powdered sugar and water. A typical flat icing for sweet rolls and other pastry is prepared by beating together powdered sugar, corn syrup, liquid (including fruit juices), and a flavoring (or spices) and heating to 100°F in a double boiler. This quick pastry and cake glaze can be flavored with spices or fruit juices. Flat icing is stored covered with a damp towel or plastic wrap and is reheated in a double boiler.
2. BUTTER: ***Buttercream icing*** is a coating prepared by creaming together butter or shortening, powdered sugar (confectioners'), and vanilla to a fluffy and light consistency. It is one of the most popular cake coatings in the U.S. Some buttercream icings use eggs that add richness to the flavor. These icings vary from thin, to medium, to stiff based on intended use. The longer buttercream icing is beaten, the fluffier it becomes by trapping more and more air bubbles in the mixture. Stiffened buttercream icing is often used to create cake decorations and especially flower decorations. Buttercream icings tend to be unstable in warm weather and crust under refrigeration. They are stored covered with plastic wrap to avoid crusting. [NOTE: The cans of "frosting" found in grocery stores are a type of buttercream.] There are several types of butter icings including:
    a. ***Simple buttercream*** is a quickly prepared, smoothly blended icing of room temperature fat (butter or shortening), powdered sugar, salt, flavoring (vanilla, almond, etc.), and liquid (milk, coffee, water). Simple buttercream does not overbeat and is often used for casual cake decorating. In contrast, most icing prepared for cake decoration (e.g., pastry bag and tip) is made with all or part shortening (rather than butter). Variations include: cream cheese, chocolate, caramel, butterscotch, mocha, orange, etc.
    b. German chocolate cake frosting is another variation of French buttercream made with granulated sugar, evaporated milk, butter, and eggs or egg yolks cooked together until thickened. Then, pecans and shredded coconut are added to the mixture. This frosting is normally placed between layers and atop of the cake but not the sides.
3. FOAM/BOILED/MERINGUE: ***Foam/boiled/meringue icings*** are cooked syrups that use egg whites to create a fluffy, glossy, sugary icing. Most are syrup mixtures of sugar, glucose, and water boiled to about 240°F and then added to an egg white meringue. Some are mixtures of egg whites, sugar, and water cooked together in the top of a double boiler and beaten with a hand held electric mixer until quadrupled in volume, stiff, and glossy. [NOTE: As sugar syrup cooks, water boils away the sugar concentration increases, and the temperature rises. The highest temperature the syrup reaches tells the baker how the syrup will perform when cooled. For example, sugar syrups cooked to soft-ball stage (235°F) form a soft ball when dropped in cold water. The cooled syrup will be thick and gum-like in appearance and texture. CAUTION should be exercised when working with sugar syrup mixtures.] Foam icings are used the same day as prepared and applied as for a meringue pie topping by spreading

and peaking the mixture or by piping the mixture onto cakes and pastry. Often this icing is browned with a chef's blowtorch or by baking in a 400°F oven until the tips are browned. Baked Alaska uses a type of meringue icing. There are several types of foam/boiled/meringue icing including:

a. ***Seven minute icing/frosting*** is a foam coating mixture that is 100% fat free and contains beaten egg whites, granulated sugar, and water: a mixture similar to meringue but more stable and sturdy enough for piping. The ingredients are cooked in a double boiler while being continuously beaten with a hand held electric mixer for seven minutes or until the temperature reaches 140°F. Seven minute icing has a gooey marshmallow texture, a delicate flavor, and a very light texture. This icing hardens quickly which requires that the cake to be iced be ready before the baker prepares the icing. It is a delicate frosting easily absorbed into the cake and best eaten within several hours of preparation and application. Seafoam icing is seven minute icing variation that substitutes brown sugar for granulated sugar. French, Italian, and Swiss buttercream icings all use eggs and no powdered sugar. It is highly recommended to use a stand mixer when preparing French, Italian, and Swiss buttercream icing as each requires about 20 minutes of whipping. Temperature is very important when preparing these buttercream icings; following the instructions closely and using a candy thermometer are necessary to achieve standard products. [NOTE: Sometimes meringue powder is used in place of egg whites.]

b. ***French buttercream*** is a classic icing made with cooked sugar syrup and an egg-yolk foam that produces a rich, creamy color. The preparation begins with room temperature ingredients and heating granulated sugar, water, and cream of tartar until the sugar dissolves (creates a smooth, non-gritty syrup). Then, the sugar mixture is cooked uncovered until the syrup reaches soft-ball stage (238°F) on a candy thermometer. Next, egg yolks are beaten until thickened and the heated syrup is beaten into the egg mixture in a thin, steady stream. Now the mixture (syrup and egg yolks) is heated again until it reaches 160°F. Finally, butter is beaten into the mixture one tablespoon at time until the icing is smooth and spreadable. French buttercream has a light consistency and is less stable than Italian or Swiss buttercreams but it is the tastiest (due to the egg yolks). This buttercream does not pipe as well as other meringue icings. [NOTE: This buttercream uses raw eggs; care should be taken to refrigerate when not in use. If pasteurized eggs are a requirement, use the Swiss version.]

c. ***Italian meringue buttercream*** is a icing mixture of hot sugar syrup (240°F) poured over whipped egg whites and whipped until the mixture cools. Then, butter is added one tablespoon at a time until an airy icing is achieved. It is a variation of French buttercream that uses boiled simple syrup rather than granulated sugar. [TIP: Pouring the hot syrup into the egg whites is best accomplished away from the edges of the stand mixer bowl as touching the metal or glass bowl can cause the hot syrup to harden prematurely.] It is an easy buttercream to pipe into decorative shapes and designs.

d. ***Swiss meringue buttercream*** is an icing mixture composed of a meringue into which large amounts of butter are beaten in small increments until the mixture is smooth, fluffy, and glossy. [NOTE: It is very similar to Italian meringue buttercream, as they both use egg whites, and then large dollops of meringue are beaten into large amounts of butter.] Again, all icing ingredients are at room temperature. First, the egg whites, granulated sugar, water, and cream of tartar are beaten on low speed over simmering water until the mixture reaches 140°F. Then, the mixture continues to be beaten on high speed until it reaches 160°F. Finally, large dollops of meringue are beaten into large amounts of butter until the mixture is smooth, fluffy, and glossy.

4. ROYAL: ***Royal icing*** is a hard coating made from beaten egg whites, icing (powdered) sugar, and a liquid (usually lemon or lime juice) that creates a hard, brittle texture. It is pure white (or tinted) sticky icing that dries hard and is used to decorate gingerbread houses, make decorative sugar sculptures, and cake decorations. Royal icing is often made from meringue powder or dried egg white powder, powdered or confectioners' sugar, cream of tartar, and varied amounts of water and is easily tinted. Sometimes glycerin is added to soften it. Royal icing is piped from decorating bags to create lattice designs, beads, bows, flowers, fruits and vegetable shapes, and cartoon "googley eyes." Desserts made with royal icing dry hard and last for months. The texture of royal icing (brittle and sometimes a bit gritty) does not make eating it desirable. When not in use, royal icing is covered with a damp cloth.
5. FONDANT: ***Fondant*** is a sweet, rich, elastic, white icing made from sugar, glucose, and water that hardens when exposed to the air. The basic preparation is cooking a mixture of sugar, glucose, and water to a temperature of 240°F and letting it cool to 150°F; then mixing until it is creamy and smooth. Next, it is rolled out and draped or is poured over a cake or pastry. Fondant is time consuming and difficult to make. [NOTE: Powdered fondant is available commercially to which water and glucose are added. This process is quicker and easier to prepare and very stable.] Most fondant made from scratch is produced on a stand mixer. If a stand mixer is not available, the baker can use a hand mixer to begin the process and then complete the majority of the mixing by kneading until smooth. Once prepared, fondant must be kept covered with a thin coating of water or plastic wrap and stored in a cool location.
    a. ***Rolled fondant*** is an icing frequently used to cover wedding or specialty cakes to produce a "porcelain" look. The cake to which rolled fondant is applied must be firm (butter, pound, or fruit), and lightly covered with a fruit glaze, buttercream icing, or marzipan to ensure the fondant properly adheres to the cake. Rolled fondant consistency remains soft but has little flavor. [NOTE: A variation is marshmallow fondant made with melted fresh mini marshmallows, corn syrup, lemon juice, powdered sugar, and shortening. Also, ***marzipan*** (almond paste with a dough-like consistency) is similar to rolled fondant. It can be made from scratch or purchased and rolled and applied as for fondant.]

b. ***Poured fondant*** is an icing that creates a very sweet, smooth, satiny finish for cakes and petit fours. ***Petit fours*** are small, decorative, and layered bite-size cakes often covered with poured fondant icing. Poured fondant seals in freshness and dries to a semi-hard and smooth finish. Then, the petit four is decorated.

6. FUDGE: ***Fudge icing*** is rich, heavy icing prepared in a similar fashion to fudge candy. Granulated sugar, milk, butter, and chocolate is cooked to soft-ball stage. Then, the fudge mixture is cooled before beating with a mixer to add air and lightness. This pourable icing is used warm and used quickly. When necessary, fudge icing is reheated in a double boiler or bain-marie. Store covered with plastic wrap under refrigeration.
7. GANACHE: ***Ganache icing*** is a French term for a rich chocolate emulsion of heavy cream and chocolate used as a filling, an icing or glaze, and as a candy truffle base. It's prepared by heating heavy cream and chocolate until the chocolate melts. The better the chocolate, the better the ganache. Ganache icing is easy to prepare and whipped ganache produces a fluffy icing especially nice for piping on cupcakes. The same mixture proportions are pourable at 85°F and spreadable at room temperature. Light ganache is used as a thin glaze to coat cakes and pastries: a 1:1 ratio (weight) of chocolate to heavy cream. Firm ganache is beaten until fluffy and stiff and used as icing or filling and/or as a truffle base: a 2:1 ratio (weight) of chocolate to heavy cream. A variation with a buttercream consistency is ganache beurre: softened butter whipped into a ganache base. In all applications, the use of high quality chocolate makes a better tasting ganache.
8. WHIPPED CREAM: ***Whipped cream icing*** is made from powdered sugar, flavoring, chilled heavy (whipping) cream, and a stabilizer (to prevent the icing from separating). Powdered sugar contains some cornstarch that helps to stabilize the icing; or, additional cornstarch may be added to the mixture. Whipped cream is also stabilized using unflavored gelatin that gives the mixture a mousse-like texture. Gelatin also prevents weeping (bleeding of water from the cream). TIP: Cooling the dissolved gelatin slightly helps prevent "blobs" of gelatin forming in the whipped cream icing mixture. [NOTE: Weeping is *not* prevented by the use of powdered sugar and/or additional cornstarch.] Whipped cream can be used as piped decoration or as soft creamy icing. Care must be taken not to overbeat the cream or it turns into sweetened butter. Whipped cream icings are used for layer cakes, cake rolls, and specialty desserts and are best tinted to pastel shades only. Store whipped cream icings under refrigeration. [NOTE: A sample stabilized whipped cream recipe is on the Wilton® website at http://www.food.com/recipe/wilton-stabilized-whipped-cream-79506#activity-feed.]

9. GLAZE: To glaze (glacé) is to cover a cake or pastry with a smooth and/or shiny finish, usually by pouring or by drizzling. Glazes are the thinnest of the coatings when prepared; some are as simple as water glaze types (e.g., powdered sugar and liquid). They give desserts a smooth and/or a shiny surface as well as seal in moisture. Common glazes include:
    a. Melted chocolate (often in combination with cream, butter, and/or sugar syrup)
    b. Water icings (sugar and liquid)
    c. Sieved fruit jams (or melted jellies) for tarts; aspic
    d. Pourable fondant icings (thick and opaque)
    e. Caramel
    f. Sugar-icing syrup cooked to 'crack' stage is brittle and gives products sheen
    g. Tart glaze (usually sieved jam, preserves, and/or jelly
    h. Pastry glaze brushed on prior to baking (egg wash; milk, cream, or butter; sugar sprinkled over pastry, etc.)

C. Cake decorating tips
    1. MISE EN PLACE: Follow "mise en place" rules when working with icing and glaze. ***Mise en place*** is a French cooking term that literally means everything in its place. One who observes the mise en place rules would:
        a. Read the entire icing or glaze recipe.
        b. Collect all the ingredients.
        c. Conduct processes requested by the recipe including: chill a stainless steel bowl in the freezer to whip heavy cream, ensure other ingredients are at room temperature, etc.
        d. Prepare any decorations: flowers, piped chocolate decorations, sanding sugars, wash fresh fruit, etc. [NOTE: Two resources for creating piped chocolate decorations from tempered chocolate include: "How to Pipe in Chocolate" on the Learn Cake Decorating website at https://www.learncakedecoratingonline.com/how-to-pipe-in-chocolate/ and "How to Pipe Chocolate Decorations" on the Food Techniques website at http://www.bbc.co.uk/food/techniques/how_to_pipe_chocolate_decorations. Please plan to revisit the term "tempered" for any student who may not have encountered the term in relation to melted chocolate. Piping requires the use of tempered chocolate.]
        e. Prepare the workstation by cleaning the area and gathering tools (measuring equipment, spatulas, or stand mixer) as required.
        f. Preheat the broiler if making broiled topping.
        g. Prepare icing or glaze and ready it to be added to a baked product.
        h. Ice and/or glaze the cake. Store leftover icing or glaze under refrigeration (or as directed).

i. Assemble the decorations and the tools (e.g., piping bags, tips, premade flowers, icing sugars, fresh fruits, etc.
j. Decorate the cake and store as directed.

2. DAIRY:
   a. Use butter instead of margarine or shortening for richer flavor. Butter should be at room temperature before mixing.
   b. Chilled heavy cream whipped in a chilled bowl will reach the best possible volume.
3. EGGS:
   a. Raw eggs are potential hazards to food safety. Cook, heat, or use pasteurized egg products for all frosting that contains whole eggs, egg whites, or egg yolks.
   b. Egg whites must be at room temperature to whip well. Avoid any grease on utensils or mixing bowls.
4. STORAGE:
   a. Refrigerate any cake with perishable icing.
   b. Refrigerate any unused icing. Use an airtight covered container and place plastic wrap on top of simple buttercream icing to prevent the top from drying out. Bring the frosting back to room temperature and beat buttercream frosting before using again. Icings may be refrigerated and used within two weeks.
5. DECORATING
   a. Calculate the amount of icing needed to fill between layers, on the sides, and for the top of different cakes. [NOTE: See the "Wedding Cake Icing Chart and Cake Icing Tips," on the Wedding Cakes for You website at http://www.wedding-cakes-for-you.com/wedding-cake-icing-chart.html.]
   b. A possible, prepare frosting and frost cake on cool, dry days or prepare in an air-conditioned environment. The primary ingredient in icing is sugar and humidity affects the icing results.
   c. To prevent introducing crumbs onto the cake, dip the spatula in warm water and dry it off before reusing. A warm spatula will also give a smoother finish to a cake.
   d. To obtain a smooth top when icing, avoid lifting the spatula from the cake surface. Making a continuous flat movement from the outside edge to the center will help ensure a smooth cake top. Continue the flat movement as needed.
   e. Keep decorating tips in the best condition by washing after each use in hot, soapy water. Use a tip brush to clean icing clogged in openings. Rinse in hot water and air dry.

D. Icing a two-layer cake
   1. STEP 1: Prepare and completely cool the cake layers.
   2. STEP 2: ***Crumb the cake*** by brushing loose crumbs from the cake layers with a pastry brush.

3. STEP 3: Prepare the icing. Icing spreads best at room temperature.
4. STEP 4: Prepare the turntable. Bakeries place a small dollop of icing on the cake turntable, top the icing dollop with a sheet of parchment paper or cake board, and then place another dollop of icing on top of the parchment or cake board to stabilize the cake layer. [NOTE: The dollops of icing help ensure that the cake and cardboard or parchment paper stay in place during icing and decorating.]
5. STEP 5: Place one cake layer upside down onto the prepared turntable. [NOTE: The goal is to select the "best looking" cake top and then place the other layer flat side up on the turntable assembly. The second layer is placed atop the icing with the two "flat sides together." Ensuring that the flat sides are together has the effect of making the sides and top appear flat.]
6. STEP 6: Ice the cake. Ice the flat side of the bottom layer with about ½ cup of the icing. Using an offset spatula spread the icing from the center of the layer out and slightly over the edge of the bottom layer. Pushing the icing over the edge of the layer helps ensure that no gap (lack of icing) occurs between the two layers.
7. STEP 7: Add the second layer, flat sides together. If necessary, remove any excess cake from the top layer that may prevent the cake from appearing even. [NOTE: Should trimming of the top layer's "bump" be necessary, carefully 'crumb the cake' again and apply a thin layer of icing to secure any crumbs to the cake before icing the remainder of the cake. Allow the thin icing layer to dry for a few minutes.] [TIP: Butter cakes bake more evenly (level) if the batter in the layer pan is slightly "dipped" in the center just before baking.]
8. STEP 8: Crumb-coat the cake. ***Crumb coating*** is spreading a thin layer of icing on the sides and top of the cake to seal any loose bits of cake. Let the crumb coat dry: sources use 10 to 20 minute wait times and some recommend 30-minute refrigeration prior to applying the decorative icing to the cake. [NOTE: See the Betty Crocker Kitchens YouTube video, "How to Crumb Coat a Cake," at https://www.youtube.com/watch?v=2KvwwGRyHBg.]
9. STEP 9: Decorate the cake. Using an offset spatula or pastry bag spread the decorative layer of icing on the cake sides. Then, ice the top of the cake. To create straight-line edges between the sides and the top, gently pull the spatula through the "lip of icing" that typically forms at the junction of the side and the top toward the center of the cake. Continue this process while making quarter turns and gently pulling the icing toward the center until the cake top and sides are straight. Cake sides may be textured with a cake or icing comb or with finely chopped nuts or coconut. To use the icing comb, hold the comb at a 45° angle to the sides and slowly rotate the turntable. The sides may also be smoothed or textured with an offset spatula.
10. STEP 10: Remove the cake from the turntable. The parchment sheet allows easy removal of the cake to a cake stand or display plate. TIP 1: Remove the parchment paper before adding the cake borders. TIP 2: If a cake stand will be used to display the cake, complete the borders *after* placing the cake on the stand. This action prevents repairing borders.

E. Practice cake decoration skills

1. STEP 1: Prepare a suitable buttercream icing for the cake or pastry. [TIP: For beginners, a recommended recipe is the Wilton® buttercream frosting. It uses half butter and half shortening with powdered sugar for a medium consistency frosting. A series of "Cake Decorating Tips" is available on the Wilton® website at http://www.wilton.com/learn-decorating-techniques/. A beginning guide to the essentials of cake decorating (consistency, pressure, and bag control) is embedded in the video link, "How to Hold a Piping Bag," (and at http://www.wilton.com/learn-decorating-techniques/).]
2. STEP 2: Adjust the icing consistency based on the decorating design. A stiff consistency (e.g., the addition of more powdered sugar) is required to produce flower petals that maintain their shape. A medium consistency (typically the original recipe ratios) is used for stars, shells, and borders. A thin consistency (e.g., the addition of more water, milk, or corn syrup) is used for writing, vines, and leaves. [NOTE: A beginner's video guide to "Icing Essentials for Cake Decorating," is on the Wilton® website embedded in the video, "How to Hold a Piping Bag," at http://www.wilton.com/learn-decorating-techniques/.]
3. STEP 3 OPTIONAL: Create a paper pastry bag/cone. [NOTE: Consider demonstrating to student how to make a paper pastry bag/cone and/or assign a flipped classroom task of watching a step-by-step video such as, "How to Use Pastry Bags and Pastry Cones," from the Howdini and Betty Crocker Kitchens website at http://www.howdini.com/video/7095736/how-to-use-pastry-bags-and-pastry-cones. This website video shows a few decorating tips. *Heads-Up: The positioning of the baker's hands in this video is atypical. A twisted bag is easier for any beginner to control than a rolled bag, especially when making borders*.]
4. STEP 4: Fill the pastry bag. Place a coupler inside the pastry bag to attach small decorating tips or place a large decorating tip inside the bag positioned to deposit icing. [NOTE: If using disposable pastry bags, cut off the tip to the desired opening for small or large decorating tip.] Add desired decorating tip and close with coupler ring. Grasp the middle of the piping bag and, with one hand, fold the large end of the bag down toward the tip. This allows filling the bag ⅔ to ¾ full without a mess. Bring the folded down portion of the pastry bag back to its original position and push the filling toward the tip with your hands. Next, burp out any air and twist the large opening shut. Hold the bag near the top twisted area with the dominant hand. Place filled pastry bag over a bowl. With a little pressure, remove any air in the pastry bag by twisting the top until an air burp (and sometimes icing) comes out the tip. [NOTE: See a slide show example, "How to Hold a Piping Bag," on the Kitchn website at http://www.thekitchn.com/how-to-use-a-piping-bag-224064.]
5. STEP 5: Practice pastry bag position. Stars and flat petals are piped at a 90° angle, and writing and boarders are piped at a 45° angle. Those who are right handed work right to left. Those who are left handed work left to right, except when writing with icing. Often directions will use "clock face" directions, for example: "Hold the bag at the 3 o'clock position."

6. STEP 6: Practice pressure and control of borders using a plate, cardboard round, or cake round pan. Hover just over the top of the decorated area: never touch the cake or practice area with the decorating tip. [NOTE: See the Wilton® website video, "Piping Bag Pressure Control," at http://www.wilton.com/piping-bag-pressure-control/WLTECH-414.html#start=15.]
7. STEP 7: Identify decorating techniques for each tip. [NOTE: See pictures of designs that might be done with plain round, leaf tip, petal tip, and star tip on the Kitchn website at http://www.thekitchn.com/how-to-use-a-piping-bag-224064. See 306 "Cake Decorating Tips," on topics such as "How to Make Icing Roses," "How to Make Shell Border," "How to Color Fondant," etc. on the Wilton® website at http://www.wilton.com/learn-decorating-techniques/.

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–F to differentiate between the terms "ice, frost, and glaze." Use VM–G to illustrate foam/boiled/meringue icings. Use VM–H to illustrate royal icing applications. Use VM–I to illustrate rolled fondant icings. Use VM–J to illustrate poured fondant icings. Use VM–K to illustrate the characteristics of fudge icing. Use VM–L to illustrate the characteristics of ganache icings. Use VM–M to illustrate the characteristics of whipped cream icings. Use VM–N to illustrate glaze applications and types. Use VM–O to review the rules for mise en place. Ask students to reword the mise en place rules in their own words. Use VM–P to review the steps to icing a two-layer cake.*

FLIPPED CLASSROOM: *Students may also be directed to view various Wilton.com website videos about cake decorating topics prior to decorating their first cake.*

DEMONSTRATION #1: *How to fold a paper-decorating bag. How to: attach tips and couplers to pastry bags (paper, plastic, and muslin). How to: hold, fill, and squeeze (control) a decorating bag by use of the proper pressure to place each star, form a border, etc.*

DEMONSTRATION #2: *Many glazes (e.g., powdered sugar and water) can be mixed or kneaded together in a plastic storage bag. Demonstrate using the bag to mix and then, snip the corner of a plastic storage bag to drizzle glaze.*

Assign LS–A to have students practice simple petit fours assembly, icing, glazing, and decorating on a small scale. Assign LS–B to have students practice cake decorating techniques and to evaluate decoration and icing. [NOTE: Assign these labs after students have spent ample time practicing their decoration techniques and ideas on cardboard layer cake circles or upside down cake pans.] Making cakes with a variety of icings and/or glazes could be a moneymaking project for FCCLA or for a class project. For example, iced cakes could be presold before a holiday to give the class experiences with a variety of icings and glazes.

Objective 3: Analyze physical changes and chemical reactions that occur in icing and glaze preparation.

Anticipated Problem: What physical changes occur during icing and glaze preparation? What chemical reactions occur during icing and glaze preparation? What is emulsion? What is foam?

III. Physical changes and chemical reactions

A. Baking is a science. Many scientific actions occur when preparing icings and glazes: numerous physical changes and chemical reactions are necessary to prepare the perfect icing or glaze. The difference between a chemical reaction and a physical change is composition.

1. A ***chemical reaction*** is a permanent change in the chemical composition of a substance in which molecules are broken apart and rearranged into new molecules. For example, fresh eggs that are fried cannot become fresh eggs again: the protein in the egg is permanently changed and the appearance is very different. When dough and batter are heated in an oven, a chemical reaction occurs and new bonds are formed. Heat creates chemical reactions: exothermic and endothermic reactions. For example, heating sugar and liquid produces an endothermic chemical reaction that changes basic ingredients into "icing or glaze." An ***exothermic reaction*** produces heat. An ***endothermic reaction*** absorbs (takes in) heat.
2. A ***physical change*** is the transformation of a substance that does not alter its chemical properties: it's just a physical phase change. The change involves a difference in the way the substance displays: appearance (color or shape), texture, temperature, smell, or a change of state of the substance (e.g., frozen or melting or boiling). Melting, boiling, and freezing are examples of a physical phase change: an ice cube (frozen water) that melts is still water (liquid water) and its chemical properties remain intact. [NOTE: In the physical change described here, the ice cube and warm temperature are the reactants: the ingredients of physical change. The liquid water is the product or result of a physical change.]
3. TEACHER NOTE: Two common baking examples may help students differentiate between a physical change and a chemical reaction: 1) Adding vinegar to baking soda causes the mixture to fizz (a gas is given off). 2) Boiling water produces steam. One of these examples is a chemical reaction and the other is a physical change. To be termed a chemical reaction a new substance must be formed. When water boils, liquid water changes into steam, but it's still water (in a gas form): a physical change. And, it's possible for the steam gas to return to a liquid state. However, when vinegar is added to baking soda, the gas produced is a new substance called carbon dioxide (CO_2) and it is not possible to turn this new solution back into vinegar and baking soda: a chemical reaction. [See VM–Q and VM–R.]

B. Physical changes

1. ***Absorption*** is the act of attracting (taking up) particles of gas or liquid into a liquid or solid substance. (Absorption can be physical or chemical.) For example: During icing and glaze preparation, liquid is absorbed in the following ways:
   a. Sugars are hygroscopic; including granulated sugar, confectioners', honey, brown sugar, and molasses. ***Hygroscopic*** is the ability of a chemical to absorb water from its surroundings. Sugar attracts water keeping icings and glazes moist and soft.
   b. Fat/sugar mixtures, such as buttercream icing types, absorb liquid.
   c. Gelatin, used in some whipped cream icings, absorbs liquid during the "blooming step" (soaking gelatin in liquid). The gelatin granules or sheets soak for 5 minutes without stirring until the liquid is absorbed and the mixture looks translucent. Stabilized whipped cream icings may add gelatin. [NOTE: In contrast, cornstarch is not hygroscopic. Although, in some cases cornstarch may be used to stabilize whipped cream icings.]
2. ***Condensation*** is the conversion (a physical change) of a vapor or a gas to a liquid: the reverse of evaporation. Condensation develops on the pans of cooked icings as steaming liquid gathers on the rims of the pan or double boiler and becomes droplets. Condensation can develop on iced cakes especially those covered with rolled fondant icing.
3. ***Evaporation*** is the conversion (a physical change) of a liquid to a vapor at temperatures below the boiling point. The rate of evaporation increases with the rise in temperature. Evaporation is used in many culinary processes to concentrate a solution (e.g., "cooking down" pan sauces to thicken and intensify the flavor, simmering tomatoes to release moisture and thicken a pasta sauce, cooking sugar and water to evaporate water and concentrate the sugar, etc.).
4. An ***emulsion*** is a semi-liquid and stable mixture in which one liquid is suspended in another: a mixture of two or more ingredients ***immiscible*** (unmixable) unless combined in an emulsion. Emulsions are uniform mixtures: ***homogeneous mixtures*** have a uniform composition and the same properties throughout. Eggs contain protein, fat, and natural emulsifiers. The fats and emulsifiers in eggs work like starch, stabilizing the bubbles in icing. Typical emulsions include a fat or oil and a liquid. Emulsions can be water dispersed in fat or fat dispersed in water. Natural emulsions include butter (water dispersed in fat) and homogenized milk and cream (fat dispersed in water). [NOTE: More information about emulsions is available in the Stella Culinary website article, "FS 001: What Is An Emulsion? A Cook's Guide," at https://stellaculinary.com/cooking-videos/food-science-101/fs-001-what-emulsion-cooks-guide.]
   a. French buttercream icing is thickened with egg yolks: a fat dispersed in water emulsion. Egg yolks contain ***lecithin***, a protein substance found in egg yolks that attracts both water and fatty substances and aids in forming emulsions. [NOTE: Solid butter, should be 60° to 70°F and whole eggs, egg

whites, and egg yolks must be at room temperature to whip to their maximum volume.]

b. In contrast to an emulsion, a ***suspension*** is a heterogeneous mixture (a non-uniform composition such as sand and water) of fluid and solid particles in which the components are mechanically dispersed and eventually settle out. In an oil and water mixture, shaking the mixture causes it to temporarily "suspend" the heavier water in the oil.]

5. ***Heat transfer*** is the physical process of a food coming into contact with a heat source and becoming hot: the exchange of thermal energy between two objects. The action that occurs during heating is food molecules absorbing energy, vibrating quickly, and bouncing off each other. Each collision produces heat, which is transferred to the food: cooking. Cooked icings use the science of heat transfer. There are three methods of heat transfer:
   a. ***Radiation*** is heat transmitted as infrared rays. The stovetop burner or unit produces radiant heat to prepare cooked icings.
   b. ***Conduction*** is heat passed between objects by direct contact, by the collision of molecules. For example, stovetop burners conduct heat to pots and pans and pots and pans transfer or conduct heat to the icing and molecules collide. For example, grilling a steak or a hamburger is an example of conduction heat transfer. Also, cake pans transfer heat, by conduction, to the baked good.
   c. ***Convection*** is heat transferred by circulating warm air around food. In a convection oven, a fan blows hot air over and around the food. [NOTE: See the Biscuit People website article, "Heat Transfer for Biscuit Baking," for more information on heat transfer at http://biscuitpeople.com/heat-transfer-for-biscuit-baking/.]

C. Chemical reactions

1. ***Foam*** is air (in the form of bubbles) that is incorporated and trapped in a protein film by whipping: the act of whipping egg whites causes bubbles to form and be trapped in a protein film. (Source: Food Science: The Biochemistry of Food and Nutrition). For example, visualize a child blowing a bubble with a wand or straw dipped in a soapy solution or with bubble gum: these are types of foams. All foams are a type of ***colloidal dispersion*** (a suspension) in which air is dispersed without dissolving. Not all ingredients foam. For example: to foam, a liquid must have a low surface tension.
   a. ***Surface tension*** is a property of a liquid that allows the liquid to resist external forces: the surface of a liquid, where the liquid is in contact with gas, acts like a thin elastic sheet. (Remember the soap bubble? It's a pressurized bubble of air contained within a thin, elastic surface of liquid: surface tension.) Warm temperatures lower the surface tension of liquid eggs, making it easier for bubbles to form. Egg foams develop the volume and lightness of icings due to their ability to foam and the innate (natural) surface tension of liquid eggs.
   b. Natural proteins, at the molecular level, are shaped like coils or springs. When exposed to heat, salt, or acid, they ***denature*** (unfold) and the coils

unwind. Foams form when the protein liquid of eggs is whipped: the foam forms a film around the air pockets and denatures the protein. When proteins denature, they ***coagulate*** (bond together and form solid clumps). When heated, the protein in the egg white (ovalbumin) coagulates (clots, thickens) and gives the foam structure. The egg white bond must be denatured and the bond loosened to coagulate. ***Coagulation*** is the changing of a liquid to a semisolid or solid mass.

c. ***Denaturation*** is a chemical reaction that changes the shape of a protein molecule by loosening the hydrogen bond that originally formed coils and springs and turns it into a long, shapeless chain. Denaturation usually happens during heating or by the addition of an acid, but in the case of egg whites it happens due to physical whipping that causes the proteins to unfold. Denaturing breaks the hydrogen bond and makes a loose, less compact structure. Egg whites' ***viscosity*** (resistance to flow), due to their large protein molecules, makes them easily denatured by whipping. In contrast, milk does not retain the foam that forms when it is whipped because milk contains less protein than eggs and is less viscous (contains more water than eggs).

d. ***Colloids*** are mixtures of small, insoluble particles found in solutions and in suspensions that are evenly distributed without "settling out." Milk and cream are examples of colloidal dispersions: mixtures of colloid particles in a dispersing medium.

e. The elastic tendency of a liquid (surface tension) allows the molecules on the surface to push together and form layers (e.g., liquid fat and water). Emulsions break the surface tension and allow two liquids or a liquid fat and another liquid to mix. Egg yolk (a liquid and fat) and sugar syrup are emulsified in French buttercream by breaking the surface tension. [NOTE: Warm temperatures lower the surface tension of liquid eggs, making it easier for bubbles to form. Egg foams develop the volume and lightness of icings due to their ability to foam and the innate (natural) surface tension of liquid eggs.]

f. Colloids and suspensions are different primarily because the suspension components eventually settle out. Colloids are also different than solutions due to the ***Tyndall effect***: a beam of light passing through a true solution, such as air, is not visible, however the particles in colloids are large enough to deflect the light. [NOTE: For more general information about emulsions, see MyCAERT CA B3–8 lesson and e-unit.]

2. ***Caramelization*** is the oxidation (browning) of sugar, a process used extensively in cooking for the resulting nutty flavor and brown color: a chemical reaction. (Source: Science of Cooking) Meringue icing is an example of caramelized sugar that is browned with a propane or butane torch or placed under the broiler before serving. Caramelization occurs when sugars are heated and each sugar type caramelizes at a different temperature.
   a. Fructose caramelizes at 230°F (110°C).
   b. Sucrose caramelizes at 320°F (160°C).

c. As sugar syrups cook, water boils away, and the concentration of sugar in the solution increases. As a result the temperature of the sugar syrup increases. The name of each stage of cooked sugar syrup indicates what the syrup will be like when cooled.

(1) ***Thread stage*** is a sugar syrup measurement reached between 230° and 235°F in which the sugar concentration is about 80%. The syrup still contains a lot of water. When this syrup is dropped into cool water it forms a thread but does not create a ball. USES: Syrup for ice cream or pancakes.

(2) ***Soft-ball stage*** is a sugar syrup measurement reached between 235° and 240°F in which the sugar concentration is about 85%. This syrup, when dropped in cool water, forms a soft, flexible ball. It flattens in your hand when removed from the water. USES: Fudge, pralines, and fondant.

(3) ***Firm-ball stage*** is a sugar syrup measurement reached between 245° and 250°F in which the sugar concentration is about 87%. When this syrup is dropped into cool water is forms a firm ball that does not flatten when removed from the water. It will flatten when squeezed. USE: Caramel candy.

(4) ***Hard-ball stage*** is a sugar syrup measurement reached between 250° and 265°F in which the sugar concentration is about 92%, a rather high concentration. This syrup, when dropped into cool water forms a thick, rope-like thread as it is poured and forms a hard ball after contact with the cool water. The ball does not flatten when removed from the cool water but it can be squashed to modify its shape. USES: Nougat, marshmallows, gummies, divinity, and rock candy.

(5) ***Soft-crack stage*** is a sugar syrup measurement reached between 270° and 290°F in which the sugar concentration is about 95% and the water content is very low. The mixture's bubbles become smaller, thicker, and closer together as the syrup boils. When dropped into cool water it solidifies into threads that are flexible but brittle (bend slightly before breaking). USES: Saltwater taffy and butterscotch candies.

(6) ***Hard-crack stage*** is a sugar syrup measurement reached between 300° and 310°F in which the sugar concentration is 99% and almost no water remains in the syrup. Dropping this mixture into cool water produces hard, brittle thread that break when bent. USES: Toffee, nut brittles, and suckers.

3. ***Hydrolysis*** is the splitting of a compound into smaller parts by the addition of water or another liquid. Hydrolysis occurs when cooked icings are prepared. For example: Sucrose + Water → Glucose + Fructose. The result of hydrolysis of sucrose is invert sugar. ***Invert sugar*** is equal parts glucose and fructose. Fructose is sweeter than sucrose. The heating of eggs and sugar prior to whipping allows time for the conversion of sucrose (table sugar) with moisture

(from fat and egg) to begin. [NOTE: Inversion is the process of hydrolysis of sucrose with an acid and heat (used in candy making). See the America's Test Kitchen's "Science of the Perfect Chewy Chocolate Chip Cookie," video for an explanation about sugar hydrolysis (letting sugar/liquid fat batter set 10 minutes before adding flour to ensure the sucrose becomes an invert sugar) at https://www.youtube.com/watch?v=M5fzyhIJYOw.]

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–Q and VM–R to illustrate the difference between a physical change and a chemical reaction. Use VM–S to illustrate an example of absorption. Use VM–T to illustrate methods of physical heat transfer. Use VM–U to review foam colloidial dispersion. Use VM–V to review foam protein coagulation and denaturation. Use VM–W to review and illustrate caramelization.*

NGSS and FCS CLASSROOMS: *Learning the biological and chemical basics of food and nutrition benefits all students. Culinary arts courses demonstrate real-life applications of the scientific principles of food preparation and nutrition. Introducing the science behind the skills, gives students a head start in understanding scientific terms and reactions. Science in FCS classrooms encourages students to develop scientific reasoning skills and have fun doing it. Being part of the conceptual shifts in science education means getting students prepared for Next Generation Science Standards (NGSS). NGSS states that "K–12 Science Education Should Reflect the Interconnected Nature of Science as it is Practiced and Experienced in the Real World." FCS classes already include problem solving, teamworking, and real-life application of concepts. Adding science concepts in FCS classes is a continuation of what is already taught in our courses. When you are teaching a skill, explain the science behind the skill. This will prepare your students with a scientific and an artistic viewpoint.*

RESEARCH LINKS: *The benefit of teaching "science" in Family and Consumer Sciences classrooms seems obvious. The following websites are some quick links to details of teaching science in FCS: "Cooking Class Benefits Kids in Many Ways" at http://health.usnews.com/health-news/diet-fitness/diet/articles/2011/11/10/cooking-class-benefits-kids-in-many-ways; "Six Reasons You Should Study Food Science," http://sciencemeetsfood.org/6-reasons-why-you-should-study-food-science/; "The Top 5 Reasons to Teach Nutrition Education in Your Classroom," at http://www.healthyeating.org/Schools/Tips-Trends/Article-Viewer/Article/521/Top-5-Reasons-to-Teach-Nutrition-Education-in-Your-Classroom.aspx; and, "High School Food and Nutrition Classes Serve Up Skills for Life," at https://www.usnews.com/education/blogs/high-school-notes/2014/06/16/high-school-food-and-nutrition-classes-serve-up-skills-for-life.*

DEMONSTRATION OF TYNDALL EFFECT: *Demonstrate the Tyndall effect by filling on clear glass with water and another clear glass with gelatin softened in water. In a dark space, shine a flashlight through both glasses. The Tyndall effect shows the colloids in the glass with softened gelatin in water. KEY: Gelatin is a colloid large enough to view with the naked eye.*

Review/Summary.

Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. If a textbook is being used, questions at the ends of chapters may also be included in the Review/Summary. Use the E-Unit as the textbook for this lesson, including sidebars, extended learning, summary, and review questions.

Application.

Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.

Evaluation.

Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

Answers to Sample Test:

Part One: Matching Baking Terms

1. d
2. h
3. e
4. g
5. f
6. i
7. j
8. c
9. a
10. b

Part Two: Matching Science Terms

1. f
2. b
3. j
4. a
5. i
6. h
7. e
8. d
9. g
10. c

Part Three: Completion

1. sugar
2. ganache icing
3. simple syrup
4. powdered sugar (or confectioners' sugar, icing sugar)
5. Three of the following functions: moisture, flavor, color, steam leavening, binds
6. emulsifiers
7. meringue powder
8. cold
9. chocolate
10. icing comb

Part Four: Short Answer

The correct chronological order to ice a two-layer cake is:

a. Prepare and completely cool the cake layers
b./c. Crumb the cake
b./c. Prepare the icing
d. Place the first cake layer upside down on the turntable
e. Ice the flat side of the bottom layer
f. Add the second layer
g. Crumb-coat the cake and allow it to dry
h. Spread the decorative icing layer on the cake sides
i. Spread the decorative icing layer on the cake top
j. Gently pull the spatula through the icing on the cake top toward the center to smooth any icing build-up

Sample Test

Name _____

Icings and Glazes

Part One: Matching Baking Terms

Instructions: **Match the term with the correct definition.**

a. buttercream icing
b. crumb coating
c. flat icing
d. fondant
e. French buttercream
f. Italian meringue buttercream
g. petit fours
h. royal icing
i. seven minute icing/frosting
j. Swiss meringue buttercream

_____1. Sweet, rich, elastic, white icing made from sugar, glucose, and water that hardens when exposed to the air

_____2. A hard coating made from beaten egg whites, icing (powdered) sugar, and a liquid (usually lemon or lime juice) that creates a hard, brittle texture

_____3. A classic icing made with cooked sugar syrup and egg yolk foam that produces a rich, creamy color

_____4. Small, decorative, and layered bite-size cakes often covered with poured fondant icing

_____5. An icing mixture of hot sugar syrup (240°F) poured over whipped egg whites and whipped until the mixture cools

_____6. A foam coating mixture that is 100% fat free and contains beaten egg whites, granulated sugar, and water: a mixture similar to meringue but more stable and sturdy enough for piping

_____7. An icing mixture composed of a meringue into which large amounts of butter are beaten in small increments until the mixture is smooth, fluffy, and glossy

_____8. A simple coating prepared with just a few ingredients: often powdered sugar and water

_____9. A coating prepared by creaming together butter or shortening, powdered sugar (confectioners'), and vanilla to a fluffy and light consistency

____10. Spreading a thin layer of icing on the sides and top of the cake to seal any loose bits of cake

Part Two: Matching Science Terms

Instructions: **Match the term with the correct definition.**

a. alkaloid
b. caramelization
c. coagulate
d. colloids
e. emulsion
f. foam
g. hard-crack stage
h. lecithin
i. soft-ball stage
j. thread stage

_____1. Air (in the form of bubbles) that is incorporated and trapped in a protein film by whipping: the act of whipping egg whites causes bubbles to form and be trapped in a protein film

_____2. The oxidation (browning) of sugar, a process used extensively in cooking for the resulting nutty flavor and brown color

_____3. A sugar syrup measurement reached between 230° and 235°F in which the sugar concentration is about 80%

_____4. A large group of organic substances found in plants that are colorless, bitter tasting alkaline substances; the most common of which is caffeine

_____5. A sugar syrup measurement reached between 235° and 240°F in which the sugar concentration is about 85%

_____6. A protein substance found in egg yolks that attract both water and fatty substances and aids in forming emulsions

_____7. A semi-liquid and stable mixture in which one liquid is suspended in another: a mixture of two or more ingredients that are immiscible (unmixable) unless in an emulsion

_____8. Mixtures of small, insoluble particles found in solutions and suspensions that are evenly distributed without "settling out"

_____9. A sugar syrup measurement reached between 300° and 310°F in which the sugar concentration is 99% and almost no water remains in the syrup

____10. To bond together and form solid clumps

Part Three: Completion

Instructions: **Provide the word or words to complete the following statements.**

1. The number one most used ingredient in icings and glazes _____.
2. The French term for a rich chocolate emulsion of heavy cream and chocolate is _____.

3. A mixture of 1-part sugar (by weight) to 1-part water (by weight) boiled for 1 minute is _____.
4. Granulated sugar crushed to a fine powder, bright white, and containing 3% cornstarch to prevent clumping is _____.
5. Liquid is the second most commonly used ingredient in icings and glazes. Three functions of liquid in icings and glazes are _____, _____, and _____.
6. Additives that reduce the tension between oil and water and improve the softness, texture, stability, volume, and shelf life of shortenings are called _____.
7. Pasteurized powdered egg whites with sugar and additives used to make long-lasting, hard-drying royal icing is called _____.
8. Eggs are easiest to separate when _____.
9. The general term used for the products of the cacao bean is _____.
10. A metal (or plastic) triangle-shaped tool with toothed or serrated edges used to decorate/texturize cake sides or tops is a/an _____.

Part Four: Short Answer

Instructions: **Answer the following.**

The basic steps to icing a two-layer cake are listed here in alphabetical order. Arrange these basic steps in the correct chronological order.

_____ Add the second layer

_____ Crumb-coat the cake

_____ Crumb the cake

_____ Gently pull the spatula through the icing on the cake top toward the center to smooth any icing build-up

_____ Ice the flat side of the bottom layer

_____ Place the first cake layer upside down on turntable

_____ Prepare and completely cool the cake layers

_____ Prepare the icing

_____ Spread the decorative icing layer on the cake sides

_____ Spread the decorative icing layer on the cake top

WHAT IS A COATING?

A coating is a covering for a dessert or other foodstuff. Each of the cakes pictured in this visual master have been "coated" with icing and/or glaze. The three main functions of icings and glazes are to:

- Add flavor and richness to the dessert and interest to the surface.
- Develop the dessert's appearance and suggest special occasions.
- Improve the keeping quality of the dessert by the addition of moisture and flavor. For each cake pictured, which of these main functions are met? One cake is covered with white chocolate and dark chocolate glazes, another is a Christmas cake covered in thick fondant icing, and another is a valentine cake.

COATINGS: ICINGS AND GLAZES

The first culinary coating was powdered sugar. Icing is a sugar coating used to decorate cakes, buns, cookies, bars, etc. Frosting is the American term for icing made with egg white and icing sugar (confectioners') and its consistency is thick, creamy, and fluffy. Glaze (glacé) is a broad term for several dessert coatings: sugar-icing-syrup coatings cooked to the 'crack' stage that harden when cold, for water icings, for melted chocolate with cream or other additives, or for sieved jams and jellies that gelatinize on the dessert's surface. Glazes give desserts a smooth and/or a shiny surface as well as sealing in moisture.

BASIC ICING AND GLAZE INGREDIENT FUNCTIONS

The three main functions of dessert coatings are to: 1) Add flavor and richness to the dessert and interest to the surface. 2) Develop the dessert's appearance and suggest special occasions. 3) Improve the keeping quality of the dessert (moisture and flavor) with the protective coating. The two most commonly used ingredients in all icings and glazes are sugar and liquid. What other basic ingredients are found in the chocolate buttercream icing pictured here?

Ingredient	Functions
Sugar (sucre)	Flavor, tenderizes, color (caramelizes and aids in browning), moisture retention, cause spread [NOTE: Artificial sweeteners do not provide the same characteristics as natural sugars.]
Liquid	Moisture (also "thins" icings and glazes), flavor, color, steam leavening, binds icing and glaze ingredients together
Fat (graisse)	Flavor and richness, moisture, traps air during creaming (e.g., adds volume and fine texture), shortens (tenderizes), emulsifies two liquid ingredients together, carries an added flavor throughout the mixture
Eggs (oeufs)	Natural leavening (trap air bubbles), structural framework for some cooked icings, emulsification (binding), moisture, color, flavor, texture, thickening
Flavoring (parfum)	Enhances or fundamentally changes the taste of icings and glazes, chocolate adds flavor, texture, and shine
Salt (sel)	Flavor (adds complexity (without it you would primarily taste sugar); heightens the flavor of other ingredients), toughens the texture of soft fat-and-sugar mixtures
Leavening	Causes greater volume in icings (via whipping whole eggs, egg yolks, and egg whites)

VM–D

ICING AND GLAZE EQUIPMENT AND TOOLS

Identify these pieces of icing and glaze equipment and tools.

ROSE AND PEARL CAKE DESIGN

The rose and pearl design for this wedding cake uses only two decorating tips. Of the six decorating tips pictured, which two were used to create the “rose and pearl” design?

ICE, FROST, AND GLAZE

To ‘ice’ is to cover a cake or pastry with icing/frosting, usually using an offset spatula and/or using piping bag with tips. To ‘frost’ is to cover a cake or pastry with icing/frosting, usually using a spatula or spoon (a casual coating). To ‘glaze (glacé)’ is to give cakes and pastries a smooth and/or shiny finish, usually by pouring or by drizzling. The first coating was sifted confectioners’ sugar. Which picture represents each of these definitions: ice, frost, and glaze? The raspberry tarts are shown with two coatings: which one is more appealing to you?

FOAM/BOILED/MERINGUE ICINGS

Foam/boiled/meringue icings are cooked syrups that use egg whites to create a fluffy, glossy, sugary icing. These four images represent types of foam/boiled/meringue icings. The key lime cupcake is topped with seven minute icing and toasted coconut. The plum-flavored meringue macaroons are filled with French buttercream icing. The sponge biscuit cake is iced with Swiss meringue buttercream "rippled" onto the cake with a star tip and topped with fresh roses. The all over rose design for a special occasion is iced with Italian meringue buttercream using an open star tip (about 14 mm).

ROYAL ICING

Royal icing is a hard coating made from beaten egg whites, icing (powdered) sugar, and a liquid (usually lemon or lime juice) that creates a hard, brittle texture. It is pure white (or tinted) sticky icing that dries hard. The valentine cookies pictured here are decorated with pink royal icing and topped with white royal icing decoration. The gingerbread house shingles, snow, icicles, and all trim are created with royal icing. The base, front, back, sides, and roof are all constructed (attached to each other) with royal icing. Gingerbread house bakers call royal icing "cement." The googly eyes are made with white and black royal icing. What pastry or cake would you create using these googly eyes?

FONDANT ICING: ROLLED

Fondant is sweet, rich, elastic, white icing made from sugar, glucose, and water that hardens when exposed to the air. It is rolled out and draped and shaped over a cake or pastry. Rolled fondant is an icing frequently used to cover wedding or specialty cakes to produce a smooth "porcelain" look. The cake to which rolled fondant is applied must be firm (butter, pound, or fruit), and lightly covered with a fruit glaze, buttercream icing, or marzipan to ensure the fondant properly adheres to the cake. Rolled fondant consistency remains soft but has little flavor.

FONDANT ICING: POURED

Poured fondant is an icing that creates a very sweet, smooth, satiny finish for cakes and petit fours. Petit fours are small, decorative, and layered bite-size cakes often covered with poured fondant icing. Poured fondant seals in freshness and dries to a semi-hard and smooth finish. Then, the petit four is decorated.

FUDGE ICING

Fudge icing is rich, heavy icing prepared in a similar fashion to fudge candy. Granulated sugar, milk, butter, and chocolate is cooked to soft-ball stage. Then, the fudge mixture is cooled before beating with a mixer to add air and lightness. This pourable icing is used warm and used quickly. What differentiate this icing's appearance with that of simple chocolate buttercream frosting?

GANACHE ICING

Ganache is the French term for a rich chocolate emulsion of heavy cream and chocolate. It's prepared by heating heavy cream and chocolate until the chocolate melts. The better the chocolate, the better the ganache. Ganache is easy to prepare and may be used as a cake or torte filling, an icing (often whipped for cakes and cupcakes), a glaze (cakes, tarts, or tortes), and as a truffle candy base. Whipped ganache produces a fluffy icing especially nice for piping on cupcakes. The same mixture proportions are pourable at 85°F and spreadable at room temperature. Pictured here are four desserts made with ganache: a pound cake covered with ganache icing, a ganache torte, French macaroon cookies with ganache filling, and truffles. Notice the ganache interior of the truffle: it's shiny and soft, but firm. If you like Ferrero Rocher® candy, you like truffles.

WHIPPED CREAM ICING

Whipped cream icing is made from powdered sugar, flavoring, chilled heavy (whipping) cream, and a stabilizer (to prevent the icing from separating). Powdered sugar contains some cornstarch that helps to stabilize the icing; or, additional cornstarch may be added to the mixture. Whipped cream is also stabilized using unflavored gelatin that gives the mixture a mousse-like texture. Gelatin also prevents weeping (bleeding of water from the cream). This process shows the piping process, adding icing to the top tier, smoothing, and finally, decorating.

GLAZES

Glazing is a broad term for several types of dessert coatings: sugar-icing-syrup coatings cooked to the 'crack' stage that harden when cold, water icings (liquid and sugar), melted chocolate with cream or other additives (think of ganache), or sieved jams and jellies that gelatinize on the dessert's surface (think aspic and other fruit-based glazes). To glaze (glacé) is to cover a cake or pastry with a smooth and/or shiny finish, usually by pouring or by drizzling. Glazes are the thinnest of the coatings when prepared: they give desserts a smooth and/or a shiny surface as well as seal in moisture. Match each pictured glaze with its glaze coating type.

MISE EN PLACE

Mise en place is a French cooking term that literally means everything in its place. One who observes the mise en place rule would complete the following steps to ice and/or glaze a cake or other dessert.

- STEP 1: Read the entire icing or glaze recipe.
- STEP 2: Collect all the ingredients.
- STEP 3: Conduct processes requested by the recipe including: chill a stainless steel bowl in the freezer to whip heavy cream, ensure other ingredients are at room temperature, etc.
- STEP 4: Prepare any decorations: flowers, piped chocolate decorations, sanding sugars, wash fresh fruit, etc.
- STEP 5: Prepare the workstation by cleaning the area and gathering tools (measuring equipment, spatulas, or stand mixer) as required.
- STEP 6: Preheat the broiler if making broiled topping.
- STEP 7: Prepare icing or glaze and ready it to be added to a baked product.

- STEP 8: Ice and/or glaze the cake. Store any leftover icing or glaze under refrigeration (or as directed).
- STEP 9: Assemble the decorations and the tools (e.g., piping bags, tips, premade flowers, icing sugars, fresh fruits, etc.
- STEP 10: Decorate the cake and store as directed.

ICING A TWO-LAYER CAKE

Crumb coating is spreading a thin layer of icing on the sides and top of the cake to seal any loose bits of cake. Then, the crumb coat dries for 10 to 20 minutes. Some sources recommend 30-minute refrigeration prior to applying the decorative icing to the cake. The decorative layer of icing can include a combed side, a chopped nut or coconut side treatment, a border, a glaze, fresh fruit and flowers, sugar flowers, etc.

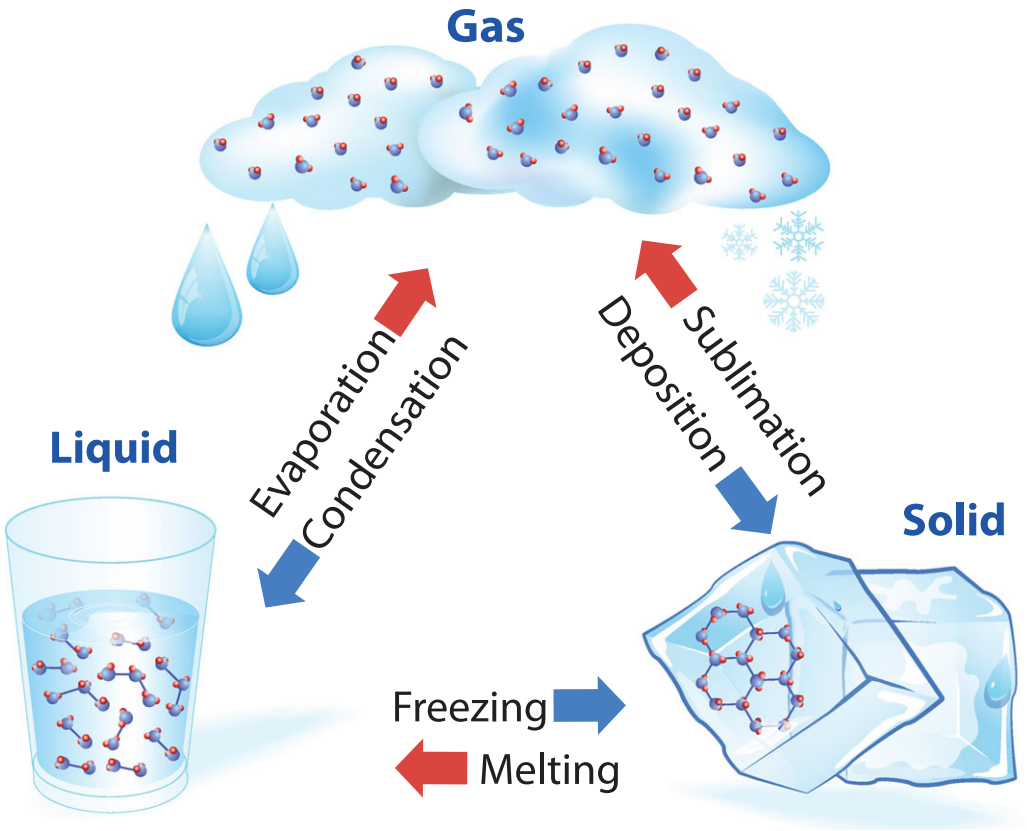
- STEP 1: Prepare and completely cool the cake layers.
- STEP 2: Crumb the cake by brushing loose crumbs from the cake layers with a pastry brush.
- STEP 3: Prepare the icing.
- STEP 4: Prepare the cake turntable.

- STEP 5: Place one cake layer upside down onto the prepared turntable.
- STEP 6: Ice the flat side of the bottom layer with about ½ cup of icing; move icing from the center of the layer out and slightly over the edge of the bottom layer.
- STEP 7: Add the second layer, flat sides together.
- STEP 8: Crumb-coat the cake.
- STEP 9: Spread the decorative layer of icing on the cake sides using an offset spatula. Then, ice the top of the cake.
- STEP 10: Remove cake from turntable to a cake stand or display plate.

PHYSICAL CHANGES: PHASE CHANGES

A physical change is the transformation of a substance that does not alter its chemical properties: it's just a phase change. Melting, boiling, and freezing are examples of a physical phase change: an ice cube (frozen water) that melts is still water (liquid water) and its chemical properties remain intact. Physical changes occur when matter gains or looses heat: no new substance is produced, just a change in its physical state.

STATE OF MATTER



CHEMICAL REACTIONS: BAKING SODA AND VINEGAR

A chemical reaction is a permanent change in the chemical composition of a substance in which molecules are broken apart and rearranged into new molecules. To be termed a chemical reaction a new substance must be formed. When water boils, liquid water changes into steam, but it's still water (in a gas form): a physical change. And, it's possible for steam (a gas) to return to a liquid state. However, when vinegar is added to baking soda, the gas produced is a new substance called carbon dioxide (CO_2) and it is not possible to turn this new solution back into vinegar and baking soda: it's an example of a chemical reaction.

ABSORPTION

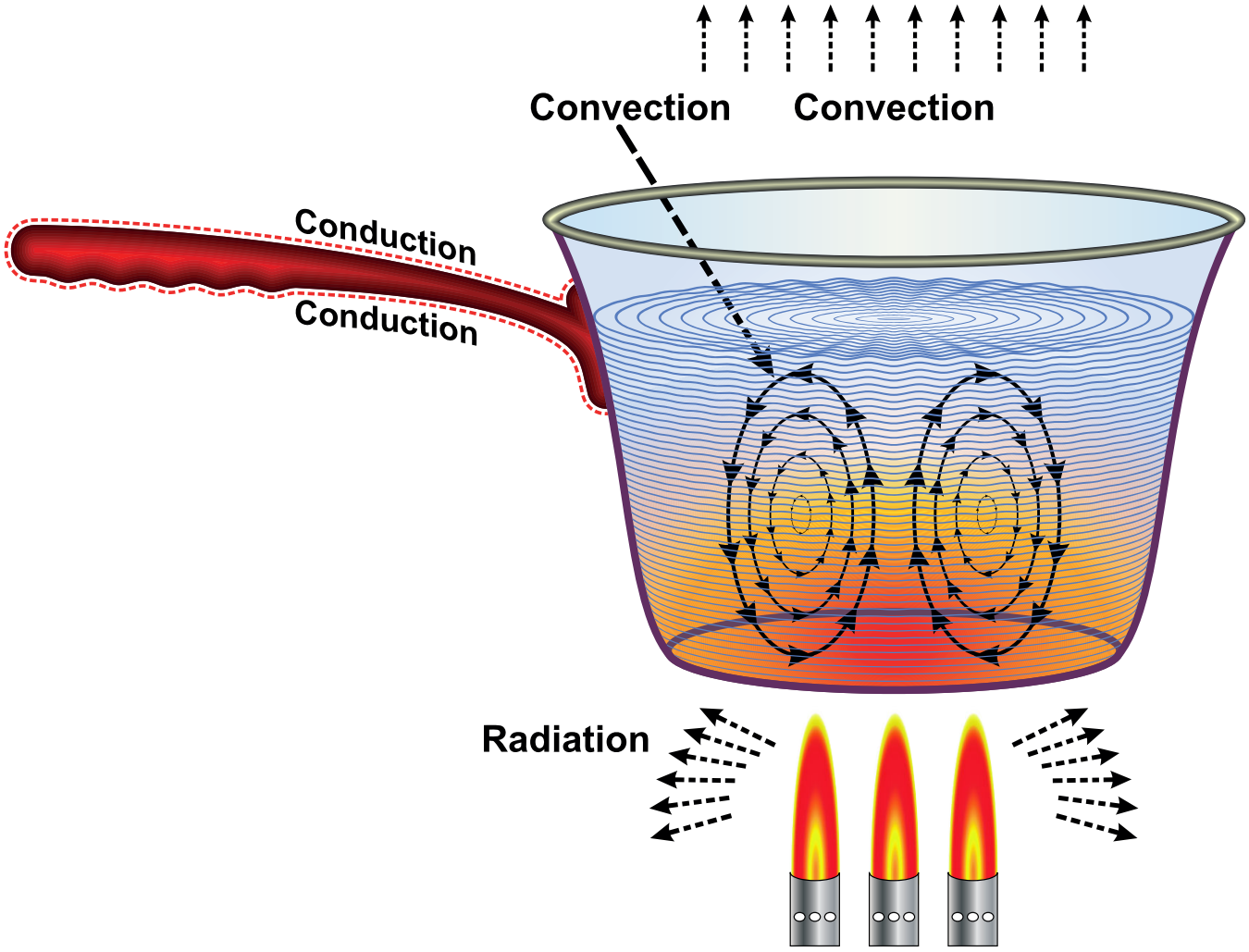
Absorption is the act of attracting (taking up) particles of gas or liquid into a liquid or solid substance. Sugars are hygroscopic: the ability of a chemical to absorb water from its surroundings. Sugar attracts water keeping icings and glazes moist and soft. These gelatin sheets soak for 5 minutes without stirring until the cold liquid is absorbed and the mixture looks translucent. Whipped cream icings may add gelatin to stabilize the mixture.

PHYSICAL CHANGE: HEAT TRANSFER

Heat transfer is the physical process of a food coming into contact with a heat source and becoming hot: the exchange of thermal energy between two objects. The action that occurs during heating is food molecules absorbing energy, vibrating quickly, and bouncing off each other. Each collision produces heat, which is transferred to the food: cooking. There are three methods of heat transfer: radiation, conduction, and convection.

- **Radiation** is heat transmitted as infrared rays. Radiant heat is evident when opening a preheated oven: one can "feel" the warmed air. Warmed air is transferred to food and cooks it.
- **Conduction** is heat passed between objects by direct contact, by the collision of molecules. For example, stovetop burners conduct heat to pots and pans and pots and pans transfer or conduct heat to the food. Grilling a steak or a hamburger is an example of conduction heat transfer. Cake pans transfer heat, by conduction, to the baked good.

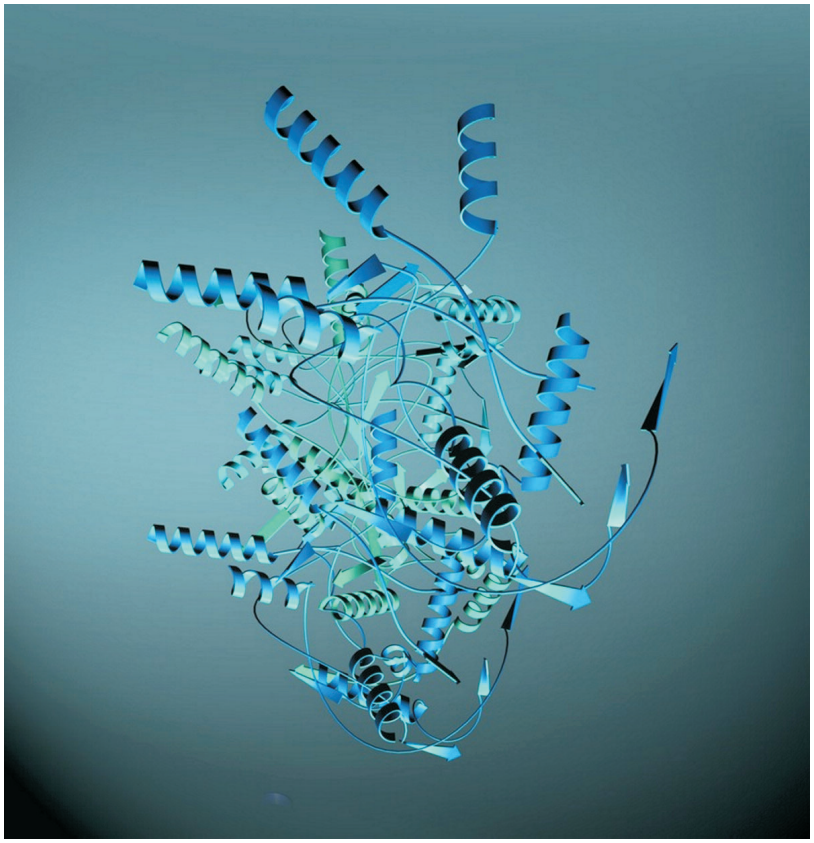
- **Convection** is heat transferred by circulating warm air around food. In a convection oven, a fan blows hot air over and around the food.



CHEMICAL REACTION: FOAM COLLOIDAL DISPERSION

Foam is air (in the form of bubbles) that is incorporated and trapped in a protein film by whipping: the act of whipping egg whites causes bubbles to form and be trapped in a protein film. All foams are a type of colloidal dispersion (a suspension) in which air is dispersed without dissolving. The stiffly beaten egg whites in this image are a type of egg foam: a colloidal dispersion.

CHEMICAL REACTION: FOAM PROTEIN COAGULATION AND DENATURATION



Natural proteins, at the molecular level, are shaped like coils or springs. When exposed to heat, salt, or acid, they denature (unfold) and the coils unwind. Foams form when the protein liquid of eggs is whipped: the foam forms a film around the air pockets and denatures the protein in the egg. When proteins denature, they coagulate (bond together and form solid clumps). Coagulation is the changing of a liquid to a semisolid or solid mass.

CHEMICAL REACTION: CARAMELIZATION

Caramelization is the oxidation (browning) of sugar, a process used extensively in cooking for the resulting nutty flavor and brown color. Caramelization occurs when sugars are heated. This image shows sugar and water cooking (bubbling). As the heat increases and evaporation of the water occurs, the sugar becomes darker and darker (more sugar molecules, fewer water molecules because the water is evaporating). The longer the sugar syrup cooks, the more concentrated it becomes with sugar molecules and caramelization occurs.

LS–A

Name _____

Petit Fours: Small Scale Decorating

Purpose

The purpose of this lab activity is to practice your icing, glaze, and cake-decorating skills on a small scale.

Objectives

1. Research petit fours, icings, and glazes.
2. Select icing and glaze recipes/formulas.
3. Calculate one-half and one-third recipe/formula amounts.
4. Create the petit fours design.
5. Prepare the cake, filling, and icings.
6. Decorate the petit fours.
7. Display the decorated petit fours. (Photograph as required.)

Materials

- lab sheet
- device with Internet access
- sketching materials (paper and colored pencils)
- ingredients and equipment to:
  - prepare and cut cake (serrated knife, thin slicer knife, etc.)
  - prepare and apply glaze or preserve layer
  - prepare and apply buttercream icing
  - smooth top layer (under poured fondant)
  - prepare and apply poured fondant
  - decorate (icing and piping tools)

Procedure

1. RESEARCH:

   a. Access and read the amounts and directions for the cooked, poured fondant recipe on the All Recipes website at http://allrecipes.com/recipe/73799/frosting-for-petits-fours/. You will need half of this recipe to complete the lab activity. Calculate and record the amounts in the "One Half Recipe" column. Ask your instructor to check your calculations before preparing the poured fondant icing.

Cooked Poured Fondant Recipe/Formula

Ingredient	Original Recipe	One Half Recipe
Granulated sugar	2 cups	
Cream of tartar	1/8 teaspoon	
Water	1 cup	
Powdered sugar	1½ cup	

   b. Access and read the heated, poured fondant recipe amounts and directions on the RoseBakes website at http://rosebakes.com/petit-four-icing-poured-fondant/. You will need one-third of this recipe to complete the lab activity. Calculate and record the amounts in the "One Third Recipe" column. Ask your instructor to check your calculations before preparing the heated poured fondant icing.

Heated Poured Fondant Recipe/Formula

Ingredient	Full Recipe	One Third Recipe
Powdered sugar	6 cups	
Water	½ cup (or 8 tablespoons)	
Light corn syrup	2 tablespoons (or 6 teaspoons)	
Flavoring (combine almond and vanilla extracts)	3 teaspoons (or 1 tablespoon)	
White chocolate chips	¾ cup	

   c. Access pictures of petit fours from the following websites:
      (1) Petit Fours Mini Cakes Recipe on the Wilton website at http://www.wilton.com/petit-fours-mini-cakes/WLRECIP-292.html#q=petit+fours&start=1
      (2) Pretty Petit Fours Mini Cakes on the Wilton website at http://www.wilton.com/pretty-petit-fours-mini-cakes/WLPROJ-702.html#q=petit+fours&prefn1=contentType&prefv1=decorating&start=25

d. Research "How to Make Perfect Petit Fours" on the RoseBakes website at http://rosebakes.com/how-to-make-perfect-petit-fours-recipe-tutorial/. [NOTE: Notice the glaze and the buttercream icing added between the layers and the buttercream added to the top. Either glaze and/or buttercream frosting *must be added on top of the cake* for the poured fondant to adhere (stick) properly. The glaze and icing also help prevent cake crumbs when cutting into shapes.

2. DETERMINE THE PETIT FOURS ELEMENTS: As a lab group:

   a. Make and record the selections indicated in the table.

Petit Fours Fillings and Icings	Recipe and/or Selection
Cake Type a. Frozen, purchased, or from scratch b. Thickness of layer(s)	 a. b.
Glaze or Preserves between layer(s)	
Icings a. For layers (buttercream/rolled fondant) b. For top (under poured fondant) c. For exterior (poured fondant) d. For decorative piping	 a. b. c. d.

   b. Design the petit fours layers. [NOTE: Petit fours are bite size and layers must be thin to accommodate "one bite."] Complete the diagram of the petit fours beginning with the bottom layer of cake as indicated and add your description of the bottom layer. Then, "move up the diagram" to detail each layer. Finally, indicate how the top of each petit four would be decorated. (Use as many design rows as necessary to complete your design.)

8. Piped decorations (drop flowers, leaf)
7.
6.
5.
4.
3.
2.
1. Cake (bottom layer of sponge cake, yellow cake, pound cake, etc. about ¾-inch thick)

c. Individually sketch shapes and designs for the top and sides of the petit fours. Then, share the sketches and collaborate on a group design. Sketch in the space provided.

3. PREPARE THE CAKE: Select a sponge or butter cake recipe/formula for your petit fours. [NOTE: Possible cake selections include: a previously baked cake; a cake baked in a half-sheet pan; and, purchased pound cake work well for this project. Recall your research: many cakes for petit fours are cut into thin layers, filled, and stacked before cutting into decorative shapes.] If preparing a cake from scratch, prepare and completely cool the cake well before assembly (preferably cooling overnight).

4. PREPARE THE FILLING & ICINGS: Talk with your instructor about any questions regarding the selection of an appropriate icing or filling for the petit fours. (All recipes suggested in this lab sheet can be made a day ahead. Some poured fondants may need to be reheated the day the petit fours are decorated.)

   a. Prepare a buttercream icing for your project. [NOTE: Determine the schedule to fill and ice the petit fours. If you would not ice until the next day, you may wish to prepare the poured fondant on the second day.] Access and read the instructions for the "6 Flavored Buttercream Frosting Recipes" on the Wilton website at http://blog.wilton.com/index.php/6-flavored-buttercream-frosting-recipes/#q=buttercream%2Bicing&start=17.
   b. Prepare a filling (glaze or preserves).

5. CUT LAYERS AND FREEZE:

   a. Mise en Place: Prepare a cooling rack and sheet pan setup (e.g., sheet pan, layer of waxed or parchment paper, top with cooling rack) to catch excess poured fondant icing.
   b. Cut the cake into layers and place on prepared cooling rack and sheet pan.
   c. Fill with glaze, preserves, and/or buttercream or rolled fondant icing.
   d. Freeze for 1 hour. [NOTE: If holding petit fours decoration until the next day, wrap the cake tightly and freeze overnight.]
   e. Cut into small shapes (triangles, squares) or use open cookie cutters for hearts, circles, or flowers.

6. DECORATE THE PETIT FOURS: Review piping techniques for buttercream icing via the Cake's website video "ProTip: How-To to Pipe Buttercream Icing Like a Pro," at https://www.youtube.com/watch?v=UtLe-4TtZ7E.

   a. Make/reheat the poured fondant while the cake is in the freezer.

b. Prepare and tools to cover petit fours with warm icing. (e.g., offset spatula, small ladle, double boiler, slotted spoon, etc.)
c. Bring buttercream icing to desired temperature.
d. Remove petit fours from freezer. Leave on cooling rack/sheet pan setup.
e. Cover petit fours with poured fondant:
    (1) Dip bottom
    (2) Pour/drizzle top to completely cover
    (3) Smooth and seal sides
    (4) Cool. (Add another layer if necessary. Cool.) [NOTE: To reuse excess poured fondant (from waxed or parchment paper), reheat slightly.]
f. Assemble icing tips, bags, and couplers. Pipe sketched decorations onto individual petit fours. Use small, uniform designs on the bite-sized petit fours.

7. DISPLAY: Display your petit fours. Photograph for your portfolio as required.

8. Turn your completed lab sheet in to your instructor.

Petit Fours: Small Scale Decorating

1. Sponge cake for this lab may have been frozen when students completed the "Foam Cakes" lesson CA C8–4.
2. Consider demonstrating the cooked poured fondant process and pouring. Then, have students try some of each cooked and heated poured fondant recipes during the petit fours lab.
3. Recipe amounts may be divided for cooked and heated poured fondant recipes/formulas. Smaller lab groups do not need a full recipe of the poured fondant.
4. Evaluation tables from LS–B may be used with this lab sheet.
5. Suggested answers for LS–A tables:

Cooked Poured Fondant Recipe/Formula KEY:

Ingredient	Original Recipe	One Half Recipe
Granulated sugar	2 cups	1 cup
Cream of tartar	1/8 teaspoon	1/16 t. (half of 1/8 t.)
Water	1 cup	½ cup
Powdered sugar	1½ cup	¾ cup

Heated Poured Fondant Recipe/Formula KEY:

Ingredient	Full Recipe	One Third Recipe
Powdered sugar	6 cups	2 cups
Water	½ cup (or 8 T.)	2 T. + 2 t.
Light corn syrup	2 T. (or 6 t.)	2 t.
Flavoring (combine almond and vanilla extracts)	3 t. (or 1 T.)	1 t. total (e.g. ¼ t. almond and ¾ t. vanilla, etc.)
White chocolate chips	¾ cup	¼ cup

Petit Fours Elements SAMPLE:

Petit Fours Fillings and Icings	Recipe and/or Selection
Cake Type a. Frozen, purchased, or from scratch b. Thickness of layer(s)	 a. Butter cake baked in 9 × 13 × 2-inch pan (Recipe at http://www.wilton.com/petit-fours-mini-cakes/WLRECIP-292.html#q=petit+fours&start=1) b. ¾-inch thickness per layer
Glaze or Preserves between layer(s)	Heated, reduced, and strained raspberry preserves
Icings a. For layers b. For cake top c. For exterior d. For decorative piping	 a. Buttercream or rolled fondant (insert URL or recipe name) b. Buttercream or rolled fondant (insert URL or recipe name) c. Raspberry poured fondant (insert URL or recipe name) d. Buttercream (insert URL or recipe name)

Petit Fours Layer Design SAMPLE:

There is more than one possibility for the petit fours design. Some lab groups may use additional layers of icing, glaze, or cake.

8. Piped decoration of buttercream icing (pink drop flowers with green leaf)
7. Poured fondant (raspberry flavor)
6. Buttercream icing (raspberry flavor)
5. Fruit glaze or preserves (as for layer 2)
4. Cake (second layer as for layer 1)
3. Buttercream icing (vanilla flavor)
2. Fruit glaze or preserves (raspberry preserves heated, reduced, strained)
1. Cake (bottom layer of yellow cake, sponge cake, pound cake, etc. about ¾-inch thick)

LS–B

Name _____

Practice Cake Decorating Techniques

Purpose

The purpose of this activity is to practice your cake decorating techniques.

Objectives

1. Select layer cake and simple buttercream recipes/formulas.
2. Sketch a decoration design for a two-layer cake.
3. Practice the selected decoration designs.
4. Conduct mise en place.
5. Prepare the cake and buttercream icing.
6. Ice and decorate the cake.
7. Display your decorated cake. (Photograph as required.)
8. Self-evaluate the cake decoration and icing.
9. Receive evaluation feedback from independent evaluators.

Materials

- lab sheet
- device with Internet access
- cookbooks
- recipes/formulas, ingredients, and equipment to prepare:
  - scratch cake (or cake mix)
  - simple buttercream icing
- sketching materials (paper and colored pencils)
- cake decorating equipment (pastry tips, bags, couplers, tints, etc.)
- assessment tools for independent evaluators (optional and as needed)

Procedure

1. Divide into teams of 2 or 3 students. As a team:
    a. Select a layer cake (scratch or mix) to decorate. Receive your instructor's approval for the scratch cake and provide a detailed grocery list. [Instructor Initials: _____]
    b. Select a simple buttercream recipe. Receive your instructor's approval and provide a detailed grocery list. [Instructor Initials: _____]
    c. Collaborate and sketch a decoration design for your two-layer cake in the space provided. Take inspiration from the cake name and/or theme to help you select color and decoration details. Sketch two views on a separate sheet of paper and attach to this lab sheet: the cake top and border view and the side view.
    d. Practice selected decorations (e.g., borders, flowers, leaves, writing, etc.)
2. Conduct mise en place.
    a. Review the cake recipe/formula or the cake mix instructions.
    b. Review the icing recipe and the preparation steps.
3. Prepare the cake and the buttercream icing.
4. Ice the layer cake as directed in the recipe/formula using a turntable or other device. (If necessary, review your class notes or E-Unit for the protocol to ice two-layer cakes.) Plan for time to crumb coat the cake and let dry. Then, apply the finish-icing layer. Move the cake to a cake stand (or other display plate or platform).
5. Apply the cake decorations. [NOTE: Your instructor may have assembled an impartial judging team to evaluate all the cakes decorated in this lab activity. The judging team will use the following assessment.]
6. Display your cake for judging. As a team, evaluate your cake using the "Decorative Cake Assessment" form. Add comments. Then, taste and evaluate your team's icing selections using the "Icing Taste Evaluation" tool. Add comments. Receive independent evaluator feedback for decoration and icing.
7. Turn your completed lab sheet in to your instructor.

Cake Decoration Assessment

Cake Name/Theme: _____

Team Members: _____

Indicators	Points	Comments
Clean, neat display		
Color selection matches theme		
Attention to detail; uniform borders		
Icing visual texture		
Level of design creativity		
Smoothed surfaces to apply decoration		
Decoration difficulty		
Overall design		
TOTAL:		**40 possible points**

Rating Scale of 1 to 4 (4 = Excellent and 1=Poor)

Icing Taste Evaluation

Buttercream: _____

Team Members: _____

Icing Indicators	Points	Comments
Mouthfeel		
Aroma		
Texture, creaminess		
Stability		
Flavor		
Decoration flavor		
TOTAL:		**30 possible points**

Rating Scale of 1 to 4 (4 = Excellent and 1=Poor)

Practice Cake Decorating Techniques

1. The lab sheet offers the choice of a box or scratch cake. MyCAERT lessons related to cake preparation are: CA C8–3, Butter Cakes and CA, C8–4 Foam Cakes. Butter cakes and sponge cakes (a type of foam cake) make excellent decorated cakes for this lab activity.
2. This lab sheet can be performed in teams or as individual projects. Have the students take pictures of the decorated individual and team cakes to use for displays, website pictures, etc. For individual projects, students may evaluate icing taste at home and "show off" their project to their family and friends. If cakes are taken home, the icings can be evaluated using leftover icing. [NOTE & CAUTION: The taste and stability of icings are negatively affected by excessive use of food coloring (including paste types).]
3. Use the evaluation tools to score each team's cake and icings. Compare your scores and comments to the students'. Discuss with students, if appropriate.
4. Grading Option: 30 points lab team work and clean up, 40 points decorative cake assessment, and 30 points icing taste assessment = 100 points