HOME BAKING Association Teach • Learn • Inspire

LAB 1

Why Bake?

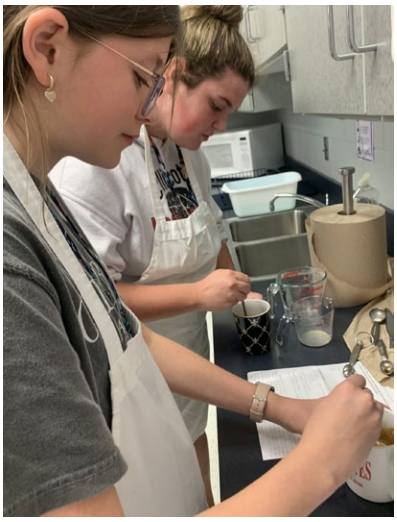
Lab 1
Why Bake?

Baking is Science... Tech... Engineering... Art... Math... Cultural Literacy... History... Deliciousness

"The preparing, cooking, and sociable eating of food are so central to the human experience that the culinary arts may well be what made us human in the first place...There is no record anywhere of any people who have lived without cooking."

Richard W. Wrangham, Professor of Anthropology, Harvard University. p. 57 Lost Recipes, by Marion Cunningham

See Family & Consumer Sciences Education Standards, STEAM and P21 connections to this lab in the Appendix. Framework for FCS in Career and Technical Education is found at leadfcsed.org/career-pathways-through-fcs.html.



High school Family & Consumer Sciences baking lab.

Introduction

Bakers produce everything from the every-meal staples to the highly crafted bread, pastry or dessert. A fresh-baked bread or dessert adds warmth to the humblest of meals—whether prepared at home, carried in, or eaten out. The skill of baking can build relationships, wellness, a career, and wealth.

People bake to:

- Show people they love, honor, or care about them
- Celebrate a season, holiday, religious festival, special occasion
- Craft a personal artisan "touch" in a high-tech environment
- Bring freshness, less stress, flavor, and appeal to daily life
- Add value, quality, and nutritious ingredients to menus, diets, special needs
- Conserve resources, money, prepare food locally and save fuel, reduce packaging, time

Terms & Techniques

Find and learn the terms and techniques used in this lab in the Baking Glossary.

A Baker's Dozen	Consumer	Lab	Pantry
Apron	Cut-in	*Mise en place*	Sanitary
Artisan	Equipment	Muffin	Scoop
Bake	Ingredient	Oven mitt	Teamwork

Experiential Learning

1. Do it—Experience the activity.
2. What happened—Share publicly the results, reactions, observations.
3. Critical thinking—Process by discussing, looking at the experience, analyzing and reflecting. Use critical thinking skills to problem-solve poor outcomes together.
4. Connect it—Generalize to connect the experience to real-world examples.
5. Now what—Apply what was learned to a similar or different situation; practice.
6. Explore the Future in Baking, futureinbaking.com as you bake at home, in school or in out-of-school programs.

More from the University of Minnesota Extension Experiential Learning Guide for Adults Who Work with Youth, 2023, https://extension.umn.edu/youth-learning-and-skills/experiential-learning-guide

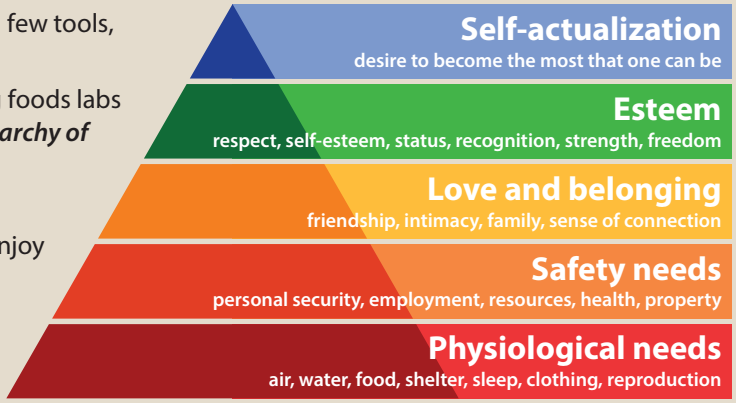
A-B-C's for Baking Educators

Baking is:

AFFORDABLE Flour, water, yeast or baking powder and salt—add a little butter, shortening or oil, egg, cocoa and sugar—and students can learn the history and science of everything from ancient breads to lava cakes! Equipping the lab need not be enormously expensive. Early baking was done on flat rocks! Simple baking can be taught on griddles or skillets with a few tools, water, and in under an hour of time.

BASIC to human needs. At every level, hands-on baking foods labs move the student toward the goal: peak of Maslow's ***Hierarchy of Human Needs***.

Source: simplypsychology.org/maslow.html



COMPREHENSIBLE Students understand the value, enjoy the fresh sensory qualities, embrace the resourcefulness, welcome the cultural opportunities and extend the skills and knowledge in their homes, communities and workplace.

Outcomes

- Identify five or more benefits baking provides individuals, families and communities.
- Recognize current bakers as professionals in test kitchens, and small and large businesses.
- Relate baking to four or more components of a healthful, meaningful lifestyle.
- Cite three career or personal goals or skills students will gain from baking labs.
- Identify a dozen or more tools used in the baking labs.
- Teachers identify existing food skills students possess to organize and prepare one of the five Strawberry Muffin Top baking lab options.
- Explore ***The Muffin Man and the Healthy Kids Act*** lesson and resources homebaking.org/wp-content/uploads/2019/07/muffinman_lessonplan.pdf
- Assess the results of the baking lab using ***A Matter of Taste*** evaluation forms.
- Select a local baker, culinary writer, well-known home baker, or caterer and invite them to discuss how and why they bake.
- Find, try and write down a baking recipe that is a favorite or looks good. Include steps to make it "food safe" as you write the instructions.
- Identify and name essential ***Baking Temperatures*** (Appendix) for recipe's processes, interior doneness, oven preheating and if applicable, altitude.

For Teacher

- Preview ***Build Baking Bridge Home to Careers***, PowerPoint PDF, and ***Baking Flour and Food Safety*** guides, homebaking.org/baking-food-safety
- Preview how and why baking helps make meals happen. Prepare five reasons learning food skills, preparing and eating meals together makes a life-long difference for your students. Resource connections:
  - ***Mealtime Solutions***, homebaking.org/mealtimesolutions
  - ***UNL Cooperative Extension Food Resources***, how-to guides, recipes, substitutions, food.unl.edu/recipe-central
  - TheFamilyDinnerProject.org conversation starters, recipes
  - ***Whole Grain Baking 101*** guides you in baking whole grain rich, homebaking.org/wp-content/uploads/2019/05/WGBaking101REV.pdf
- Find local professionals and home bakers to speak to the students. The baker may be in the school's cafeteria, a 4-H foods leader, FCCLA member, well-known home baker, caterer, test kitchen baker or restaurant owner.
  - ***No one local?*** Have questions ready and contact King Arthur Baking Baker's Hotline, 855-371-2253 or visit kingarthurbaking.com/bakers-hotline

BAKER'S HOTLINE

- Review recipe writing styles and select the style you will require students to use. Two guides include wikihow.com/Write-a-Recipe and thedailymeal.com/how-write-recipe. Have students include the steps for food safe baking after they review Baking Food Safety steps.
  - Use ***Safe Recipe Style Guide*** resources, saferecipeguide.org to illustrate.

- Assign students to:
  1. Describe how they will create their Baker's Portfolios—digital, a physical binder, create a website?
  2. Write down or type (not downloaded) a favorite baking recipe to share with the class from family, friends, community group or test kitchen website. Great baking resources and websites are listed in Lab 13. (NOTE: Students gain *mise en place* organizational and functional literacy skills from the task of recipe writing.) A source credit line must be included.
  3. Read recipe and terms and techniques from Glossary.
- Provide to students for their Portfolios (Appendix):

  A Matter of Taste Lab Evaluation Form
  Baking Food Safety 101 Guide
  Baking Lab Equipment List
  Baking Lab Rubric (how lab scores determined)
  Baking Skills Checklist
  Baking Temperatures
  Safe Kitchen Checklist
  Washing Hands
  What is Gluten? Infographic
  Wheat 101 and ***Flour 101***
- Prepare a display of baking tools/equipment for the Skill Drill using 2 or 3 18×13-inch baking sheet pans. Include:

electronic scale	level tool
stirring spoon	batter or dough scoop
measuring spoons	custard cup
dry measuring cups	pastry brush
bowl scraper	food thermometer
pastry blender or knives	baker's apron or jacket
egg separator	mixer attachments
bread loaf pan	
oven mitt	
parchment sheet	
whisk	
mixing bowl	
liquid measuring cup	

- Review muffin mixing method and tips. See ***Baking Glossary*** for muffin mixing how-to links, homebaking.org/glossary/#m

Baking Hack

Create a portable culinary experience to let students demonstrate and teach others! Load a microwave on a food cart plus some mugs and ingredients for the ***Blueberry Mug Muffin*** food safety temperature lesson. (In Appendix or homebaking.org/wp-content/uploads/2021/09/Baking-Food-Safety-Mug-Muffin-Lesson21.pdf)

Take 10 Skill Drills

1. Assemble a dozen or more baking tools on a sheet pan. Have the students tell or list on a sheet of paper, the name of each tool on the sheet pan and one ingredient and/or technique for which the tool would be used.
2. Demonstrate how to correctly use volume measure: a 1 cup measuring tool to measure 1 cup flour, 1 cup water and a digital scale to weigh ingredients in the recipe.
3. On a separate piece of paper, write two paragraphs about Why You Bake ***or*** Want to Learn. This may include:
   - Paragraph one: What baked foods you enjoy from traditions or in everyday life.
   - Paragraph two: Three skills or short term goals you have for the class.
4. Do the Listening for Directions activity (Appendix) to improve *mise en place* skills.

Computer Lab

Assignment Options:

- Visit our baker's blogs homebaking.org/blog, spotlights homebaking.org/bakers-spotlight or choose an HBA Member and visit their website (see list of members homebaking.org/members).
- Visit bakemag.com by Sosland to learn the latest in ingredients and events in commercial baking.
- View how to cut-in butter, shortening or margarine in the Glossary, "cut-in" entry homebaking.org/glossary/#c
- Buff muffin skills—learn baking tips & how-tos, baking basics, and muffin tips with ***Baker Bettie's Muffin Mixing Method***, bakerbettie.com/muffin-mixing-method.
- Learn muffin facts at foodtimeline.org/foodfaq2.html#muffins.
- Check out the history of ***National Muffin Day*** (February 20) at daysoftheyear.com/days/muffin-day and ways to give back through nationalmuffinday.org.
- Create your own muffin day community service!
- View ***Quality Baking Temperatures*** to learn why temperature is so important for processes, product food safety and doneness and oven pre-heating, homebaking.org/baking-food-safety

Baking Labs

Strawberry Muffin Tops

This introductory baking experience will inspire questions and help students see the skills and knowledge baking encompasses! Each lab will bake Strawberry Muffin Tops, with a "Why Bake?" variation! The Strawberry Muffin Tops photo can be seen on the Lab One divider.

This lab is an applied pre-test for all levels of baking students—first, intermediate and advanced. It incorporates introductory baking ingredient use, fundamental baking measurements and production methods.

Use the ***Baking Lab Rubric*** to consider students' current skill levels and to help in selecting the baking lab level (First, Intermediate or Advanced Experience).

Before You Begin

- Read the control Baking Lab 1 recipe with the students. Require students, or do together, *mise en place* steps for the recipe.
- Provide the students with basic method demonstrations as needed (cutting-in butter; use of scales or dry and liquid measuring tools; mixing; how to scoop same-sized muffin tops). View how-to videos in glossary or YouTube Channel, HomeBaking.org.
- Use this lab as an opportunity to introduce the ***Baking Lab Rubric*** criteria, HomeBaking.org Baking Food Safety and ***Safe Kitchen Checklist*** guidelines, and how to work with equipment, each other and clean up labs.
- Use student list and the ***Baking Lab Rubric*** to note the skill levels of students as they work.
- Provide copies of ***A Matter of Taste*** form—one for each product students will sample.
- Assign Lab teams.

All labs will prepare Strawberry Muffin Tops.

Each lab's focus is on one reason why people bake, and bakes a variation for "I bake…."

Lab 1: for enjoyment....freshness, flavor, appeal, esteem

Lab 2: to show kindness, affection, celebrate

Lab 3: to offer nutritional value, for health and wellness

Lab 4: for resourcefulness (save money, packaging, shipping, to be locally produced)

Lab 5: for special dietary needs (less sodium, ingredient allergies, whole grain). Choose one special "Why Bake?" option per lab.

Lab Supply List

- ❑ Baking aprons, hair ties, caps or covers
- ❑ Ingredients for each lab to prepare one of five recipes
- ❑ Dried fruit for Lab 3, if no in-season fruit or locally grown fruit is available (Note: May use fresh fruit in season, cake and pastry canned filling (such as Solo™) or fruit preserves)
- ❑ Allergy ingredient option(s) for Lab 5 – Gluten-free baking mixture (prepare own, or purchase all-purpose gluten-free flour blend, including xanthan gum—see Glossary); flax meal, soy or rice milk
- ❑ Medium mixing bowl
- ❑ Stirring spoon
- ❑ Fork or wire whisk
- ❑ Large (2 cup/16 ounce) liquid measuring cup
- ❑ Pastry cutter, knives or food processor with steel blades
- ❑ Two baking sheet pans and wire cooling racks per lab
- ❑ Parchment or pan spray
- ❑ Muffin batter scoop ¼ cup (#16/2 ounce) dipper/scoop or scant ⅓ cup (#12) dipper
- ❑ Ovens
- ❑ Serving tools or gloves for baked product
- ❑ Food thermometer (digital or probe)

Videos ***How to Mix Muffin Batter*** *with Lisa Pluff, 12:10,* youtu.be/X4lZwrYvjQk?t=730 and ***Cornbread Batter*** youtu.be/ujPUhFlNAFQ

Strawberry Muffin Tops, courtesy Clabber Girl

Baking Lab 1: Fresh is Best!

Strawberry Muffin Tops

Yield: 12 muffin tops, (2.9 oz/81g each)

Ingredients	Measurement	Weight
All-purpose flour	1 ¾ cups	7.75 oz/220g
Sugar, granulated	⅓ cup	2.3 oz/65g
Baking powder	1 ½ teaspoons	0.25 oz/7g
Baking soda	½ teaspoons	2.5g
Salt	¼ teaspoons	1.5g
Unsalted butter, cold	4 Tablespoons (½ stick)	2 oz/57g
Large egg	1	2.6 oz/50g
Buttermilk*	¾ cup	7 oz/200g
Fresh strawberries, sliced	1 ½ cups	8 oz/227g
Strawberry cake/pastry filling or preserves	about 4 Tablespoons	3 oz/85g

***Buttermilk option:** *Stir together 2 teaspoons lemon juice or vinegar plus milk to make ¾ cup*

Directions

1. Preheat oven to 425˚F. Line two baking sheets with parchment paper OR lightly oil or spray.
2. In medium mixing bowl, whisk to combine the flour, sugar, baking powder, baking soda, and salt.
3. Cut the cold butter into small pieces (about 8); toss pieces with the dry mixture and cut-in the butter until it resembles coarse bread crumbs. (This step may be done in the food processor, with two knives or a pastry blender.)
4. In a 2-cup liquid measuring cup, measure milk and add egg; use a fork or wire whisk to thoroughly blend the buttermilk and egg.
5. Toss the sliced berries lightly with flour mixture. Make a "well" or divot in the center of dry mixture. Add the beaten egg and buttermilk mixture.
6. Use a large spoon to turn and combine the dough until it forms a slightly sticky dough ball. You won't knead this dough. If the dough is too wet to form a dough ball, add another 2 Tablespoons of flour sprinkled over the surface. Stir again just to bring the dough into a ball.
7. Scoop dough onto prepared baking sheets or prepared canning jar lids (see text box), approximately 6 #16 (¼ cup) scoops per pan, 1 ½ inches around each muffin top.
8. Gently press a thumb-sized indentation in center of the top with a small spoon and drop in a generous rounded teaspoon of fruit filling or preserves.
9. Bake for 18 minutes or until golden. Cool briefly on wire cooling rack and serve.

Recipe courtesy of Clabber Girl, clabbergirl.com

Baking Lab 2: Celebrate!

Add these special treatments for celebrations.

- Prepare streusel mixture to sprinkle on the ***Strawberry Muffin Tops*** before baking.
- Prepare a confectioner's drizzle and drizzle over each muffin top before serving.

Streusel Topping

Yield: Streusel to top 12 muffin tops

Ingredients	Measurement	Weight
Brown sugar	½ cup, packed	3.25 oz/92g
All-purpose flour	⅓ cup	1.4 oz/40g
Ground cinnamon	1 ½ teaspoons	5g
Ground nutmeg	¼ teaspoon	0.75g
Butter, cold, cut in pieces	¼ cup	2 oz/56g
Chopped nuts (optional) OR rolled oats OR flaked coconut	½ cup	2 oz/56g

Confectioners Drizzle

Stir until smooth.

Powdered sugar	½ cup	2 oz/56g
Milk	2 to 3 teaspoons	0.75 to 1 oz/28g
Vanilla extract	½ teaspoon	2g

Muffin Topping Directions

1. Prepare muffin tops and streusel topping.
2. Sprinkle muffin tops with streusel at Step 8, just before baking.
3. Prepare confectioners drizzle while tops bake. Allow tops to cool. Just before serving, drop drizzle lightly from a fork or pointed spoon over the tops.

Real vanilla offers a bigger flavor impact. Learn more, rodellekitchen.com/resources/learning

Strawberry Muffin Tops (without streusel or drizzle)

Nutrition Facts

Serving Size (81g)
Servings Per Container

Amount Per Serving

Calories 150 Calories from Fat 40

	% Daily Value*
Total Fat 4.5g	7%
Saturated Fat 3g	15%
Trans Fat 0g	
Cholesterol 30mg	10%
Sodium 200mg	8%
Total Carbohydrate 26g	9%
Dietary Fiber 1g	4%
Sugars 12g	
Protein 3g	

Vitamin A 4% • Vitamin C 20%
Calcium 4% • Iron 6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300 mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Baking Lab 3: Nutrition Plus!

Add a whole grain option to help make "half your grains whole," as Dietary Guidelines for Americans recommend.

- Compare ***Whole Grain Strawberry Muffin*** nutrition facts with original ***Strawberry Muffin Tops***.
- ***"Reduced sodium"*** muffin tops must have 25% less sodium than the original. Is this true about the muffin tops you prepared? Compare facts labels. *(A: yes)* *"Low sodium"* foods can have 140 mg or less sodium per serving. Do Whole Grain Strawberry Muffin Tops qualify as "low sodium?" *(A: yes)*
- Could you sell Whole Grain Tops in school as a homebaking.org/wp-content/uploads/2019/11/smart_snacks_bakersdozen.pdf product? *(A: Yes, substitute 1 Tbsp. butter and 3 Tbsp. vegetable oil for 4 Tbsp. butter in the recipe)*

Whole Grain Strawberry Muffin Tops

Yield: 12 muffin tops, (2.8 oz/79g each)

Ingredients	Measurement	Weight
Whole wheat flour	1 cup	4 oz/115g
Rolled oats, quick or old-fashioned	½ cup	1.5 oz/35g
All-purpose flour*	¼ cup	1 oz/28g
Sugar, granulated	⅓ cup	2.3 oz/67g
Baking powder	1 ½ teaspoons	0.25 oz/7g
Baking soda	½ teaspoon	2.5g
Salt	Pinch (1/16 teaspoon)	0.75g
Unsalted butter, cold	2 Tablespoons/¼ stick	1 oz/28g
Vegetable oil	2 Tablespoons	
Large egg	1	2.6 oz/50g
Buttermilk**	¾ cup	7 oz/200g
Fresh strawberries, sliced	1 ½ cups	8 oz/227g
Strawberry pastry filling or preserves	about 4 Tablespoons	3 oz/85g

**All-purpose flour may be Ultragrain® flour*

***Buttermilk option: Stir together 2 Tablespoons lemon juice or vinegar plus 1% or skim milk to make ¾ cup*

Directions

1. Wash hands and surfaces. Preheat oven to 425˚F. Line 2 baking sheets with parchment paper OR lightly oil or spray.
2. In medium mixing bowl, whisk to combine the flours, oatmeal, sugar, baking powder, baking soda, and salt.
3. Cut the cold butter into small pieces (about 8); toss pieces with the dry mixture and cut-in the butter until it resembles coarse bread crumbs, using two knives, pastry blender or food processor.
4. In a 2-cup measuring cup, measure milk and add egg; use a fork or wire whisk to thoroughly blend the buttermilk and egg.
5. Toss the sliced berries lightly with the flour mixture. Make a "well" or divot in the center of the dry mixture. Add the beaten egg and buttermilk mixture.
6. Use a large spoon to turn and combine the dough until it forms a slightly sticky dough ball. You won't knead this dough. If the dough is too wet to form a dough ball, add another 2 Tablespoons of flour sprinkled over the surface. Stir again just to bring the dough into a ball.
7. Scoop dough onto prepared baking sheets, 6 scoops per pan, 1 ½ inches around each muffin top.
8. Gently press a thumb-sized indentation in center of the top with a small spoon and drop a generous rounded teaspoon of preserves or jam in the indentation.
9. Bake for 18 minutes or until golden. Cool briefly on wire cooling rack, wash hands and serve.

Whole Grain Strawberry Muffin Tops

Nutrition Facts

Serving Size (79g)
Servings Per Container

Amount Per Serving

Calories 160	Calories from Fat 45
	% Daily Value*
Total Fat 5g	**8%**
Saturated Fat 2g	**10%**
Trans Fat 0g	
Cholesterol 25mg	**8%**
Sodium 140mg	**6%**
Total Carbohydrate 25g	**8%**
Dietary Fiber 2g	**8%**
Sugars 12g	
Protein 3g	
Vitamin A 2% •	Vitamin C 20%
Calcium 6% •	Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories: 2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300 mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Baking Lab 4: Going Green

Prepare the ***Strawberry Muffin Tops***, using locally produced or in-season ingredients. Locally produced ingredients may be fresh, frozen or dried fruits, herbs, milk, eggs, wheat flour, butter, sugar, black walnuts or any ingredient.

Optional

- Substitute 1 cup conditioned dried fruit such as raisins, dried cranberries, dried cherries, blueberries, and 1 Tablespoon fresh herb, such as lavender, if desired. Snip or dice into smaller pieces.
- **How to condition dried fruit:** Cover dried fruit in room temperature tap water (~80˚F) for 5 to 10 minutes; drain off water. Measure dried fruit; place remainder in sealable food container or plastic bag. Store refrigerated.

See ***Where Wheat is Grown*** and ***Where Sugar is Produced*** maps in the Appendix.

Black Walnuts are native to North America. Learn where this nut grows, is forage-harvested and processed, black-walnuts.com

Find bio-compostible packaging to deliver goods, goodnaturedproducts.com

Baking Lab 5: Baking for Special Needs

Prepare ***Strawberry Muffin Tops***. Each lab should choose ONE of these Special Needs substitutions for the original recipe:

1. **Lactose allergy:** Replace the dairy buttermilk with 1 Tablespoon lemon juice + a non-dairy milk to equal 1 cup. Stir well.
2. **Egg allergy:** Replace 1 large egg with 1 Tablespoon flax meal + 3 Tablespoons water OR ¼ cup soft silken tofu.
3. **Prepare or purchase an "all-in-one" gluten-free baking mixture** to replace all-purpose flour one for one (1 ¾ cup) in the original recipe. Freeze mix that is not needed.

Food allergies and Celiac are serious illnesses. Learn more, at acaai.org/allergies/types/food-allergy; NationalCeliac.org, and HomeBaking.org Glossary, "Gluten Free" entry.

Gluten-Free Baking Mix

Recipe Land O'Lakes, landolakes.com

Ingredients	Measurement
Brown rice flour	2 cups
Potato starch	⅔ cup
Tapioca flour	⅓ cup
Xanthan gum	1 teaspoon

Whisk or blend with mixer wire attachment. Yield: 3 cups

Gluten-free baking tips

1. Gluten-free flours may require more chemical leavening, but not more yeast to compensate for the lack of elasticity. If you convert a recipe to gluten-free, you may need to add about 25% more baking soda or baking powder than what is called for in the original wheat version.
2. Use an electric mixer—either stand or hand-held—to help prevent clumping that can occur when you use gluten-free flours.
3. Gluten-free batters tend to be sticky. You may need to scrape the sides of the mixing bowl often.
4. Be sure to use good measuring techniques and quality, standard measuring spoons and cups or scales for accuracy. A slight measuring mistake can alter the texture and lead to a gummy, undesirable result.
5. Gluten-free baked goods may stick more to the pan. To prevent batter from sticking to surfaces and pans, use non-stick pans or line your pans with parchment paper.
6. When using a gluten-free flour, store it in the freezer in a resealable plastic freezer bag to maintain quality. Always let the flour come to room temperature before using.
7. Baked goods with gluten-free flours taste best when eaten warm from the oven but they also freeze well. Wrap small amounts of the baked product in plastic food wrap and place in a resealable freezer bag or a tightly covered container. Thaw only what you plan to use.

Gluten-Free (GF) Substitutions

Gluten provides the structure for baked goods. Gluten-free products will not bake the same.

Chef Stephanie Petersen, Culinary Specialist, provides tips for gluten-free baking.

1. Know your grains, seeds and starches

Contain gluten:

- Wheat, its six classes, ancestors and products: einkorn, spelt, khorasan wheat, faro, durum, semolina, bulgur, farina, and grano. *The amount of gluten in wheat varies by class—hard or soft—and the production year.*
- Barley, rye, and triticale

Gluten-free (GF):

- Amaranth seeds (when popped, great in breads, cakes, cookies)
- Beans—garbanzo (chickpea)
- Brown rice flour, whole grain version, use like white rice flour, as basic flour for GF baking; bland and blends well with other GF flours
- Buckwheat, taste and texture like wheat in breads, cakes, cookies
- Corn, potato, and tapioca starches
- Cornmeal and corn flour—yellow and white
- Flax seed meal (seeds must be ground to be digested)
- Millet, mild, sweet nut-like
- Oats and oat flour—naturally GF; look on label for "certified gluten-free" (produced in a gluten-free mill)
- Peas, lentils, soy (legumes) stronger flavor or aftertaste
- Sorghum, white or red—use no more than 30% in GF flour blends
- Teff—a grass seed; most often used in cookies, cakes, tortillas, flat breads

Whole Grain Gluten-Free Blend

Makes 7 ½ cups

3 cups sorghum flour

2 cups brown rice flour

2 cups tapioca starch/ flour

1 cup cornstarch or potato starch

2 Tbsp. xanthan gum

1 Tbsp. sea salt

Blend well, store sealed, refrigerated.

Chef Stephanie Petersen
PanhandleMilling.com

2. No one GF flour will do the trick for avoiding dense GF results.

Use a blend of no more than 30% of any one GF flour, less than 20% of millet and garbanzo beans. Refrigerate all GF flours—return to room temperature before using and whisk to remove lumps.

3. Include gum for structure.

Add xanthan or guar gum when GF flour blend does NOT contain it. Whisk the gum in with the other dry ingredients or it may be mixed into the oil or butter.

- Xanthan gum for baking and yeast breads—blend per cup of GF flour: cookies: ¼ tsp; cakes/pancakes: ½ tsp.; quick breads: ¾ tsp.; yeast breads: 1 to 1 ½ tsp.; pizza dough: 2 tsp.
- Guar gum is best for those with severe allergies to corn and soy; improves texture and elasticity. Per cup GF flour, whisk in: cookies: ¼ to ½ tsp.; cakes/pancakes: ¾ tsp.; quick breads: 1 tsp.; yeast breads: 2 tsp. to 1 Tbl.

Find ingredients and learn more about GF baking Baking Glossary, homebaking.org/glossary/#g

Consumer Sensory Evaluations: *A Matter of Taste*

On baking day do a sampling and evaluate the product. Each lab should:

1. Have ***A Matter of Taste*** forms and pencils for each student in the class to evaluate the lab's product.
2. Display one uncut Strawberry Muffin Top and cut small samples from the rest for the whole class to try.
3. As the students try each lab's product sample, write the Lab Number or product name on ***A Matter of Taste*** evaluation form and complete it as they sample.
4. Gather all the evaluations for each lab.
5. Clean up.
6. Tally Consumer Sensory Evaluations. Discuss *Why Bake?* labs.
   - Tally the evaluations for each lab. Calculate the percentages for each question on the ***A Matter of Taste*** form.

     Example: I would enjoy eating this product again.
     —15 "yes" out of 18 students
     —Set up the problem: Tally number over total surveys returned: 15/18
     15 students said "yes", divided by 18 total evaluations = 83%
     —What it means: A 60% or higher rating on a category requires no more improvement. Lower % ratings mean an improvement is needed.
   - Have each lab discuss and suggest their ideas for product improvement in categories below 60%.
   - Self-evaluate their lab team, using the ***Baking Lab Rubric***. How did they rank their performance in the lab? Write their questions or suggestions on the back of the rubric.

DIY Costs and Benefits:

Lab 1: Fresh is Best Muffins cost about $0.50 each—$6.00 for a dozen, using fresh in-season strawberries. (Fresh-baked muffin tops may cost $4.50 ***each*** in a coffee shop.)

Lab 2: Celebrate! Streusel cost is $0.40 each for the extra drizzle and streusel with nuts. A beautiful treat that's even good for you!

Lab 3: Nutrition Plus The muffin is nutritious as it is, with fresh fruit, low fat buttermilk and moderate amounts of fat, sodium and sugar. Whole grain is an easy variation and does not cost much more.

Lab 4: Going Green Save on refrigeration/freezer trucking by being ***locally*** baked. Many products are trucked over 1500 miles when prepared and shipped in. Local or regional ingredients may be black walnuts, flour, vegetable oil, dairy, eggs and strawberries. Packaging should be bio-compostible, if possible, "7 of the Cutest (and Greenest) Ways to Gift Your Baked Goods," kingarthurbaking.com/blog/2022/12/07/7-of-the-cutest-and-greenest-ways-to-gift-your-baked-goods

Lab 5: Bake for Special Needs Foods specially made for food allergies may cost 10× more, or more! Bake them yourself for freshness and savings, homebaking.org/wp-content/uploads/2019/07/final_kitchenscience-1.pdf

Bake for Special Markets, too. A vegan muffin top may be made using the egg substitutions and the lemon juice option to sour a plant-based milk.

Critical Thinking

Use the ***Baking Lab Rubric*** and the ***A Matter of Taste*** forms (tallied and summarized by each lab) for this discussion. Each lab:

- Prepare verbal or written comments/suggestions based on each of the Baking Lab Rubric categories.
- Report on their product's ***A Matter of Taste*** evaluation forms tally and consumer ratings.

1. How did their muffin top rate for customer appeal on ***A Matter of Taste*** forms? *(A: A 60% or higher ranking in any category means the product would sell.)*
2. What could be improved? *(A: Give each lab opportunity to report based on their responses.)*
3. Do you think making the muffin tops yourself was a cost savings? (See text box)
4. Was the time it took to prepare them a problem?
5. What resources have been saved by doing it yourself? *(A: Fuel to transport prepared dough or products up to 1500 miles)*
6. Gluten-free and lactose-free products will not look or taste the same as a wheat-based product—but are the products you baked acceptable? If not, what most needs improvement?
7. What other ways can costs and natural resources be saved when making a baked item at home or for a baking business? *(A: These may include: Preheat oven, and load it quickly; store product in reusable storage containers; bulk purchase ingredients; no national brand advertising costs; no outer hard plastic or cardboard packaging; more net weight product for half the cost; real fruit, butter—not flavorings; properly storing ingredients to prevent waste.)*
8. What benefits were gained by making the product yourself? *(A: Highest quality ingredients; freshness; nutrition; control of ingredients; less packaging; save money)*
9. What other specialty baked goods are in demand? *(A: vegan, organic and GMO free)* What do these terms mean? Would they be more costly? *(Note: all wheat flours are non-GMO. Learn about sustainably produced wheat, ardentmills.com; wawheat.org)*
10. Visit foodinsight.org for additional consumer surveys.

Local Connections

Get to Know a Baker

Invite a professional baker, avid home baker (adult or teen), catering baker, supermarket baker, food service baker, or baking teacher to come to the class.

1. Students discuss and prepare questions ahead of baker's presentation.
2. Encourage the guest baker to demonstrate at least one specialty of theirs—shaping, signature bread or pastry, local cultural specialty.
3. Ask the baker how they got started baking and 5 things students can do now to gain skills at home, online or in school in baking, food knowledge, and managing costs.
4. Have the baker highlight baking food safety, handling, sales regulations and new baking trends they follow.
5. If possible, have the baker discuss how they develop and test a new product.
6. If no local baker is available, go online!
   - Computer Lab references, Blogs, Baker Spotlights, videos, PowerPoint presentations, Baker Chefs Gemma Stafford and Kristin Hoffman, homebaking.org/associate-members, and more at HomeBaking.org
   - Sugar Association, sugar.org and ASR Groups, chsugar.com and dominosugar.com
   - Explore baking and milling careers with Home Baking Association Members, homebaking.org/members
   - King Arthur Baker's Hotline, kingarthurbaking.com/bakers-hotline
   - National Festival of Breads, winning home bakers featured at nationalfestivalofbreads.com
7. Meet mentors, ***The Future in Baking***, futureinbaking.com, graincraft.com/careers

Family & Consumer Sciences student, Chillicothe HS, Mo.

A Matter Of Taste

Lab Evaluation Form

How to use:

1. Tally each category – taste, color, aroma, appearance, would eat again.
2. Calculate the percentages marking each category.
   Example: 8 out of 15 surveyed thought it very good=53%
3. Each overall category needs at least a 60% consumer positive approval before the product will sell.

Product Name: _____ Lab group: _____ Date: _____

I think the food products tastes:	❑ very good	❑ good	❑ okay	❑ improvements needed	
The food tastes:	❑ savory	❑ sweet	❑ bitter	❑ salty	❑ sour ❑ not as expected
The color is:	❑ great	❑ too pale	❑ too dark	❑ not right for the product	
The aroma (smell) is:	❑ inviting	❑ too strong	❑ too weak	❑ not inviting	
The food looks:	❑ yummy	❑ okay	❑ improvement needed		
The portion size is:	❑ just right	❑ too small	❑ larger than needed		
I would enjoy eating this food again.	❑ yes	❑ no	❑ maybe		
Comments:					