

# Baking Sciences: Fat Functions Scones



**Lab Goal:** The Scone labs will introduce students to baking ingredients and methods common to “quick breads” and a commercial product sold from this category. Scones are a profitable baked good often sold wherever there are coffee or tea kiosks or shops. Students may also create, prepare, price and market a value-added (designer) scone.

### Food History:

The Scottish are especially known for scones. Scottish scones are often less sweet than American scones, made with butter or lard, and may contain rolled oats. Scottish scones may also be baked on a “girdle” (griddle), instead of in an oven.

Scones are considered “quick” breads since they are leavened with baking powder or baking soda and cream of tartar. They may be plain, but often have a wide variety of sweet or savory ingredients. Scones should be golden on the outside and tender and flaky inside, like a slightly sweetened biscuit.

### Technology Assignment:

#### Butter Web Quest:

See how butter is made, quality factors and how to prepare it yourself at <http://webexhibits.org/butter/>

Great Baking Techniques at [www.landolakes.com](http://www.landolakes.com)

More links at The Butter Institute. [www.butterinstitute.org](http://www.butterinstitute.org)

**More Scone How-tos:** [www.bettycrocker.com](http://www.bettycrocker.com)

Click Baking Basics; Tips & Techniques

**Quick Breads**  
are classified by  
types of batter.

**Pour batter:**  
Pancakes, waffles,  
cornbread

**Drop batter:**  
Muffins, drop biscuits,  
loaf-style quick breads

**Soft dough:**  
Scones, rolled & cut  
biscuits

### Teacher Review:

- Terms and Techniques for “cutting” butter into flour  
(view on *Bakers Dozen Lessons* [www.homebaking.org](http://www.homebaking.org))
- Quick Bread ingredients and their functions (Power Point *Flout to Table*)

**Flour:** Less gluten development in scones and biscuits is desirable

- Use an enriched all-purpose or pastry flour—bleached or unbleached
- Part whole wheat flour may be used, pastry, all-purpose or whole wheat
- Medium protein is best, 10.5-11.0%
- Self-rising flour may be used—if so, omit the leavening and salt
- Less than 25% of the flour might be non-wheat flour such as oatmeal, cornmeal, sorghum, soy or another flour to vary flavor and texture

**Fat:** “Shortens” the flour—slows the gluten from developing; makes the dough “short” or tender; increases keeping quality, and keeps the product from sticking. Fats used may be

- Butter offers the best flavor
- Lard will provide the best “keeping” qualities
- Margarine and shortening are used to save dollars
- Vegetable oils will not “cut in” or shorten the flour
- Good ratio: 5 tablespoons to 2 cups all-purpose unbleached flour

**Liquids:** The liquid used will help make the scones light through steam and if the liquid used is acidic, it will react with the leavening.

- May be cream, buttermilk, yogurt, water, juice, fruit juice

**Leavening:** The leavening in scones is typically double acting baking powder and steam, but scones may also use some baking soda to offset acidic ingredients, such as buttermilk, lemon, yogurt, and sour cream. Sometimes cream of tartar and baking soda will be used. (1 teaspoon baking powder is approx  $\frac{1}{4}$  teaspoon soda +  $\frac{1}{2}$  teaspoon cream of tartar). Review leavening in the Glossary. Too much leavening will make a loose, crumbly product and too little produces a heavy one.

- Self-rising flour contains the leavening and is often used for scones (especially in Europe).

**Sugars:** Granulated sugar is typically used, ranging from none to  $\frac{1}{2}$  cup for sweet scones. Sugar adds sweetness, tenderizes, and aids browning and a fine texture. Molasses, brown sugar, maple syrup, or honey may occasionally be used in a drop scone and will make the scone more cake-like.

**Eggs:** May be added for a more cake-like scone that's typically dropped from a spoon. Sometimes scones will be glazed (brushed) with beaten egg, giving them a browner crust.

**Spices or flavorings:** Spices, citrus peel, herbs, vanilla or other flavorings, added for variety

- 2 to 3 tablespoons fresh herbs (or 1 teaspoon dried), snipped chives or scallions, may all be added to a savory scone dough—grated cheeses may also be added.
- Grated citrus peel, 2 teaspoons per 2 cups flour; 1 to 2 teaspoons ginger, cinnamon, grated nutmeg, cardamom, mace or other sweet spices

**Options:**  $\frac{1}{2}$  to 1 cup chopped nuts (pre-toasted are best), chopped fresh or dried fruits, and chocolate pieces

**Oven temperature:** A hot to very hot oven (425 to 450°F.) immediately turns moisture to steam and makes for a higher, brown-crusted scone. Baking scones at a lower temperature will produce a dense or heavy scone.

#### Teacher Supplies:

- Grated citrus peel, 2 teaspoons per 2 cups flour; 1 to 2 teaspoons ginger, cinnamon, grated nutmeg, cardamom, mace or other sweet spices
- Unbleached enriched all-purpose flour (enough for all to use the same flour)
- **Refrigerated fats** (so all fat is the same temperature) salted butter, margarine, vegetable shortening, vegetable oil, 65% fat stick spread, and lard
- Large eggs, sugar, salt, baking powder, fresh oranges, mandarin oranges (drained), milk
- Variety of ingredient options listed in Designer Scones lab.
- Pastry cutters or food processor; sheet pans; parchment pan liner (optional)

"**Quick breads** can be savory or sweet, and depending on the type of recipe, some are best served warm from the oven with others at room temperature. However, all recipes are made from similar and readily available ingredients but in different proportions: flour, usually all-purpose, chemical leaveners such as baking powder and baking soda, stick or melted butter, lard, shortening or oil, sugar, a liquid, usually milk and sometimes egg(s). Quick breads contain fat, butter and eggs, but it is proportionately less than in a cake. While a yeasted bread gets its flavor from yeast fermentation, quick-bread recipes get theirs from the ingredients, such as specialty flours, extracts, fruits, cocoa powder, nuts, chocolate chips, peanut butter and spices, to name a few. Generally quick batters must be baked, fried or cooked immediately, taking a short time until done. They also need to be removed from the oven immediately when done and cannot cool in their pans or they'll get soggy."

Sarah Phillips on Quick Breads. [www.baking911.com](http://www.baking911.com)

**Ingredient Lab:** Compare the results when the fat is the variable in scones.

**Controls:**

- The fats used must be refrigerated (40 to 50°F.), not at room temperature or melted.
- All groups use the same flour: Enriched all-purpose, unbleached (Gold Medal, Hudson Cream Short Patent, Pillsbury, W-R Mill, Hodgson Mill), at room temperature (65-75°F.)
- Use the standard recipe and method for each group. For best comparison, weigh the flour and any ingredients over 1 tablespoon.

**Variables:**

Group One: Salted butter

Group Two: Substitute margarine (80% fat—will be labeled as margarine)

Group Three: Substitute shortening

Group Four: Substitute vegetable oil (also refrigerated)

Group Five: Substitute 65% fat “baking” spread (sold in sticks)

Group Six: Substitute lard

**Ingredient Lab Recipe: Double Orange Scones** Makes 8 scones.

**Ingredient**      **Measure**

Ingredient	Measure	Weight
Unbleached all-purpose flour	2 cups	8.2 oz. (230g)
Baking powder	1 tablespoon	0.5 oz. (15g)
Granulated sugar	3 tablespoons	1.33oz. (38g)
Fresh grated orange zest (peel)	2 teaspoons	0.14 oz (4g)
Salt	¼ teaspoon	0.05 oz (1.5g)
Cold butter (40°F)	4 tablespoons	2 oz. (56g)
Drained mandarin oranges	½ cup	3.5 oz. (98g)
Large egg, beaten	1	1.75 oz. (50g)
Milk or cream	1/3 cup	2.75 oz
Egg white, beaten*	1	1 oz. (30g)
Sugar	1 tablespoon	0.44 oz. (12g)

**Nutrition Facts**

Serving Size (78g)	
Servings Per Container	
Amount Per Serving	
Calories 200	Calories from Fat 60
	% Daily Value*
Total Fat 7g	10%
Saturated Fat 4g	20%
Cholesterol 45mg	14%
Sodium 360mg	15%
Total Carbohydrate 30g	10%
Dietary Fiber 1g	4%
Sugars 8g	
Protein 5g	
Vitamin A 8% • Vitamin C 8%	
Calcium 6% • Iron 8%	
*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 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4	

**Method:**

- Preheat oven to 425°F. Lightly coat cookie sheet with cooking spray.
- In a large bowl, combine flour, baking powder, 3 tablespoons sugar, and grated orange zest; mix well with a wire whisk.
- Using a pastry blender OR a food processor (12, 1-second pulses), cut the cold butter into the flour mixture until it resembles coarse meal.
- Stir in the oranges, egg, and milk just until the dough begins to form a ball (leaves the side of the bowl).
- Turn dough onto a lightly floured surface and knead lightly 10 times—about 10 seconds. (Use just enough flour on counter so dough doesn't stick; form a rough, slightly sticky ball.)
- Place the dough ball on the greased cookie sheet and using hands, pat into an evenly shaped 8-inch circle. With sharp dough cutter, cut into 8 wedges, separating slightly. Brush the top of the scones with the beaten egg white\* and sprinkle with 1 tablespoon sugar.
- Bake 12-15 minutes or until the scone tops are golden brown. Immediately remove to a wire rack to cool for 10 minutes. Serve warm or at room temperature.

**Source:** Kansas Wheat Commission. [www.kswheat.com](http://www.kswheat.com)



## Evaluating Scones

As each group completes their test bake, have students place their scones on a plate for the class to evaluate, using the following rubric:

### Scone Lab Rubric

Type of fat in scone: \_\_\_\_\_

	Acceptable	Okay	Needs Improvement
Top and bottom crust	Even brownness Not burned or pale	Edges browned	Very pale Greasy or doughy appearance Brown on only top or bottom
Volume	Doubled in height	Raised somewhat	Same height
Interior crumb	Flaky, tender	Moist and not too dry to eat	Dense, wet, crumbly or doughy Oily or greasy
Flavor	Rich, a little sweet Wheaty, pleasant	Pleasant flavor	Too much oil or fat flavor Coats mouth; unpleasant
Keeping quality after 1 day	Still flavorful Good aroma/flavor Still moist	Edible but not best Somewhat moist	Crumbly or off flavor; fat flavor Dry

## Baking Lab: Designer Scones

We know consumers have many different food preferences! Finding scones to suit all the clientele at home, or in a coffee or tea shop means several options would be a great idea.

Use the Double Orange Scone recipe above and the following variations to create several choices that will please customers.

### Variations:

1. **Whole Grain Scones:** Use half (1 cup/4oz.) whole wheat flour (from white wheat, if possible, for sweeter flavor).
2. **Wheat n' Oats Scones:** Omit orange ingredients and egg. Use  $\frac{1}{2}$  cup rolled oats (2 oz.) and  $1\frac{1}{2}$  (6 oz.) cups all-purpose flour. Omit baking powder. Use 1 teaspoon baking soda (1/6 oz.) and 2 tsp. (1/4 oz.) cream of tartar. Use 6 tablespoons (3 oz.) butter. Use  $\frac{1}{2}$  cup milk (4 oz.).
3. **Currant Cream Scones:** Omit egg and orange ingredients. Use 1 cup (8.5 oz) Half and Half or cream. Add  $\frac{1}{2}$  cup dried currants OR raisins (chopped is desired). Stir in the fruit just before adding the Half and Half.  
Glaze: Brush with cream and sprinkle with 1 tablespoon sugar before baking.

**4. Lemon Cornmeal Scones:** Omit orange ingredients.

Oven temperature: 400°F.

Topping: 2 tablespoons sugar, 1 tsp. grated lemon peel

Use 1 ½ cups all-purpose flour, ½ cup cornmeal. Reduce sugar to 2 tablespoons (1/8 cup). Use 4 teaspoons baking powder (1/2 oz.). Add 2 teaspoons fresh grated lemon peel (zest). Use 6 tablespoons (3 oz.) butter. Add 2 beaten eggs and 1/3 cup Half and Half. Sprinkle with topping and cut into wedges, but DO NOT SEPARATE wedges.



Lemon Cornmeal Scone,  
Land O' Lakes

Visit [www.landolakes.com](http://www.landolakes.com) for more scone baking tips and techniques.

(Click on Promotions, *Baking Basics* brochure, Click Download to view brochure).

**5. Lemon Cranberry Cornmeal Scones:** Prepare #4, but stir in ½ cup sweetened dried cranberries after blending dry ingredients.

**6. Toasted Pecan Scones:** On cookie sheet, lightly toast ½ cup chopped pecans in preheated 325 °F. oven. Shake the cookie sheet after about 5 minutes of toasting. Toast 7-10 minutes. Cool nuts before adding to mixture.

Prepare variation #2, 3, or 4 scones—omit currants, add nuts with the flour mixture.

**7. Honey Wheat n' Oat Scones:** Prepare #2, substituting honey for granulated sugar. Stir the honey into the milk, reducing the milk to ¼ cup.

**8. Ginger Scones:** Prepare #3; substitute ½ cup chopped crystallized ginger for the currants.

**Use the Rubric** to evaluate each product's resulting quality. When you have a winning product, you're ready for the next steps—costing, labeling, finding your “price point” (what the consumer will pay for your product) and creating a market!

**Critical Thinking Corner:**

Discuss some of the baking science that produces an excellent or inferior product.

Review portions of Baking Terms & Techniques—gluten, baking soda, baking powder, oven temperature with the students to explain what made the difference between the scones.

**1. What is the difference between vegetable oil, margarine, butter and shortening? (A:** butter and margarine are 20% water/whey—more liquid added to the dough). What differences might this extra liquid make? **(A:** The scones made with butter or margarine would have more liquid and might be moister; flavor from butter is considered premium; cold butter should make the scones flaky. Vegetable oil would not cut into the flour and make it flaky—it would soak into it, and might then taste greasy or be crumbly. Shortening would have less flavor, but should make a flaky texture.)

**2. Why is it important for the fat to be cold and not too warm or melted? (A:** If warm, it cannot shorten or make flaky layers with the flour. It will cause the flour to be greasy instead.)

**3. Would the scone be flakier if the flour were refrigerated too? (A** good idea to test out!)

**4. Why wouldn't bread flour be a good choice for scones? (A:** Too much protein—it would be more absorbent than all-purpose and make the scones dry; the gluten would develop too much and make the scones tough)

**5. Which scone did you prefer and why? (All consumers will not like the same characteristics!)**

**6. If the scones do not rise very much, what might be the cause(s)? (A:** Scones cut with a dull knife will compress the edges and less rise occurs; too low an oven setting—an oven that is not preheated or very hot won't have the heat needed for steam to help raise the scone; old leavening.)

## Consumer Marketing Lab:

Before you sell a product, or decide if baking is cost-effective, you will want to “cost” the product.

### How much did the scone dough cost to make?

1. Teacher: Record the cost of each item used in the scone recipes.
2. For the ingredients in your scone, note how many ounces, cups, teaspoons etc. are in each package and how much you used.
3. Divide the total package cost by the number of cups, ounces, Tbsp. in the package (unit cost). Multiply how many units you used X cost/unit.

Ex: If there are 20 cups of flour per 5 lb. package; \$1.89 per package. Flour cost is \$0.095 cents per cup X 2 cups used=\$0.19.

Ingredient	Cost per unit (package)	Cost per recipe (cup, oz., tsp, Tbsp)
All purpose flour	_____	_____
Butter _____	_____	_____
Milk or cream	_____	_____
Leavening	_____	_____
Salt	_____	_____
Fat _____	_____	_____
Egg, large	_____	_____
Other _____	_____	_____
Other _____	_____	_____
<b>Total cost for one recipe, 8 scones</b>	\$ _____	

One scone costs \_\_\_\_\_ to make.

What other “overhead” costs do you have that need to be paid for?

(Students may suggest packaging, electricity, insurance, and/or employee labor)

How much does a local bakery or coffee place charge per scone? \$ \_\_\_\_\_

What would you like to charge per scone? (Consider at least a 4X mark up, maybe more)  
\$ \_\_\_\_\_

Would your customers be willing to pay this much? (This is called the consumer “price point”)  
\_\_\_\_yes \_\_\_\_no Why will they pay it, or why not?



### Community Service Learning

Coffee houses originated in Mecca in the 15<sup>th</sup> century. In the colonies, they were a place where our leaders gathered to discuss politics and plans. Later, coffee houses provided a stage for literature, music, drama and fellowship.

Recreate a coffee house to showcase the talents of your baking labs AND the students in your school.

#### Provide a stage for:

Drama club one-act plays  
Student, faculty or local author readings  
Jazz band or school ensembles  
Guitar, piano or vocalists  
Feature excerpts from great new books and local comedy

Raise funds for FCS or a local concern with the admissions and selling coffee, tea and baked goods.

More @ [www.homebaking.org](http://www.homebaking.org),  
2002 FCS Educator award winning program, Java Den. Click on Educator Resources

**Before you open shop:**

**You should conduct a consumer product taste test to determine which scones will sell. (Use A Matter of Taste form below for taste tests).**

**Once the Taste forms are tallied and the top-ranked scones are selected, prepare the following label information:**

- A product name for the scone to “sell” it.
  - An ingredient label listing the ingredients from the largest to the smallest amounts.
  - A Nutrition Facts Label for each new scone. Use ESHA II or your class’s software to calculate the nutrition information.
  - List any selling points for the label, such as “whole grain,” “made with butter”
  - Tech Option: Computer design a package label or table-top sales flyer for your product.
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### **A Matter of Taste**

Product Tasted: \_\_\_\_\_ Age/Grade: \_\_\_\_\_ Date: \_\_\_\_\_

I think the food tastes:

very good  good  okay but not my favorite  needs improvement

The food tastes:  sweet  bitter  salty  sour  not what I expected  just right

The color is:  great  too pale  too dark  not right for the product

The aroma (smell) is:  too strong  too weak  just right  not good

The food looks:  yummy  okay  not good

I would enjoy eating this food again.  yes  no  maybe

Comments:

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## **References and Resources:**

**Bake and Take Day.** (Annually the fourth Saturday of March). Deliver hot scones to people you know who live alone. Take time to visit over a scone and a cup of tea, cocoa or coffee. Learn more at [www.bakeandtakeday.org](http://www.bakeandtakeday.org) for prizes and recognition.

**Bakers Dozen Lessons for Better Baking.** DVD and Web-site resources. Home Baking Association. 2005. 13 baking lessons for educators (ingredient, terms and techniques).

[www.homebaking.org](http://www.homebaking.org)

Segments: Fats, Flours and Chemical Leavening offer illustrations related to scones.

Consider submitting your group's successful scone recipe(s) at [www.homebaking.org](http://www.homebaking.org)

**Baking Basics.** Land O' Lakes. Visit [www.landolakes.com](http://www.landolakes.com) for more scone baking tips and techniques. Click on Promotions, *Baking Basics* brochure, Click Download to view brochure

**Baking 911.** Phillips, Sarah. [www.baking911.com](http://www.baking911.com)

**Baking with Julia.** Greenspan, Dorie. 1996. A La Carte Communications. William Morrow and Company, NY, NY.

**Biscuits and Scones.** Alston, Elizabeth. 1988. Clarkson N. Potter, Inc. NY, NY.

**Bread Bakers Guild Extras.** Explore the History and Making of Butter.

Visit <http://webexhibits.org/butter>

**Cook's Illustrated** magazine. "Baking Basics." September/October, 2003. pp16-17. OR, visit

[www.cooksillustrated.com](http://www.cooksillustrated.com) Click on Illustrated How-tos and Baking Basics.

**Kansas Wheat Commission.** [www.kswheat.com](http://www.kswheat.com)

**Quick Breads, Soups and Stews.** Gubser, Mary. 1991. Council Oaks Books. Tulsa, OK.

**Wheat Foods Council.** Learn more about the nutritional value of wheat and grain foods.

[www.wheatfoods.org](http://www.wheatfoods.org)