Nasco Education

LESSON PLAN

FCS

Developed with Delaine Stendahl, Home Baking Association Educator Award Winner, FCS and Health Sciences Instructor

Eggs – A culinary tool

Volume 69 | Gr. 9–12

Materials list:

- Aprons
- Hair restraints
- Liquid measuring cups
- Dry measuring cups
- Measuring spoons
- Custard cups
- Rubber scrapers
- Stainless steel bowls
- Disher, size 24 (for portioning batter into the standard size 12-receptacle muffin tin)
- Muffin tin (size can vary but the size of the disher would need to be adjusted)
- Potholders
- Cooling rack
- Food thermometer
- Butter knife
- Saucepan
- Whisk
- Stand mixer
- 9" x 5" loaf pan
- "Best loved blueberry muffins" recipe (p. 3)
- "Power of eggs" worksheet (p. 4)
- "Power of eggs" answer key (p. 5)

Resource List:

- *Alton Brown's "The Egg Files 1"* from Food Network; available on YouTube
- Baking Food Safety 101 (p. 6–7)
- Baking glossary: eggs (p. 8)
- Measure UP! worksheet (p. 9)
- Measure UP! answer key (p. 10)
- Level headed measuring (p. 11)
- Scoop, spoon, scale baking activity (p. 12)

National FCS Standards

8.2 Demonstrate food safety and sanitation procedures.

8.2.5 Practice good personal hygiene/health procedures, including dental health and weight management and report symptoms of illness.

8.2.7 Demonstrate safe food handling and preparation techniques that prevent cross contamination from potentially hazardous foods, between raw and ready-to-eat foods, and between animal and fish sources and other food products.

8.5 Demonstrate professional food preparation methods and techniques for all menu categories to produce a variety of food products that meet customer needs.

8.5.3 Utilize weights and measurement tools to demonstrate knowledge of portion control and proper scaling and measurement techniques.

Summary of the Baking Lesson:

These lessons are used in a Food Science & Nutrition courses for students in grades 9–12. The lessons focus on the use of eggs in baking and the multiple roles eggs play in food preparation. It addresses the scientific role of eggs in recipes.

The function of eggs as a culinary ingredient in this lesson include eggs as a...

- Binding agent (coagulant) in muffins and pound cake.
- Emulsifier in the production of pound cake.
- Thickener and texture agent in preparing lemon curd as topping on pound cake.

Students are able to see the direct application of science concepts through the production of the food products.

Objectives

Students will...

- Practice personal hygiene, sanitation, and safety in the lab
- Use communication, problem solving, and teamwork skills to prepare a simple recipe
- Identify proper measuring tools and measure ingredients correctly
- Identify the scientific role of eggs in the production of various food products
- Utilize food safety knowledge to ensure products reach appropriate temperatures to prevent food borne illness

Day 1– Introduction to eggs and their function in food preparation

Introduction (5–10 minutes)

Set the stage by cracking an egg on a small dessert dish or in a bowl. Instruct the students on the parts of the egg. Eggs can be found in most every recipe we bake. What is the reason for including eggs in a recipe? Possible responses: To add nutrients, to help hold ingredients together, to emulsify, to improve texture, to insulate, and to leaven.

Activity 1

- Introduce *The Egg Files I* (from Food Network) to students as a resource to show how eggs are an important part of a recipe, proper methods of tempering eggs, etc.
- Follow up the video with discussion of the worksheet (p. 4).

Closure (5 minutes)

After the video finishes, ask for responses on one thing they learned that day.

Day 2– Muffin lab for eggs as a coagulant/binding agent

Introduction (3–5 minutes)

Announce lab teams. Quick reminders of lab procedures, time frame for preparation and clean up, etc.

Activity (35–40 minutes until the end of class)

1. Students prepare for lab — hair restraint, apron, hand washing.
2. Students work as a team to measure and prepare their muffins.
3. Students place muffins in oven and set timer. While baking, students clean up kitchen.
4. Remove muffins from oven when done, cool, and package in paper sacks for transport.
5. Teacher conducts inspection of kitchens for lab dismissal.

Day 3– Demonstration of eggs as an emulsifier and texture agent

Introduction (5–8 minutes)

Teacher announces the demonstration on eggs as an emulsifying agent and texture agent through an interactive demonstration.

Students will wash up and help with the demonstration, making it possible to complete both pound cake and lemon curd in one class period.

Activity (35–40 minutes until the end of class)

1. Students prepare for demonstration lab with hair restraint, apron, hand washing.
2. Students assigned to measure and/or prepare ingredients for the two recipes and bring to demonstration table.
3. Students will also assist with mixing cake, and cooking the lemon curd as teacher directs each student to assist.
4. Everyone helps to clean up the kitchen.

Discussion points during the interactive lab demonstration:

- Cover Home Baking Food Safety 101: taking temperatures/doneness/ never eat raw batter from bowl or spoon.
- Key concepts discussed by teacher include baking food safety, emulsify, tempering of eggs.

Time management goal: To get both recipes prepared, with cake in the oven and the lemon curd prepared and put in a bowl, covered and refrigerated. Both products will be sampled the following day in class.

Recipe: Best loved blueberry muffins (p. 3). The recipe can be altered using ⅔ cup whole wheat flour and 1⅓ cups of all-purpose flour in place of the 2 cups all-purpose flour.

Extra Baking Science Lab: Check out the science of egg-free baking using Kitchen Science: Baking for Special Needs (green pp. 13–15). Conduct a test-kitchen sensory comparison between a control muffin recipe baked with egg and those baked with an egg-substitute using A matter of taste evaluation and Baking science evaluation (p. 16).

Best loved blueberry muffins

Nothing is better than the extra special treat of homemade muffins.

Prep time: 15 minutes
Baking time: 22 minutes
Makes 1 dozen muffins

Ingredients

Muffins

- 1 cup milk; ½ cup Land O Lakes® butter, melted
- 1 egg, slightly beaten
- 2 cups all-purpose flour
- ⅓ cup sugar
- 1 tsp. salt
- 1 cup fresh or frozen blueberries

Topping

- ¼ cup Land O Lakes® butter, melted
- ¼ cup sugar

Preparation:

Heat oven to 375°F. Combine milk, ½ cup butter and egg in large bowl. Add all remaining muffin ingredients except blueberries. Stir just until flour is moistened. Gently stir in blueberries. Spoon butter into 12 greased paper-lined muffin cups. Bake for 22–25 minutes or until golden brown. Cool slightly; remove from pan. Dip tops of muffins in ¼ cup melted butter, then in sugar.

Tricks of the trade: Store muffins in covered container up to 3 days or freeze in airtight containers up to 3 months.

Nutrition analysis: 1 muffin provides 240 calories, 4 g protein, 15 g carbohydrates, 1 g dietary fiber, 13 g fat, 50 mg cholesterol, and 230 mg sodium.

Variations:

- Lemon blueberry muffins: Stir in 1 tbsp. grated lemon peel with the flour.
- Raspberry-white chocolate chip muffins: Substitute 1 cup fresh or frozen raspberries for blueberries. Gently stir in ½ cup white baking chips with the raspberries.

Power of eggs — **worksheet**

Volume 69

Name _____ **Score** _____**/44**

Eggs have potent powers in the culinary world. Here is your opportunity to show what you know.

1. What are the 2 main functions of the eggshell? **2 pts.**

2. **True or False**? The steps to keeping food safe from bacteria include Clean, Chill, Cook, and Separate. (Circle the correct response.) **1 pt.**

3. What is the candling process? What is looked for during the candling process? **3 pts.**

4. Name the 3 grades of eggs. **3 pts.**

5. What is the difference between each grade of egg? **3 pts.**

6. Why does the lowest grade of egg have a yolk that moves around so much? **2 pts.**

7. What is the best way to store eggs and why? **5 pts.**

8. What is an epidemiologist? **2 pts.**

9. What advice is given regarding the consumption of eggs that are undercooked? **2 pts**.
   How can you be sure the food is safe to eat when baked? **1 pt.**

10. How can you tell a cooked egg from a raw egg? **2 pts.**

11. What is the proper way to crack an egg and why? **2 pts.**

12. How much liquid should be added per egg when making scrambled eggs? **2 pts.**

13. What is the impact of salt on an egg? **1 pt.**

14. What happens when you use high heat for too long when making scrambled eggs? **2 pts.**

15. Why should you "retreat from the heat" before the eggs are completely done? **2 pts.**

16. Complete the following statement: "If it looks cooked in the pan, it will be _____ on the plate." **1 pt.**

17. Why might you want to use lemon zest in a recipe? **2 pts.**

18. What is the meaning of the term "nappe"? **2 pts.**

19. Why should you use an ice bath with hard cooked eggs? **2 pts.**

20. What temperature should baked products and lemon curd reach to ensure food safety? Why? **2 pts.**

Power of eggs — **answer key**

Eggs have potent powers in the culinary world. Here is your opportunity to show what you know.

1. What are the 2 main functions of the eggshell? **2 pts.**
   Food and shelter.
2. True or False? The steps to keeping food safe from bacteria include Clean, Chill, Cook, and Separate. (Circle the correct response.) **1 pt.**
   True
3. What is the candling process? What is looked for during the candling process? **3 pts.**
   Candling is the process of checking eggs against a light for imperfections – blood spots, hairline fractures, overlarge air sacs, etc.
4. Name the 3 grades of eggs. **3 pts.**
   AA, A, B
5. What is the difference between each grad of egg? **3 pts.**
   Freshness, thickness of the yolk, movement of the yolk.
6. Why does the lowest grade of egg have a yolk that moves around so much? **2 pts.**
   The whites are thinned out from age.
7. What is the best way to store eggs and why? **5 pts.**
   In carton, rubber-banded, and set on side in refrigerator.
8. What is an epidemiologist? **2 pts.**
   A specialist in the study of food-born illness.
9. What advice is given regarding the consumption of eggs that are undercooked? **2 pts**.
   Elderly, expectant mothers, young, and immunocompromised should avoid undercooked eggs.
   How can you be sure the food is safe to eat when baked? **1 pt.**
   One should check all foods with a food thermometer to ensure it is fully cooked.
10. How can you tell a cooked egg from a raw egg? **2 pts.**
    When spun and stopped, raw continues to move, cooked stops.
11. What is the proper way to crack an egg and why? **2 pts.**
    On flat surface, avoid shell in mixture.
12. How much liquid should be added per egg when making scrambled eggs? **2 pts.**
    1 tbsp.
13. What is the impact of salt on an egg? **1 pt.**
    Causes the egg to toughen.
14. What happens when you use high heat for too long when making scrambled eggs? **2 pts.**
    The water is wrung out of the egg.
15. Why should you "retreat from the heat" before the eggs are completely done? **2 pts.**
    The eggs will continue to cook by the time they are served.
16. Complete the following statement: "If it looks cooked in the pan, it will be ____**overcooked**____ on the plate." **1 pt.**
17. Why might you want to use lemon zest in a recipe? **2 pts.**
    To intensify the flavors and add phytochemicals to the food.
18. What is the meaning of the term,"nappe"? **2 pts.**
    It refers the thickness of the mixture; when the back of a spoon is coated with the misture, and you take your finger and run it through the mixture on the spoon, and it does not run back together.
19. Why should you use an ice bath with hard cooked eggs? **2 pts.**
    To prevent the eggs from overcooking – it will stop the cooking process.
20. What temperature should baked products and lemon curd reach to ensure food safety? Why? **2 pts.**
    160°F (curd, custards, flan, quiche) and up to 200°–209°F for cakes, quick breads, pecan pie, etc.

Home Baking Food Safety 101

Prepared by Sharon Davis, Family & Consumer Sciences Education, HomeBaking.org

The many benefits of baking at home, in the community or in the classroom include and rely on the science and math of food safety—cleanliness, time, measurement, and temperatures.

Step One: Review Partnership for Food Safety Education's "Core Four" http://www.fightbac.org/food-safety-basics/the-core-four-practices/

Step Two: Apply following ***home baking*** food safety practices

CLEAN: Replace kitchen cloths, towels daily; change baking mitts or hot pads after use and launder. Sanitize sponges daily.

Before baking, in this order:

- Tie back or cover long hair, remove jewelry
- Wash hands with warm water and soap
  Pictorial guide: http://www.homebaking.org/PDF/how_to_wash.pdf
- Put on a clean apron…clothes carry dirt from where you've been
- Wash counters; assemble ingredients/tools needed for recipe
- Re-wash hands as needed before you measure, mix or portion

After mixing, while products bake:

- Scrape batter/dough from mixing tools/bowls into trash
- Wash counters, appliance surfaces, tools in warm soapy water
- Wash hands before *packaging* cooled products
- Transfer flour and meal from store bags into clean food-safe containers
- Do not re-use plastic bags raw meat has been stored in--
  store baked goods in clean, food-safe packaging

SEPARATE: Follow storage and use rules for fresh eggs, egg substitutes and all perishable baking ingredients.
http://www.foodsafety.gov/keep/charts/eggstorage.html

- Shell eggs in a separate small bowl to avoid a broken eggshell in the batter
- Keep bowls and utensils used for eggs or mixing raw batter or dough separate from dry ingredients and dry measuring tools
- Chop/dice nuts, fruits or veggies for baking on cutting board reserved for ready-to-eat foods
- Place wire cooling racks on a clean counter away from where batter or dough are mixed

For More Great Food Safety resources…

Partnership for Food Safety Education, www.fightbac.org

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Home Baking Food Safety 101

BAKE/COOK: Food safety experts agree that foods are properly cooked or baked when they are heated for a long enough time and at a high enough temperature to kill harmful bacteria that cause food borne illness.

➔*Never consumer unbaked (raw) ingredients, dough or batter. Salmonella and E. Coli are not a treat—skip tasting raw batter or dough or licking spoons, beaters or the mixing bowl.*

- Check to be sure product is done at center
- Brown crust color does not mean the product is done.
- Use a wooden pick to test product at center of pancakes, muffins, quick breads, and cakes for raw batter. Pick should come out with a few crumbs clinging to it, not wet batter.
- Oven-baked products: place food thermometer probe *at center* of product— wait until temperature maintains level on dial
- Product browned but not done? Lightly lay foil over crust to prevent over browning, continue baking product until center reaches internal temperature desired.

- **Egg wash glazes**:
  Prepare egg wash and apply ***just before*** placing product in heated oven; refrigerate egg wash if you will use within two hours, then discard.

Internal Temperature Guide: Use a probe food thermometer…temp at center

150 degrees F.
Cheese cakes—remove from oven to avoid cracking; temperature will rise

160 degrees F.
Quiche, meringue pies
Bread pudding, flan
Baked custard
Molten chocolate cake

165 degrees F.
Stuffing & casseroles
Leftovers; chocolate cream pie
Meat or poultry pot pies

170-175 degrees F.
Custard pies, flan,
Crème brulee', fruit pies

190 to 210 degrees F.
Yeast breads
Soft rolls-190 degrees F.
Crusty bread-210 degrees F.

200-209 degrees F.
Most cakes, cupcakes, quick breads, scones, pecan pie

Credit: Internal Temperatures, WhatscookingAmerica.net

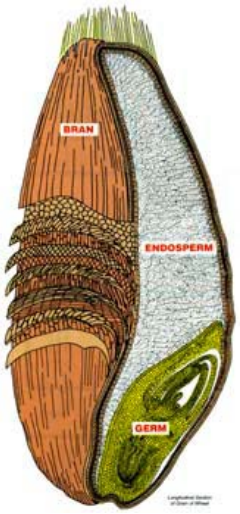
CHILL: Keep refrigerator at 40 degrees F. or below with room for cool air to circulate.

- Refrigerate perishable ingredients, pies, cheese-filled breads or baked goods with perishable filling ingredients (eggs, custards, cheese, pizza, meats, casseroles, cream pies, puddings, crème puffs) – refrigerate within two hours of use, preparation or serving at room temperature
- Refrigerate custard, cream or egg fillings, batters, and dough if not baked within 2 hours. Cookie, scone, biscuit, pie and yeasted dough may all be refrigerated or frozen for later use-
- Learn more, Dough Sculpting 101 Tips and Techniques http://www.homebaking.org/PDF/doughsculpting101online.pdf
- Cool products on clean wire cooling racks, not in pans or on counter tops
  - Yeast breads, unless filled with perishable ingredients, should be stored 1 to 2 days at room temperature or frozen, NOT refrigerated
  - More Storage at-a-Glance information at http://www.homebaking.org/Lab13a.pdf

HOME BAKING ASSOCIATION
HomeBaking.org

Prepared by Sharon Davis, Family & Consumer Sciences Education, HomeBaking.org

Baking glossary



Kernel of Wheat
www.wheatfoods.org

All-purpose flour: Wheat flour milled from hard wheat or a blend of soft and hard wheat. Used in homes for some yeast and quick breads, cakes, cookies, pastries, and noodles. All-purpose flour may be whole wheat, bleached or unbleached, and enriched with four vitamins (niacin, riboflavin, folic acid, and thiamin) and iron.

Bran: The outer layers of a kernel of grain that lie just below the hull. Whole grain flour is about 14.5% bran. Bran adds dietary fiber, multiple nutrients, and antioxidants.

Degerminated: To remove the germ portion of a grain kernel, leaving bran and/or endosperm.

Eggs: In home baking, neither the shell color nor the grade of egg matter. The size standard recipes call for large unless stated otherwise. Eggs perform many functions – leavening, binding, thickening, coating or glazing, emulsifying, moisturizing or drying, and adding color, flavor, and nutrients to the finished product. Eggs also may be used to retard crystallization in some frosting.

Emulsify, emulsifier: An ingredient such as an egg that, when beaten with two non-mixing ingredients like oil and vinegar, will hold them in a suspension so they do not separate.

Endosperm: The starch granules in grain embedded in gluten-forming proteins from which flour or meal is produced. 80–85% of a wheat kernel is endosperm. (See kernel of wheat illustration at right.)

Flour: Flour is a major ingredient in most baked goods. Although wheat flours are the most common and often essential flour to a product's quality, flour may be produced from many kinds of grains, potatoes, legumes, beans, and seeds. Example: Flour may be made from amaranth, brown or white rice, buckwheat, corn, oats, spelt, teff, quinoa, rye, sorghum, soybeans, and more. View grain milling at www.namamillers.org.

Food label: The label on food products with specific information required by the Food and Drug Administration such as Nutrition Facts, an ingredient list, the manufacturer, net weight, and dates. For more about Food Labeling go to www.fda.gov.

Granola: Cereal mixture of toasted rolled oats, barley, or other grains, plus dried fruits, seeds, nuts, and sweeteners.

Gluten: A protein found in wheat and other cereal flours that form the structure of the bread dough. It holds the carbon dioxide (CO2) produced by the yeast and expands during fermentation. Gluten is developed when flour is combined with water and liquids, mixed, and kneaded. It provides the elasticity and extensibility (stretch) in bread dough. Glutenin and gliadin form gluten.

Gluten-free: Grains, meal, mixes, or flours that do not contain gluten or the components of gluten, the peptides glutenin and gliadin. Some gluten-free grains or flours include amaranth, rice, corn, milo, sorghum, soy, and potato. For a complete list visit the Celiac Sprue Association's website at www.csaceliacs.org. For additional gluten-free baking resources and ingredients go to www.argostarch.com, www.bettycrocker.com, www.bobsredmill.com, www.foodallergy.org/recipes, www.hodgsonmill.com, www.homebaking.org, www.kingarthurflour.com, www.landolakes.com, www.rabbitcreekgourmet.com, www.redstaryeast.com, www.wheatfoods.org.

Ingredient list: Ingredients making up a food and appearing on a food label in order, most to least.

Net weight: The weight of the contents in a package, excluding the packaging weight; the edible portion's weight.

Preheat: Heating an empty oven to the recommended temperature before placing the product to be baked in it.

Serving: A specific amount of food adequate for nutrition management and health. Serving sizes vary and guidelines are offered on recipes or the Nutrition Facts Label.

Whole grain: Using rolled or milled whole kernels of any grain (such as barley, corn, oats, wheat, rice, rye, sorghum, etc.) in a food. A food must be 51% or more whole grain to carry a whole grain label and may contain 8 g (½ serving), 16 g (1 serving) or more whole grain. Currently a minimum of 3 servings or 48 g whole grain is recommended. More resources at: www.bellinstitute.com, www.wheatfoods.org, and www.wholegrainscouncil.org

Whole wheat flour: Flour produced from the whole kernel of wheat—bran, germ and endosperm. Whole wheat flour is made from six classes of soft or hard wheat that may be red or white wheat varieties. Whole wheat flour may be coarsely to very finely milled. Whole wheat flour may also be labeled stone ground or graham flour.

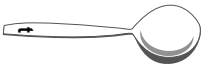
Source: Home Baking Association Glossary, www.homebaking.org

Measure UP! — **worksheet**

Name _____ **Date** _____ **Class** _____

Baking requires the most accurate measurements possible so the product turns out the same each time. Scales are most accurate. It is always best to use the fewest number of measuring steps or units possible for the most accuracy. EXAMPLE: It is more accurate to measure ¾ cup flour with ½ cup + ¼ cup (I+K) than it is to use ¼ + ¼ + ¼ (K+K+K). Also, it's best to measure liquids with a liquid cup unless the recipe calls for less than 4 tablespoons (¼ cup).

A. tablespoon



B. teaspoon

C. ½ teaspoon

D. ¼ teaspoon

E. electronic scale

F. liquid measuring cup

G. hand

H. 1 cup

I. ½ cup

J. ⅓ cup

K. ¼ cup

L. ⅛ cup

Directions:
For each ingredient listed, write in the blank the combination of letters you would use for the BEST way to measure that ingredient. In some cases, two answers may work. List all the best options. Use the Measurement Guide for equivalents and abbreviation help.

1. _____ 1 cup sugar
2. _____ 1 large egg
3. _____ 1½ tablespoons oil
4. _____ 4 tablespoons oil
5. _____ 2¼ teaspoons dry yeast
6. _____ ⅔ cup cornmeal
7. _____ 2 tablespoons corn starch
8. _____ dash nutmeg
9. _____ 4 tablespoons corn syrup
10. _____ 1 lb. powdered sugar
11. _____ 1 medium zucchini
12. _____ ½ cup moist raisins
13. _____ 3 tablespoons flax meal
14. _____ 3 teaspoons baking powder
15. _____ ½ cup butter/4 oz.
16. _____ 1½ cups (6 oz.) grated cheese
17. _____ 1 pkg. (7 g) active dry yeast
18. _____ 3 medium apples (1 lb.)
19. _____ 1, 11-oz. spice muffin mix
20. _____ ¾ teaspoon ground cinnamon
21. _____ ½ cup baking cocoa
22. _____ 8 oz. cheddar cheese
23. _____ 1, 15-oz. can pumpkin
24. _____ 1, 12-oz. pkg. chocolate chips
25. _____ ⅓ cup brown sugar
26. _____ 6 oz. water
27. _____ ¾ cup baking mix
28. _____ 2 tablespoons butter
29. _____ 2 egg whites/2 oz.
30. _____ 115 g pastry flour
31. _____ ⅓ cup oil
32. _____ a pinch of salt
33. _____ ¾ cup milk
34. _____ 1 cup applesauce
35. _____ 4 cups (312 g) rolled oats
36. _____ ⅓ tablespoon baking soda

Measure UP! — **answer key**

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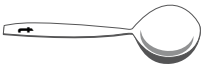
Name _____ **Date** _____ **Class** _____

Baking requires the most accurate measurements possible so the product turns out the same each time. Scales are most accurate. It is always best to use the fewest number of measuring steps or units possible for the most accuracy. EXAMPLE: It is more accurate to measure ¾ cup flour with ½ cup + ¼ cup (I+K) than it is to use ¼ + ¼ + ¼ (K+K+K). Also, it's best to measure liquids with a liquid cup unless the recipe calls for less than 4 tablespoons (¼ cup).

A. tablespoon



B. teaspoon

C. ½ teaspoon

D. ¼ teaspoon

E. electronic scale

F. liquid measuring cup

G. hand

H. 1 cup

I. ½ cup

J. ⅓ cup

K. ¼ cup

L. ⅛ cup

Directions:
For each ingredient listed, write in the blank the combination of letters you would use for the BEST way to measure that ingredient. In some cases, two answers may work. List all the best options. Use the Measurement Guide for equivalents and abbreviation help.

1.	**H**	1 cup sugar	13.	**L+A**	3 tablespoons flax meal	25.	**J**	⅓ cup brown sugar
2.	**G**	1 large egg	14.	**A**	3 teaspoons baking powder	26.	**F**	6 oz. water
3.	**A+B+C**	1½ tablespoons oil	15.	**G (1 stick)**	½ cup butter/4 oz.	27.	**I+K**	¾ cup baking mix
4.	**F (¼ cup)**	4 tablespoons oil	16.	**E or H+I**	1½ cups (6 oz.) grated cheese	28.	**G**	2 tablespoons butter
5.	**B+B+D or G**	2¼ teaspoons dry yeast	17.	**G or E**	1 pkg. (7 g) active dry yeast	29.	**G or E**	2 egg whites/2 oz.
6.	**J+J**	⅔ cup cornmeal	18.	**G or E**	3 medium apples (1 lb.)	30.	**E**	115 g pastry flour
7.	**L**	2 tablespoons corn starch	19.	**G**	1, 11-oz. spice muffin mix	31.	**F**	⅓ cup oil
8.	**G**	dash nutmeg	20.	**C+D**	¾ teaspoon ground cinnamon	32.	**G**	a pinch of salt
9.	**F (¼ cup)**	4 tablespoons corn syrup	21.	**I**	½ cup baking cocoa	33.	**F**	¾ cup milk
10.	**E**	1 lb. powdered sugar	22.	**E**	8 oz. cheddar cheese	34.	**F or H**	1 cup applesauce
11.	**G**	1 medium zucchini	23.	**G or E**	1, 15-oz. can pumpkin	35.	**E**	4 cups (312 g) rolled oats
12.	**I**	½ cup moist raisins	24.	**G**	1, 12-oz. pkg. chocolate chips	36.	**B**	⅓ tablespoon baking soda

Activity: Level headed on liquids

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Subject: Baking Measurements

Activity: Level Headed on Liquids. Get comfortable accurately measuring liquids

Resources required: Three, 2-cup liquid measuring cups; one1-cup dry measuring cup; colored water

Introduction: Groove two good habits for liquid measurement: Set the liquid measure on a level surface to view amount and avoid using dry measuring cups

Directions: Compare the results achieved when liquids are measured using three different commonly used methods.

Beaker/cup #1: Measure 2 cups colored water in a liquid measuring cup placed on a flat surface and viewed at eye level (Test kitchen method)

Beaker/cup #2: Hold the second measuring cup in hand and measure 2 cups; set down on counter next to first beaker/cup. Do not adjust.

Beaker/cup #3: Fill a 1 cup dry measuring cup until it is just ready to overflow. Pour into the third 2-cup liquid beaker/cup. Repeat to measure "2 cups"

Evaluate results: How much difference is there? (May need to use measuring spoons to add or remove water until levels are the same to determine.) How much difference can 1 tablespoon more or less than the recipe make? (A: 1 tablespoon extra liquid can collapse a cake, quick bread or bread machine bread)

Critical Thinking: Why are grated carrots, sweet potato, banana and apples considered liquids in baking? (A: They are all over 80% water!)

HBA Resource: A Bakers Dozen Labs, Lab #9. HomeBaking.org

BAKING 5 MINUTE ACTIVITIES

Activity: Scoop, spoon, scale

Subject: Baking Measurements

Activity: Scoop, Spoon, Scale — Compare and evaluate dry measuring methods for accuracy.

Resources Required: One 5-lb bag flour—half left in bag, half in large bowl
Stirring spoon; straight-edged scraper; electronic scale; mixing bowl
Two, 1-cup dry measuring cups; one, 1-cup liquid measuring cup

Introduction: To get the same great product each time, how you measure matters. Compare and evaluate dry ingredient measuring methods for accuracy and impact on results.

Directions: Have three volunteers each measure 1 cup of the same flour, each using a different method. Weigh each cup of flour in a zero-balanced bowl on the scale.

Volunteer #1: Large bowl, spoon: Stir flour with spoon to loosen; lightly spoon flour into the 1-cup dry measuring cup until heaping full. Level off the flour using straight edge.
Volunteer #2: Scoop flour out of bag with 1-cup dry measuring cup; shake to "level"
Volunteer #3: Large bowl: Scoop flour with 1-cup liquid measuring cup, shake to level

Evaluate: What are the differences in weights between the three methods? What method do test kitchens and professional bakers use? (A: Method #1 and/or scales; 1 cup all-purpose or whole wheat flour = 4.25 oz)

Extra Minute? How much extra flour will you have if you use the method to measure 3 cups flour for bread? How will the extra flour impact the recipe's result? (A: heavy, dry, crumbly)

View "How to Measure Flour" 1-minute video at HomeBaking.org Glossary, Flour.

BAKING 5- MINUTE ACTIVITIES

Kitchen Science: Baking for Special Needs

Prepared/tested by Sharon Davis, Family & Consumer Sciences Education, www.homebaking.org

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Experience "test-kitchen" science in classrooms or out-of-school programs! Use griddles, waffle irons, ovens or skillets!

- Do-It-Yourself (DIY) baking is part of an "active lifestyle," burning 125+ calories per half hour of shopping, *mis en place* preps, mixing and clean-up!
- DIY baking helps meet the needs of a variety of "customers."
- Choose ingredient adaptations and use with almost any favorite recipe to meet a special need–reduced sodium; adding whole grains, fruits or veggies, nuts, potassium; ingredient allergies. (See example recipe, p.2.)

1) View or print control recipe, Orange Raisin Nut Bread, website *www.calraisins.org/recipe/orange-raisin-nut-bread* Bake this prize winning recipe as the control product. Note: Flavors and moisture will improve if bread/muffins are sampled the day after baking the bread.

2) Assign each baking scientist or team one substitution ***(variable)*** to test for customer acceptability. Label each product with a number and variable being tested. Insert a paper strip with the variable number written on it. Place paper between batter and pan side before baking begins.

Substitution (variable) **options**

- **Reduce sodium.** Help achieve the recommended 2300mg sodium per day. See how recipe tastes as "low sodium" (140mg or less per serving)
  - Use unsalted butter for salted butter
  - Reduce salt to 1/8 teaspoon
  - Add 1 teaspoon favorite dry spice or 1 tablespoon orange/lemon zest when reducing salt
  - For 1 cup buttermilk, use 1 cup yogurt OR mix 1 tablespoons lemon juice or vinegar + milk to equal 1 cup
- **Ingredient allergies.** (Choose ONE as a variable.)
  - **Egg** – substitute for 1 large egg = ¼ cup soft tofu OR 1 tablespoon flax meal + 3 tablespoons water
  - **Lactose or casein** – substitute plain, unflavored almond, soy or rice milk for dairy milk, sour as recipe directs
  - **Wheat** – substitute a gluten-free flour blend for the whole wheat and all-purpose flours.

  Gluten-Free Flour Blend – 2 cups brown rice flour, 2/3 cup potato starch, 1/3 cup tapioca flour, 1 teaspoon xanthan gum, mix well with whisk or mixer wire whip. Makes 3 cups. (Recipe courtesy of www.landolakes.com.) For more information read ***More About Food Allergies***, and visit Glossary, Gluten-free, *www.homebaking.org*.

- **Boost protein and heart healthy fats.** Include toasted, unsalted nuts or seeds (soy, pepitas, sunflower, sesame)
- **Agave nectar sweetener.** 2/3 cup agave nectar for 1 cup brown sugar; reduce liquid by ¼ cup (more about agave nectar at *www.candhsugar.com* and *www.dominosugar.com*)
- **Add moisture, flavor and boost nutrients.** Choose ONE. Add with liquids: ½ cup grated carrots, apple or zucchini, canned pumpkin OR mashed, cooked sweet potato
- **Low fat.**
  - For 1 cup buttermilk, use 1 cup low fat yogurt OR 1 tablespoon lemon juice or vinegar + low fat milk to equal 1 cup

Flour Variables

- **Make it whole grain.** Switch half to ¾ of the flour in the recipe to whole wheat flour – whole white wheat flour will provide a lighter color, milder taste
- **Add grain variety.** Replace 1/4 cup wheat flour with 1/4 cup of a non-wheat whole grain flour or meal. Options include: cornmeal, oatmeal, flax meal OR barley, brown rice, quinoa, sorghum, soy or spelt flour

3) Copy *A Matter of Taste* Evaluation form for consumer taste-test. (For best flavor, sample product the day after baking.) Tally the results for each product. Calculate the percentages for each category. (Ex: 15 of 25 marked product was "just right" – 15 ÷ 25 = 60%) (*Note: A 60% or higher positive response in a category is an acceptable customer rating. A lower % of acceptance means the product will not "sell," improvement needed.)*

4) Provide *Baking Science Lab Variations Evaluation* to each team. Record assessments of each product variable for texture, moisture, tenderness, flavor, color.

- Have teams discuss their observations during preparation, baking, and sampling.
- Based on their **Lab Variations Evaluation** and consumer *Matter of Taste* responses, have them target what needs to improve (rankings below 60%) and how they may improve the product. (Ex: add/reduce liquid; increase/reduce oven temperature; shorter/longer bake time).

5) Pricing and Value. Bring or assign participants to find prices for specialty muffins or mixes at local supermarkets, bakeries, coffee houses.

- List all the ingredient costs and have labs total their costs for each lab recipe.
- How many muffins did your lab make? Divide total ingredient cost by number of muffins.
- Compare your muffin costs with commercial muffin prices. How much would you charge for one of your muffins at a coffee house? Six muffins?
- You may compare cost of your lab's dry ingredient mixture weight with the cost of a commercial muffin/quick bread mix. Compare the same net oz/gm weight of mix.

6) Portion Size, Nutrient Comparisons. Discussion:

1. One ounce is considered one grain serving. How many grain servings are in one lab muffin?
2. How do the lab muffins compare in weight/size to commercially baked muffins?
   (View or assign Portion Distortion Quiz, www.nhlbi.gov). What are several results of super-sizing?
3. How do sodium, fat, total calories, sugars and nutrients compare? Does this muffin qualify for "low sodium" labeling? Whole grain label? (See www.wholegrainscouncil.org)
4. What are the benefits for baking these products at home? How would you market them?

7) Share the Wealth!

- Sample your product with a local baker, food service, child care or coffee house to see if one of these specialty products could be served or sold to their customers.
- Demonstrate your new knowledge and products for a local food pantry, after-school club or child care center.
- Sell your products at a bake sale fundraiser. Promote each unique product if "low sodium" or "whole grain" or for an allergy.

Supporting Sites and Resources

California Raisin Board - www.loveyourraisins.com
Choose My Plate - www.choosemyplate.gov
C and H or Domino Sugar/Agave nectar
www.chsugar.com www.dominosugar.com
Home Baking Association - www.homebaking.org
Glossary/guides/links
DIY Baking Channel, how-to demo, cornbread
A Baker's Dozen Labs Manual
Baker's Dozen DVD
Land O'Lakes Test Kitchens - www.landolakes.com
Portion Distortion - www.hp2010.nhlbihin.net/portion
Wheat Foods Council - www.wheatfoods.org
Whole Grains Council - www.wholegrainscouncil.org

Nutrition Facts:
One of 14 pieces (3oz/85g) provides: Calories 263; 5g protein; 42g total carbohydrates (17g sugars, 14g starch, 4g dietary fiber); 9g total fat (3g sat. fat, 0g trans fat); 10mg cholesterol; 130mg sodium; 198mg potassium; Vit. A (15%) 813IU; Calcium (6%) 51mg; Vit. C (4%) 2mg; Vit. D 7IU; Folate 15mcg; Iron (8%) 1.6mg; Omega 3 fatty acids, 1g; Omega 6 fatty acids, 3g

Whole Grain Orange Raisin Nut Muffins or Bread

Makes 14 medium muffins (3oz/85g) or 1 large loaf (14 slices)

Ingredients

1 ½ cups (180g) whole wheat flour
½ cup (60g) all-purpose flour
¼ cup (33g) whole yellow cornmeal OR wheat germ OR oatmeal
1 ½ teaspoons (6g) baking powder
1 teaspoon (4.5g) baking soda
1/8 to ¼ teaspoon (3g) salt
1 cup (220g) firmly-packed brown sugar OR 2/3 cup (224g) dark agave nectar*
½ cup grated carrot OR apple OR cooked sweet potato OR pumpkin
1 large egg OR 1 tablespoon (6.5g) flax meal + 3 tablespoons water (mix; let stand 5 minutes)
1 cup buttermilk OR yogurt OR 1 tablespoon lemon juice + 1% milk to equal 1 cup sour milk (mix; let stand)
¼ cup (2oz/56g) melted unsalted butter
1 tablespoon (6g) grated orange peel
1 teaspoon vanilla
1 cup (160g) conditioned California raisins**
1 cup (117g) toasted, chopped nuts OR unsalted seeds (pumpkin pepitas, sunflower, or soy nuts)

**Reduce milk ¼ cup if using agave nectar*
***Cover raisins with water or orange juice, then drain*

Directions

1. Preheat oven to 350° F for loaf or 400° for muffins. Lightly grease 9 x 5 x 2 ½ inch loaf pan OR grease bottoms or line 14 muffin cups.
2. In a large mixing bowl, measure or weigh the first six dry ingredients. Blend well with whisk.
3. In a second bowl whisk to blend well the sugar or agave nectar, grated carrot, egg/egg substitute, milk, melted butter, orange peel and vanilla.
4. Add conditioned raisins and nuts or seeds to dry mixture. Make a large dip in the center of the mix; add liquid mixture. Stir together only until all the ingredients are moistened.
5. Scoop batter into prepared loaf pan or muffin cups (filling 2/3 full). Bake loaf 45 to 50 minutes at 350° F or muffins 18 to 20 minutes at 400° F. Cool pan 5 minutes on wire rack.
6. Turn loaf or muffins onto rack to cool, then wrap. Store one day at room temperature or freeze.

(Nutrition facts based on first ingredient in this recipe.)

More About Food Allergies

For Teacher:

Download resources about food allergies from the Newsletter archives of *Food Insight*. The International Food Information Council (IFIC) Foundation provides science-based information on health, nutrition and food safety for the public good. Sign up for *Food Insight* online newsletter at www.ific.org.

"Myths and Facts About Food Allergy"

Myth: Lots of people have food allergies.
Reality: Daryl Altman, M.D., American College of Allergy, Asthma and Immunology/Allergy Information Services: "In surveys, nearly one-in-three American adults indicate they are allergic to some foods. In reality, two percent of the population is food allergic. Food allergies should be diagnosed by a board-certified allergist.

Children are most susceptible to food allergy – up to five percent have some type of food allergy. Common allergens such as milk and eggs may be outgrown by age five.

90% of serious allergic reactions to food are from eight foods: peanuts, tree nuts, dairy, soy, wheat, eggs, fish and shellfish. (*Food Insight* newsletter archives, search Food Allergies, Nov/Dec 1997-2012.)

Myth: Any negative reaction to food is a food allergy.
Reality: Food allergy is a very specific reaction involving the immune system of the body. Food allergies are rare, food intolerances or sensitivities are more common. An intolerance, like lactose (milk sugar) intolerance, may result in a bloated feeling or gas after consuming milk or dairy products. Milk allergy can have life-threatening consequences. It is important to have a board-certified allergist diagnose a food allergy so it can be managed, and so foods essential to your health are not unnecessarily avoided.

Myth: A food allergy means I'll just get a runny nose.
Reality: No – food allergy is rare but is a serious condition. Food allergy is a reaction of the body's immune system to a certain component, usually a protein, in a food or ingredient.

Reactions are mild – vomiting, diarrhea, skin rashes and runny nose, sneezing or coughing, within hours or days after eating – to serious, such as a reaction called anaphylaxis, occurring within seconds, minutes or hours of eating. Anaphylaxis causes hives, swelling, choking, severe vomiting and even shock. Food-allergic persons who may have anaphylaxis reaction should have an emergency plan in place with teachers, schools, friends.

Celiac Disease – Celiac disease is a hereditary autoimmune disease where gluten adversely affects the small intestine, as well as contributes numerous other symptoms that vary among people. It is a lifelong, sometimes fatal disease, and those affected must avoid wheat, rye and barley. It estimated to affect approximately 1 percent of the U.S. population and many go undiagnosed. Blood tests can be done although they are not 100% accurate. An intestinal biopsy is the gold standard for detecting celiac disease.

Gluten-Sensitivity – although there are no tests for gluten-sensitivity, sufferers often have the same symptoms as those with celiac disease except their small intestine is not damaged. Approximately 6% of Americans are thought to be gluten-sensitive and must avoid wheat, barley and rye forever.

Wheat-Allergic people have an IgE-mediated response to wheat protein (not necessarily the gluten portion). These individuals must only avoid wheat, and not other grains. Most children who are allergic outgrow the allergy.

Bake a Gluten-Free Waffle

Visit www.argostarch.com for a crisp gluten-free waffle. Choose from 1 of 5 gluten-free variations (Banana, Cornmeal, Plain, Lemon-Blueberry, Pumpkin).

Important Food Allergy Resources

National Institute of Allergy and Infectious Diseases (NIAID)
View 2011 food allergy management practices and guidelines.
www.niaid.nih.gov/topics/foodallergy/clinical/pages/default.aspx
The American Academy of Allergy, Asthma and Immunology
(1-800-822-2762) www.aaaai.org
Celiac Sprue Association, Gluten-Free guidance (1-877-CSA-4CSA)
www.csaceliacs.org
Food Allergy Network (1-800-929-4040) www.foodallergy.org
International Food Information Council *Food Insight*,
www.foodinsight.org
Home Baking Association, Glossary, www.homebaking.org

A *MATTER OF TASTE* Evaluation

Product name: _____ Age/Grade :_____ Date: _____

The food tasted: _____ very good _____ good _____ okay, but not my favorite _____ needs improvement

The food tasted: _____ 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 product is: _____ too moist _____ moist _____ dry _____ crumbly

The food looks: _____ yummy _____ okay _____ not quite there yet

I would enjoy eating this food again: _____ yes _____ no _____ maybe

Comments:

_____

_____

_____

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Baking Science Lab Variations Evaluation

VARIATION	TEXTURE	TENDERNESS	AROMA	FLAVOR	COLOR
LAB 1 original					
LAB 2 _____					
LAB 3 _____					
LAB 4 _____					
LAB 5 _____					
LAB 6 _____					