Grades 8 & Above

# FOODMASTER

## Using Food to Teach Math and Science Skills

### GENERAL SCIENCE EDITION


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FoodMASTER

www.foodmaster.org

Food, Mathematics And Science Teaching Enhancement Resource Initiative

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***This book is dedicated to all teachers that selflessly give so much every day.***

*We wish to thank family, friends, co-workers and teachers who have provided much love, support and feedback.*

*— Virginia Stage, Mary White, Ashley Roseno, and Melani W. Duffrin*

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
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The Science Education Partnership Award (SEPA) was created to improve K-12 health sciences education and to create public awareness of life sciences. SEPA brings educators, media experts, community leaders, and biomedical and behavior scientists together in partnerships to design and disseminate innovative K-12 science programs. SEPA is administered by the National Center for Research Resources, a component of the National Institutes of Health.

The Food, Math, and Science Teaching Enhancement Resource (FoodMASTER) initiative received five years of SEPA-Phase funding to develop the FoodMASTER Middle curriculum and to investigate its impact. Fourteen classrooms in Eastern North Carolina participated in the pilot program. Initial results showed promise for using food as a tool to teach science to students grades 8 and above.

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**Find additional teacher resources at www.foodmaster.org under Grades 6–8.**

# FOODMASTER MIDDLE

## A food and science activity book for grades 6-8

### BACKGROUND

FoodMASTER (Food, Math and Science Teaching Enhancement Resource) is a compilation of programs aimed at using food as a tool to teach mathematics and science. It is our theory that if food is used as a tool to teach mathematics and science, students will be better prepared to demonstrate and apply mathematic and scientific knowledge. Because students encounter food on a daily basis, they have preexisting contextual experiences preparing them for learning new and relevant mathematics and science material.

Food is conducive to hands-on, active learning that uses multiple senses to engage students in the learning process. Utilizing food allows for an interdisciplinary approach to learning concepts and ideas in a variety of scientific subjects like general science, biology, chemistry, microbiology, nutrition, and health. Additionally, food labs are a dynamic way to teach mathematical concepts such as numbers and operations, algebra, geometry, measurement, and problem solving.

The knowledge and skill development that can be inspired by the FoodMASTER approach is limitless. Proper use of measurement tools, data collection and interpretation, application and generalization, classification and organization, graphing and comparative analysis, understanding chemical changes, observing functions of ingredients and controlling variables, pricing, critical thinking, self-directed learning, and team building are only a few of the potential knowledge and skill development areas for middle grade students experiencing FoodMASTER's scientific inquiry labs.

### INTRODUCTION

Welcome to the FoodMASTER Middle science program! The curriculum contained in this packet was developed by FoodMASTER with funding from the National Institutes of Health: Science Education Partnership Award to present middle grade students with ten basic topics in foods. Each topic area includes hands-on lab investigations to take your students on an exciting and innovative exploration of food and science. These engaging labs will have your students developing skills and thinking about learning in a new fashion that is fun and exciting for everyone involved. For each lesson in this manual you will find a summary of the unit, objectives, science content standards addressed, background content information, materials needed, and a suggested instruction plan including teacher tips and answer keys.

The student workbook pages are designed to be student friendly and easy for both teachers and students to follow. Teachers are encouraged to read through the labs ahead of time and decide on the best format (teacher-directed, small groups, or individual) for completing each lab with their students. The chosen method of implementation may vary depending on the amount of time, equipment and supplies, and number of classroom adult supervisors available, as well as safety considerations and learner needs.

Each of the ten FoodMASTER Middle student chapters includes a brief introduction, one to three hands-on lab investigations, and a health-related investigation. Reading introductions introduce students to new vocabulary words and engage students in the unit topic. Students will develop science inquiry and problem solving skills using real food to complete "Food Exploration" lab investigations. A flexible and creative classroom atmosphere will enhance the hands-on curriculum.

## WHAT IT TAKES TO BE A FOODMASTER

Are you enthusiastic enough to be a FoodMASTER? The hands-on FoodMASTER activities in this book take the commitment of a special teacher who is willing to take the extra time to bring food and supplies into the classroom. It also requires that teachers manage their classrooms in a more open fashion that they may not be comfortable with. However, if you desire to see science come to life for your students, you will find this method very enjoyable, rewarding, and satisfying. Teachers desiring food based activities with less mess and time commitment may choose the computer aided format or combined format. Either way, you will be filled with satisfaction when you see students applying real-life science in the classroom and you hear students share their stories of food lab cooking at home.

We hope that you will find the materials packet easy to use and that it provides you with the information you need to convey food and science concepts and knowledge to students in your class with ease and simple preparation. If you are interested in becoming more knowledgeable about other FoodMASTER materials, please visit www.foodmaster.org for more information.

## FOOD SAFETY NOTE

It is very important for you to follow and model good food safety behaviors! Your students will learn proper food safety practices in Chapter 2 of the curriculum. You will need to continue to reinforce good sanitation practices throughout the curriculum. Please be sure to remind students to never eat foods until they are instructed, and be sure students have washed their hands before preparing or eating foods. Never serve raw or undercooked meats or eggs, unpasteurized milk, spoiled foods, or expired foods. For lab investigations involving eggs, try buying eggs pasteurized in their shells.

Keep your classroom safe by thoroughly washing all kitchen utensils, supplies, equipment, counters, desktops and sinks. You should also maintain a Material Safety Data Sheet (MSDS) for all chemicals and cleaning supplies used or stored in the classroom. Cleaning supplies and sharp objects, such as paring knives and can openers, should be safely stored away for teacher use only. Keep dry food items safely stored in tight containers and perishable items stored in a refrigerator or in a cooler with ice for short periods of time.

Finally, be aware of any food allergies or intolerances. Students with food allergies could have mild to severe reactions if they taste, touch, or, in some cases, even smell their food allergen. Modify activities, when needed, to prevent allergic reactions and consider providing an appropriate alternate snack for students with food allergies or intolerances.

# How to Use this Curriculum

Each unit in the FoodMASTER Middle science curriculum includes a lesson plan, materials list, and student pages with answers. Everything you need to complete a laboratory investigation is in one place. We recommend reviewing all materials before beginning the lesson.

## LESSON PLANS

A lesson plan provided for each chapter is available at foodmaster.org. Each includes the following:

**Lesson Focus:** This section provides a general outcome statement about the skills and/or knowledge students will obtain.

**Learning Description:** This section provides a general description of the lab investigation.

**Learning Objectives:** These highlight the knowledge and skills students should be able to demonstrate at the completion of the laboratory investigation.

**Academic Content Standards:** This section includes Next Generation Science Standards and Common Core Standards for Mathematics and Language Arts that can be addressed by implementing each laboratory investigation.

**Background Information:** This section includes any background content needed to implement the laboratory investigation. The information provides more detail than can be found in the student background to allow for a deeper understanding of the material.

**Materials:** This list includes materials needed to prepare the laboratory investigation for students based on 6 groups of 4-5 students, and a total class size of 30 students.

**Student Materials:** This list includes the materials needed for 1 group of 4-5 students.

**Teacher Pre-Lab Preparation:** All laboratory investigations require preparation in advance. This section provides a step-by-step plan for preparing the investigation.

**Suggested Instructional Plan:** This section provides detailed step-by-step information for completion of the laboratory investigation. Each lesson begins by practicing good food safety behavior (e.g. washing hands), then moving on by asking students to make content-based predictions. Additional information such as nutrition facts labels are also included in this section. Some investigations (especially *Investigating Your Health* investigations) may require this information for completion.

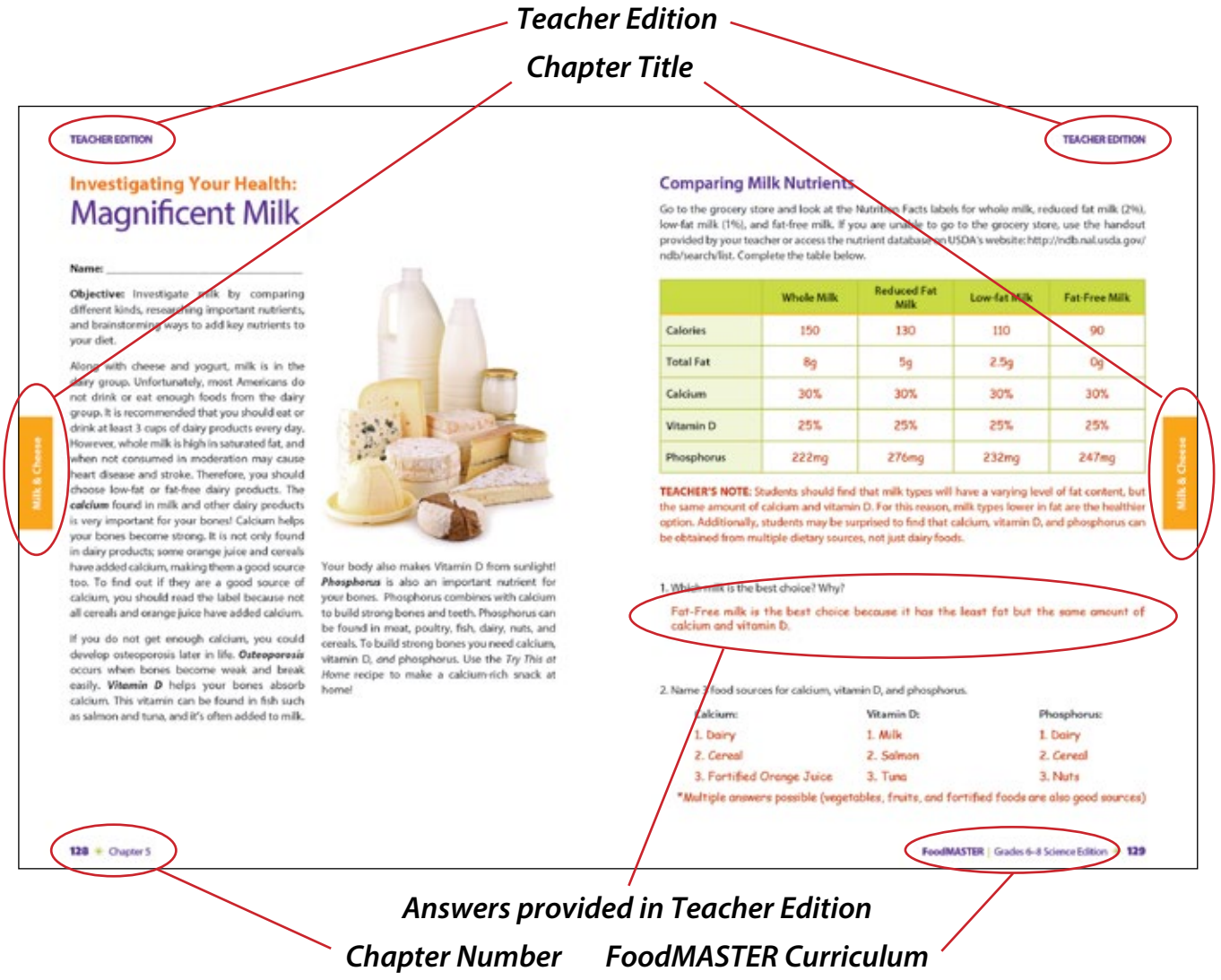
**Teacher Bites:** These lesson extensions provide an opportunity to extend the lesson for further investigation.

## TEXTBOOKS

The textbook is designed so you can quickly locate your place in the curriculum. Both student and teacher editions are available.

**Side Tab:** The chapter title is displaying in staggered, color-coded side bars.

**Footer:** Even pages indicate the chapter number and odd pages indicate the FoodMASTER curriculum.




## Lesson Format

Each chapter includes one to three hands-on *Food Exploration* laboratory investigations, one to two *Investigating Your Health* investigations, and the supporting supplemental materials. The chapter begins with an outline page providing basic information about the content covered in the chapter based on each laboratory investigation. The individual laboratory investigations include the lesson focus, lesson description, learning objectives, academic content standards, background information, material lists, teacher preparation, suggested instructional plan, and Teacher Bites (lesson extensions).

A **Teacher Edition** of the Student Textbook is also provided with expected results and correct answers by laboratory investigation. This edition is identified by "TEACHER EDITION" in the upper corners of each page. The Teacher Edition is available as a PDF with other online supplemental materials.

Each chapter begins with a student background and reading focus questions. The chapters are then broken up by laboratory investigations, which include a lab overview, lab objectives, lab safety, pre-lab question(s), materials, procedures, data entry pages, and conclusion questions.

**Background:** Each chapter begins with necessary background information to understand the concepts addressed in the chapter.

**Think About It Questions:** These questions require students to pull information from the background that will help them complete the investigation.

**Lab Overview:** This section provides students with a general description of the lab and the overall goals of the laboratory investigation.

**Lab Objectives:** This section provides students with lab investigation objectives.

**Lab Safety:** This section outlines the proper safety precautions that should be taken before and/or during the laboratory investigation.

**Lab Questions:** These questions require students to determine the result of the laboratory investigation based on their current knowledge.

**Materials:** This list provides students with the materials needed for their group to complete the laboratory investigation.

**Procedure:** This section provides students with step-by-step instructions on how to complete the laboratory investigation. Within these instructions, there may be areas where students can record findings as they work through the investigation.

**Data Entry Pages:** These pages typically provide tables or graphs for students to record and analyze the results.

**Conclusion:** These questions prompt students to make conclusions and connections based on the results.

## Investigating Your Health

Student health investigations will help your students relate scientific content learned in the lab-based investigations to their own personal health. Completion of these activities is important to student understanding of the application of science to real life. *Investigating Your Health* lessons were developed for students to complete as home-based investigations; however, each lesson can also easily be completed as an in-class activity as well.

These investigations are included with each chapter and encourage students to explore their environment. Each investigation includes an objective, background, instructions/questions, and a recipe.

**Objective:** These highlight the activities students will be completing during the investigation.

**Background:** This section provides students with a health-based connection of the content covered in the chapter. It provides basic nutrition and health information based on national recommendations.

**Instructions/Questions:** These questions prompt students to complete an action, such as comparing nutrition facts labels of specific foods and/or foods they commonly consume. They move through a series of question/instructions typically ending with a question about the better option based on their comparisons.

**Recipe:** The recipe is typically a healthy option for a food that could be connected with the chapter. For example, Chapter 1 includes a recipe for Oatmeal-Flax Chocolate Chip Cookies.

## DEMONSTRATION & REFERENCE MATERIALS

Each laboratory investigation includes teacher preparation slides, student demonstration slides, lab videos and any reference charts that may be needed to complete the investigation. All materials can be found at foodmaster.org.

### Pre-Lab Slides

**Teacher Presentation Slides:** This includes teacher presentation slides with step-by-step illustrations of the laboratory investigation as well as the expected results.

**Student Demonstration Slides:** Similar to the teacher preparation slides, only the student demonstration slides do not include answers. Videos are also included within these slides to help students understand how to complete the investigation.

### Demonstration Videos

"What to Expect" videos are available for each lab investigation and can be watched online at foodmaster.org. For some chapters, teacher lab preparation videos are also available.

### Reference Charts

The following reference charts are provided:

- Common Weights & Measurements Chart
- pH Color Chart
- Glucose Chart
- Amino Acid Color Chart

# Digital Curriculum & Materials

The full FoodMASTER curriculum, and other digital resources, are available at foodmaster.org, under Grades 6-8. You will find PDFs for the curriculum introduction, equipment and supply lists, glossary, and a program poster.

## Each curriculum chapter includes a PDF for:

- **Teacher Lesson Plan**
- **Teacher Edition Textbook**
- **Teacher Presentation Slides**
- **Student Textbook**
- **Student Demonstration Slides**

## VIDEOS & REFERENCE CHARTS BY CHAPTER

### Chapter 1: Weights & Measures

Student Pre-Lab Videos
- Lab I Video: What to Expect in Lab I
- Lab II Video: What to Expect in Lab II

Common Weights & Measures Chart

### Chapter 2: Food Safety

Student Pre-Lab Videos
- Teacher Demonstration Video: Boiling Water Method
- Lab I Video: What to Expect in Lab I
- Lab III Video: What to Expect in Lab III

### Chapter 3: Vegetables

Student Pre-Lab Videos
- Lab I Video: What to Expect in Lab I
- Lab II Video: What to Expect in Lab II

pH Indicator Chart

Red Cabbage & Apple Recipe

### Chapter 4: Fruits

Student Pre-Lab Videos
- Lab I Video: What to Expect in Lab I (Part A & B)
- Lab II Video: What to Expect in Lab II

### Chapter 5: Milk & Cheese

Student Pre-Lab Video
- Teacher Demonstration Video: Curdling Proteins
- Lab I Video: What to Expect in Lab I
- Lab II Video: What to Expect in Lab II
- Lab III Video: What to Expect in Lab III

Glucose Reference Color Chart

### Chapter 6: Meat, Fish, Poultry & Eggs

Teacher Preparation Video
- Lab II Video: Making Foam Muscles

Student Pre-Lab Videos
- Lab I Video: What to Expect in Lab I
- Lab III Videos: What to Expect in Lab III (Part A & B); How to Separate an Egg

Amino Acid Color Chart

### Chapter 7: Grains

Student Pre-Lab Videos
- Lab I Video: What to Expect in Lab I
- Lab II Video: What to Expect in Lab II
- Lab III Video: What to Expect in Lab III

### Chapter 8: Sugar

Student Pre-Lab Videos
- Teacher Demonstration Video: Saturated Solutions
- Lab I Video: What to Expect in Lab I
- Lab II Video: What to Expect in Lab II

Glucose Color Reference Chart

### Chapter 9: Fats & Oils

Student Pre-Lab Videos
- Teacher Demonstration Video: Melting Fats
- Lab I Video: What to Expect in Lab I
- Lab II Video: What to Expect in Lab II

### Chapter 10: Energy Balance

Student Pre-Lab Videos
- Lab I Video: What to Expect in Lab I

# Equipment and Supply List

Listed below is a complete list of equipment, supplies, and nonperishable foods you will need to complete all of the FoodMASTER Middle Science activities. Needs are based on classrooms with 24-30 students and assumes there will be 6 groups with 4-5 students per group. You may need to adjust for more or fewer students.

## EQUIPMENT AND SUPPLY PURCHASING

Equipment and supplies may be purchased in advance to eliminate multiple trips to the store. Before shopping for new equipment and supplies, check your classroom stock and school supply room. In the lists below, **bold** items are equipment and supplies that are considered "out of the ordinary" for a classroom setting and teachers will need to obtain these items. For budgeting purposes, if you purchase all of the **bold** items at reasonable prices, it would cost you approximately $500.00; however, most of these items can be reused every year.

## TIPS FOR OBTAINING EQUIPMENT, SUPPLIES, AND FOOD:

- Apply for small grants
- Ask for donations from your local retailers
- Shop around for sale items
- Check out garage sales or thrift stores for items in good shape (Be sure to thoroughly scrub and sanitize these items before use.)
- Watch for surplus items from school systems
- Include basic items on your classroom supply list
- Ask parents for donations
- Share equipment with family and consumer science classrooms
- Ask administration for support

When purchasing items, it is important to balance price verse quality. It is not necessary to purchase "top of the line" equipment and supplies, but it is important to make sure that the equipment quality is good enough to hold up from year to year to meet your activity needs. We will make some recommendations about items below to help guide your choices and make your purchasing process a little easier.

## Equipment:

**7 triple beam balance scales**
**7 kitchen timers or stopwatches**
**7 bimetallic stemmed thermometers**
**1 double burner hot plate**
**6 hand mixers**
**1 UV light (with Glo Germ™ gel)**

We recommend a medium quality double burner hot plate. Less expensive, basic, small hand mixers are usually the easiest for students to handle. Most likely, you will have to purchase a UV light and Glo Germ™ gel online, so plan ahead. Use search terms like Glo Germ™ gel and UV light to shop for the best price. Another option for the UV light and Glo Germ™ gel is to contact your local USDA Extension Agent and ask if they have the equipment. Your agent may allow you to borrow the equipment or may even come to your classroom to help deliver the food safety lesson. In addition, teachers with limited access to refrigerator space may add a small refrigerator to their "wish list."

## Cookware:

**1 medium pot**
**2 small saucepans**
**1, 4 quart pot (or larger)**
**3 to 4 large pots**

Ideally, clear pots with lids will be purchased. However, clear pots are often expensive and difficult to find. Purchasing a cooking set is the most cost effective option and will provide you all of the pots and pans you need. Look for a set that includes at least a large stock pot with lid, 2 saucepans with lids, and 2 frying pans. We recommend purchasing a stainless steel set that has clear lids, so your students will be able to look inside the pots.

## Bowls:

**7 dry measuring cups**
**6 sets of measuring spoons**
**7 medium bowls**
**2 medium plastic containers**
**7 liquid measuring cups**
**6 large bowls**
**12 small glass or steel bowls**

We recommend plastic measuring sets for safety and cost efficiency.

## Utensils:

**6 strainers (wide mesh)**
**tongs**
**6 whisks**
**6 funnels**
**2 wooden spoons**
**7 small strainers (very thin mesh)**
**1 paring knife**
**6 rubber spatulas**
**1 large spoon**

Any type/quality of utensils will do. Look for blunt table knives that are not sharp and spoons that will be easy for kids' hands to handle. You may consider purchasing a set of 24 forks, spoons, and knives.

In the long run, this will decrease costs and storage space needs associated with disposable items. However, using disposable forks, spoons, and knives will decrease cleanup time. Remember, you must keep the paring knife safely stored for adult use only.

## Other:

6, 100 mL graduated cylinders
6, 10 or 25 mL graduated cylinders
6 test tube racks
18 test tube labels
1, 50 mL graduated cylinder
6, 250 mL beakers
18 test tubes with stoppers (any size)
**1 pitcher**
**1 mortar and pestle (or metal spoon)**
**9 lactase enzyme pills**
**120 glucose test strips**
**2 medium or large coolers (20 oz or larger)**
**6 egg separators**
**1 glass or metal rod**
**1 empty soda can**
**1 cork**
**30 medium mason jars**
**6 tablecloths**
**1 oven mitt**
**7 cutting boards**
**6 glucose reference charts**
**1 box of aluminum foil squares**
**4 heavy-duty plastic bottles (8 oz or larger)**
**1 lighter**
**active culture sample**
**1 empty metal coffee can**
**1 dishtowel**
**6 hand juicers**
**6, ½" diameter foam tubular insulations**
**2 bottles of iodine (2.4% sodium iodide with 40% alcohol recommended)**
**1-2, 5' single colored cord channels (found at home improvement store)**
**24, 8" cable ties**
**48, 4" cable ties**

Any quality of equipment here will do as well. Jars with lids can be difficult to find if it is not canning season, so plan ahead. Egg separators can sometimes be hard to find as well. If you will be purchasing perishable food items and traveling a long distance to school, you may want to consider purchasing a cooler to keep foods safe. A cooler filled with ice can also keep foods safe in the classroom.

## Classroom Supplies:

6 microscopes
1 bottle of cell stain
30 calculators
1 pair scissors
12 reusable medicine droppers
30 sticky labels
6 rulers
colored pencils or markers
3, 50-count bags of rubber bands 7" x ⅛"
18 microscope slides
1 measuring tape
6 hand lenses (optional)
1 uncoated paper clip (any size)
6 dissecting needles, scalpels, or push pins
6 metric rulers
7 black permanent markers
**24 craft pipe cleaners**
**6 pH color charts**
**1056 colored pony beads (48 each of 22 different colors)**
**48 clear pony beads**

Hopefully, as a teacher, you will have many of these supplies already on hand. Try finding hand lenses at discount stores, in teacher catalogues, or on-line to get a good price.

### Disposable Items:

**6 paper towel rolls**
**34 plastic knives**
**42 plastic forks**
**59 plastic spoons**
**soap for handwashing**
**114 paper plates**
**1 roll wax paper**
**81 plastic sandwich bags**
**1 bottle dish detergent**
**6 small plastic bowls**
**24, 2 to 4 oz plastic cups**
**57 medium Styrofoam cups**
**26 small clear plastic cups**
**42, small Styrofoam cups**
**60 small paper cups**
**18 medium clear plastic cups (10 oz or greater)**
**60, 9 oz plastic cups**

Disposable supplies will need to be replaced every year. You may consider purchasing these items in bulk at a discount retailer or asking parents to donate some of these items to the classroom.

## FOOD PURCHASING

When purchasing food items, shop ahead for sales, clip coupons, or try discount food stores for better prices. To keep food purchasing as simple as possible, we recommend that you purchase all of your nonperishable food items before beginning FoodMASTER. Keep these items stored in tight containers and in a cool, dry storage area. To minimize the possibility of contamination, do not let students obtain their ingredients directly from the storage supplies. We suggest that you or another adult obtain all the ingredients needed for each lesson and set them out in bowls. Students may then gather supplies and measure from these bowls. We also recommend replacing nonperishable items on a regular basis (e.g. flour, sugar). Be sure to check expiration dates and label item purchase dates. For budgeting purposes, if you were to purchases all of the nonperishable food items at reasonable prices, it should cost you less than $100.00 per classroom per year.

## NONPERISHABLE FOOD SUPPLIES:

### Baking Products:

6 ½ cups all-purpose flour
1 small bottle olive oil
1 medium bottle vegetable oil
2 cups cake flour
2 pounds white granulated sugar
1 box baking soda
2 cups bread (wheat) flour

### Spices/Flavoring:

1 container salt
1 container of cream of tartar
2 tablespoons honey
2 tablespoons paprika
1 gallon vinegar
6 cups lemon juice
2 tablespoons ground mustard

### Other:

12 Vitamin C tablets
1 ½ cups 100% white grape juice
1 ½ cups 100% apple juice
1 bottle yellow food coloring

### Grains:

6 popcorn kernels

## PERISHABLE FOOD SUPPLIES:

### Fruits:

11 apples
33 oranges
3 bananas

### Vegetables:

1 head red cabbage
1 bag baby carrots
2 white onions
2 large heads of broccoli
3 bags romaine lettuce

### Bread:

9 slices white bread
3 slices whole-wheat bread

### Dairy:

1 small block of hard cheese
½ cup plain soy milk
1, 6 oz container plain yogurt with active cultures
4 cups whole milk
½ cup margarine
2 ½ cups skim milk
½ cup plain rice milk
2 cups lactose-free milk
3 quarts + 1 cup 2% milk
4 sticks butter (2 cups)

### Other:

1 large bag of ice
6 eggs
1 cup peanuts
1 container egg whites

# Equipment and Supplies Lists by Chapter

Listed below is a complete list of the raw materials, including perishable and nonperishable foods, you will need to complete FoodMASTER Middle science activities. Lists are based on 6 groups of 4-5 students (24-30 students total). It is suggested for each student to have safety goggles and an apron for every lab. The ***italic bold*** items represent perishable food items used in the lab. Refer to each lab to determine how materials are specifically used (e.g. teacher demonstration, student lab investigation).

## Chapter 1: Measurement

### LAB 1 – Mastering Measurements

***4 ½ cups all-purpose flour***
***3 cups cooking oil***
3 cups water
7 sets dry measuring cups
4 liquid measuring cups (1 cup measure or greater)
1 roll wax paper
3 plastic sandwich bags
6 plastic cups (10 oz. or greater)
3 strainers (wide mesh)
3 medium bowls
3 plastic knives
3 plastic spoons
3 graduated cylinders (100 mL)
6 triple beam balance or kitchen scales

### LAB 2 – Label Logic

***1 container salt***
***3 sticks butter***
***2 cups sugar***
***2 cups olive oil***
1 black permanent marker
54 small cups
6 sets of measuring spoons
6 triple beam balance or kitchen scales

## Chapter 2: Food Safety

### LAB 1 – Changing States

***6 cups ice***
6-7 cups water
1 hot plate or double burner
1 medium pot
1 oven mitt
12, 6 ounce Styrofoam cups
7 bimetallic stemmed thermometers
7 kitchen timers or stopwatches

### LAB 2 – Invisible Creatures

Access to warm water for washing hands
Soap for hand-washing
1 bottle Glo Germ™
1 UV light
Colored pencils or markers

### LAB 3 – Multiplying Organisms

***2 apples***
***6 slices white bread***
***1 small block of hard cheese (e.g. cheddar)***
6 paper plates
6 black permanent markers
6 plastic knives
6 plastic sandwich bags
6 microscopes (optional)
12-18 microscope slides (optional)

## Chapter 3: Vegetables

### LAB 1 – Exploring Acids & Bases

**PART A**

***1 head red cabbage***
***1 bottle vinegar (16 fl. oz.)***
***1 box baking soda***
3 ½ quarts water
12 – 9 oz. clear plastic cups
2 hot plates or 1 double burner
1 - 50 mL graduated cylinder or metric measuring cup
6 - 250 mL beakers or jars
6 - 100 mL graduated cylinders or metric measuring cups
1 tablespoon
1 black permanent marker
1 pitcher
1 - 2 large pots
12 plastic spoons
6 pH color charts

**PART B**

***Remaining red cabbage juice from Part A***
***1 bottle of vinegar from Part A***
***1 box of baking soda from Part A***
***1 container cream of tartar***
***1 container salt***
24 – 9 oz. clear plastic cups
1 – 50 mL graduated cylinder or metric measuring cup
1 teaspoon
1 black permanent marker
6 pH color charts

### LAB 2 – Cooking with Acids & Bases

***2 large heads broccoli***
***1 bag baby carrots***
***2 white onions***
***¼ cup baking soda***
***4 tablespoons vinegar***
1 cup water
2 hot plates or 1 double burner
1 tongs or large spoon
1 cutting board
1 knife
1 4-qt. pot (or larger)

## Chapter 3: Vegetables *(continued)*

18 plastic sandwich bags
6 black permanent markers
12 paper plates

**Lab Extension**

6 microscopes and slides with cover slips
cell stain
12 medicine droppers
6 plastic sandwich bags with very thin onion slices

## Chapter 4: Fruits

### LAB 1 – Enzymatic Reactions

**PART A**

***3 bananas***
***4 apples – Organic preferred***
***3 oranges***
7 cutting boards
19 plastic knives
24 paper plates
6 plastic sandwich bags
1 roll paper towels
6 kitchen timers or stopwatches

**PART B**

***6 apples***
***6 apple samples from Part A***
***6 vitamin C tablets***
***3 cups lemon juice***
***3 tablespoons baking soda***
***3 tablespoons salt***
***3 tablespoons cream of tarter***
***3 tablespoons sugar***
***3 cups vinegar***

*Amounts will vary based on students' predictions*

12 – 9 oz. plastic cups
12 plastic spoons
6 plastic or blunt knives
6 beakers or measuring cups with water
3 teaspoons
6 black markers
6 cutting boards
6 kitchen timers or stopwatches
6 paper plates

## Chapter 4: Fruits *(continued)*

### LAB 2 – Hidden Antioxidants

***6 vitamin C tablets***
***3 cups lemon juice***
***3 tablespoons cream of tarter***
***3 cups vinegar***

*Amounts will vary based on students' predictions*

water
1 bottle colored iodine
1 mortar and pestle (or metal spoon)
6 beakers or measuring cups (at least 350mL or 1 ½ cups in size)
6 2 oz. or similar size cups
6 – 9 oz. plastic cups
6 medicine droppers
6 plastic spoons
6 black permanent markers

## Chapter 5: Milk & Cheese

### LAB 1 – Explicit Enzymes

***½ cup cow's milk (skim preferred)***
***½ cup plain soy milk***
***½ cup plain rice milk***
1 roll paper towels/napkins
1 black permanent marker
9 lactase enzyme pills
6 test tube racks
6 glucose reference charts
6 kitchen timers or stopwatches
18 test tubes with stoppers (any size)
18 test tube labels
72 glucose strips
30 2 to 4 oz. plastic cups (optional)

### LAB 2 – Magnificent Microbes

***1 small bag ice***
***1 6 oz. container plain yogurt with active cultures***
***2 cups lactose-free milk***
***2 cups skim milk***
***4 cups whole milk***
water
2-3 hot plates or 1 double burner
1 box aluminum foil squares

## Chapter 5: Milk & Cheese *(continued)*

2 medium or large coolers (20 or larger)
3 or 4 medium to large pots
4 heavy-duty plastic bottles (8 oz. or larger)
6 small paper or plastic cups
6 black permanent markers
7 liquid measuring cups (1 cup or larger)
8 Styrofoam cups
9 thermometers
6 tablespoons

### Lab Extension

***Active culture sample***
1 small cup water
6 microscopes
6 medicine droppers
6 microscope slides and cover slips
Cell stain

### LAB 3 – Maintaining Mass

***3 quarts + 1 cup 2% milk***
***6 tablespoons baking soda***
***3 cups vinegar***
1 hot plate or double burner
1 tablespoon
1 cup for massing the milk
1 small saucepan
1 whisk or metal spoon
14 small clear plastic cups
7 small strainers (very thin mesh)
7 liquid measuring cups
7 black permanent markers
7 triple balance beam scales
7 medium bowls
19 plastic spoons
24 Styrofoam cups

## Chapter 6: Meat, Poultry, Fish & Eggs

### LAB 1 – The Building Blocks

24 craft pipe cleaners
24 plastic sandwich bags
1 black permanent marker
1056 colored pony beads (48 each of 22

## Chapter 6: Meat, Poultry, Fish & Eggs *(continued)*

different colors)
48 clear pony beads

### LAB 2 – Synthesizing Muscles

3 - 50 count bags of rubber bands 7"x1/8"
6 — ½" diameter foam tubular insulation
1-2 – 5′ single cord channels (found at home improvement store)
24 – 8" cable ties
48 – 4" cable ties
1 pair scissors
1 measuring tape
1 knife
30 calculators

### LAB 3 – Foam Formulations

#### PART A

***6 eggs***
1 roll paper towels
6 paper plates
6 egg separators
6 whisks or electric mixers
6 kitchen timers or stopwatches
12 small glass or steel bowls

#### PART B

***1 container egg whites***
***¼ teaspoon salt***
***¼ teaspoon vegetable oil (e.g. soybean, corn, etc.)***
***1 teaspoon sugar***
***¼ tablespoon lemon juice or cream of tartar***
1 roll paper towels
12 clear plastic cups
6 rubber spatulas
6 funnels
6 small glass or steel bowls
6 whisks or electric mixers
6 sets measuring spoons
6 liquid measuring cups
6 rulers
6 kitchen timers or stopwatches
6 – 10 or 25 mL graduated cylinders

## Chapter 7: Grains

### LAB 1 – Great Grains

***6 popcorn kernels***
1 medium plastic container filled with water (~1 quart)
1 bottle iodine (2.4% sodium iodide with 40% alcohol recommended)
6 paper plates
6 small plastic cups
6 napkins
7 medicine droppers
6 dissecting needles, scalpels, or push pins
7 black permanent markers
6 hand lens (optional)

### LAB 2 – Globs of Gluten

***2 cups bread (wheat) flour***
***2 cups cake flour***
***2 cups all-purpose flour***
1 ½ cups water
1 dry measuring cup
6 plastic tablecloths
6, 4 oz. cups
6 kitchen timers or stopwatches
6 paper plates
6 small plastic bowls
6 plastic forks
6 metric rulers
6 large bowls (diameter 7.5-9″)
6 strainers (wide mesh)
7 liquid measuring cups
12 plastic sandwich bags
1 black permanent marker

#### Optional Materials

1 hot plate or double burner
1 large pot
6 strainers (wide mesh)
6 large bowls

### LAB 3 – Amylase Action

***3 slices white bread***
***3 slices whole-wheat bread***
1 cup water
1 black permanent marker
6 paper plates
6 small cups

## Chapter 7: Grains *(continued)*

1 bottle iodine (2.4% sodium iodide with 40% alcohol recommended)
6 medicine droppers
6 kitchen timers or stopwatches

## Chapter 8: Sugar

### LAB 1 – Sweet Saccharide

***1 ½ cups apple (100%) juice***
***1 ½ cups white (100%) grape juice***
***1 bottle yellow Food Coloring***
***3 tablespoons white granulated sugar***
3 cups water
1 – ½ tablespoon measuring spoon
1 roll paper towels
1 liquid measuring cup
1 plastic spoon
1 black permanent marker
6 kitchen timers or stopwatches
6 glucose color charts
24, 2-4 oz. clear plastic cups
24-48 Glucose Test Strips

### LAB 2 – Super Solutions

***30 oranges***
***900g white sugar***
water
7 triple beam balances
1 Large Spoon
1 hot plate or double burner
1 small or medium pot
1 container for massing sugar
6 plastic sandwich bags
6 - 9 oz. plastic cups
6 250 mL beakers
6 - 100mL graduated cylinders
6 plastic spoons
6 plastic knives
6 paper plates
6 medium bowls (diameter 7.5-9")
6 hand juicers
42, 2-4 oz. Styrofoam cups

## Chapter 9: Fats & Oils

### LAB 1 – Lipid Language

***½ cup butter***
***½ cup margarine***
***½ cup vegetable oil***
***12 cups of ice***
2 hot plates or 1 double burner
1 cooler
1 liquid measuring cup
2 saucepans
2 wooden spoons
6 small, clear plastic cups
6 small bowls
7 kitchen timers or stopwatches
8 thermometers

### LAB 2 – Examining Emulsions

***3 ¾ cups olive oil***
***2 tbsp honey***
***2 tbsp salt***
***3¾ cups white vinegar***
***2 tbsp ground mustard***
***2 tbsp paprika***
***3 bags of romaine lettuce***
1 roll paper towels or napkins
1 bottle dish detergent
1 dishtowel
12 small clear plastic cups
30 medium mason jars
6 large bowls
6 teaspoons
6 liquid measuring cups
6 black markers
30 sticky labels
6 kitchen timers or stopwatches
6 whisks
36 paper plates
36 plastic forks

### Lab Extension

***Emulsion droplets***
1 small cup water
6 microscope slides and cover slips
6 microscopes
6 medicine droppers

## Chapter 10: Energy Balance

### LAB 1 – Energy Balance

***6 cups of peanuts***

700mL Distilled Water (room temperature)
1 empty soda can
1 empty metal coffee can
1 cork
1 uncoated paper clip (any size)
1 lighter
1 glass or metal rod
1 cup peanuts
7 thermometers
6 small bowls
7 graduated cylinders or liquid measuring cups
6-7 triple beam balance scales