

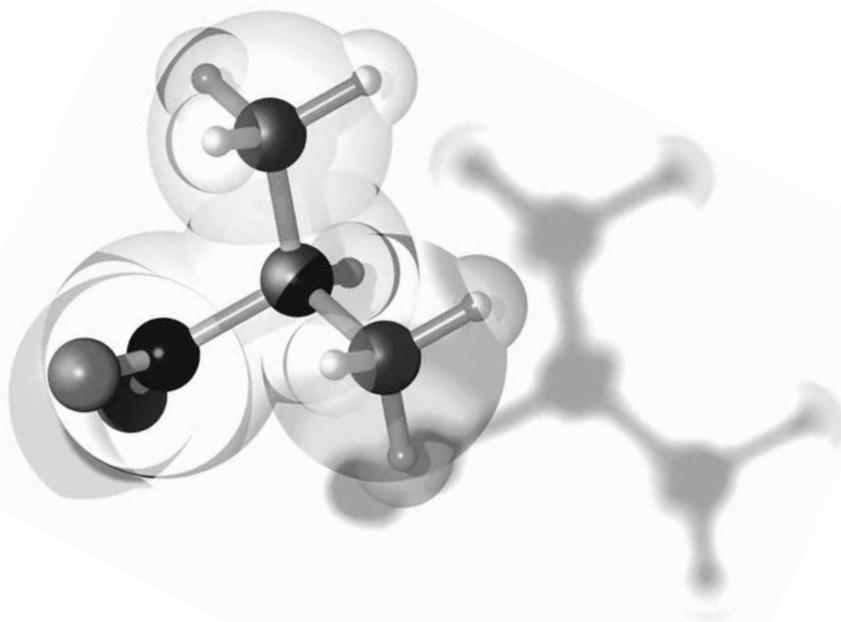
FOCUS ON

Grades 5-8

MIDDLE SCHOOL

CHEMISTRY

Teacher's Manual



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Focus On Middle School Chemistry Teacher's Manual

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A Note From the Author

This curriculum is designed to give students both solid science information and hands-on experimentation. The middle school material is geared toward fifth through eighth grades, but much of the information in the text is very different from what is taught at this grade level in other textbooks. I feel that students beginning with the fifth grade can grasp the concepts presented here. This is a *real* science text, so scientific terms are used throughout. It is not important at this time for students to master the terminology, but it *is* important that they be exposed to the real terms used to describe science.

For students, each chapter has two parts: a reading part in the *Focus On Middle School Chemistry Student Textbook* and an experimental part in the *Focus On Middle School Chemistry Laboratory Workbook*. In this teacher's manual, an estimate is given for the time needed to complete each chapter. It is not important that both the reading portion and the experimental portion be concluded in a single sitting. It may be better to have students do these on two separate days, depending on the interest level of the child and the energy level of the teacher. Also, questions not addressed in the *Teacher's Manual* may arise, and extra time may be required to investigate these questions before proceeding with the experimental section.

Each experiment is a *real* science experiment and not just a demonstration. They are designed to engage students in an actual scientific investigation. The experiments are simple but are written the way real scientists actually perform experiments in the laboratory. With this foundation, it is my hope that students will eventually begin to think of their own experiments and test their own ideas scientifically.

Enjoy!

Rebecca W. Keller, PhD

How To Use This Manual

Each chapter in this *Focus On Middle School Chemistry Teacher's Manual* begins by providing additional information for the corresponding chapter in the student textbook. This supplementary material is helpful when questions arise while students are reading the text. It is not necessary for students to learn this additional material since most of it is beyond the scope of this level. However, the teacher may find the information helpful when answering questions.

The second part of each chapter in the *Teacher's Manual* provides directions for the experiments in the *Laboratory Workbook* as well as answers to the questions asked in each experiment and review section. All of the experiments have been tested, but it is not unusual for an experiment to produce an unexpected outcome. Usually repeating an experiment helps both student and teacher see what might have occurred during the experimental process. Encourage the student to troubleshoot and investigate all possible outcomes. However, even repeating an experiment may not produce the expected outcome. **Do not worry if an experiment produces a different result.** Scientists don't always get the expected results when doing an experiment. The important thing is for students to learn about the scientific method and to make observations, think about what is taking place, and ask questions.

Getting Started

The experimentation process will be easiest if all the materials needed for the experiment are gathered together and made ready before beginning. It can be helpful to have a small shelf or cupboard or even a plastic bin dedicated to holding most of the necessary chemicals and equipment. The following *Materials at a Glance* chart lists all of the materials needed for each experiment. An additional chart lists the materials by type and quantity. A materials list is also provided at the beginning of each lesson.

Materials at a Glance

Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
pen labels from food products periodic table of elements (from <i>Focus on Middle School Chemistry Textbook</i>) books or online: dictionary, encyclopedia computer with internet access (optional)	small, colored marshmallows large marshmallows (optional) replacements for marshmallows: gumdrops or jelly beans toothpicks	baking soda lemon juice balsamic vinegar salt (1-2 Tbsp. dissolved in 1/2 cup of water) egg whites milk several small jars measuring cups measuring spoons eye dropper (See next page for materials for optional activity)	one head red cabbage distilled water ammonia vinegar soda pop milk mineral water large saucepan knife small jars coffee filters (white) eye dropper measuring cup measuring spoons marking pen scissors ruler	red cabbage indicator (from Experiment 4) household ammonia vinegar large glass jar measuring spoons measuring cup

Experiment 6	Experiment 7	Experiment 8	Experiment 9	Experiment 10
water ammonia vegetable oil rubbing alcohol melted butter vinegar small jars (7 or more) food coloring dish soap eye dropper measuring spoons measuring cup marking pen (See next page for materials for optional activity)	ballpoint ink pens (various colors) black ballpoint ink pen rubbing alcohol coffee filters (white) several small jars cardboard shoe box tape measuring cup scissors ruler	tincture of iodine (from Walgreen's or other pharmacy) raw food items: pasta, bread, celery, potato, banana, apple, etc. liquid laundry starch absorbent white paper eye dropper cookie sheet marking pen	liquid laundry starch (or Borax) Elmer's white glue Elmer's blue glue (or another glue different from white glue) water 2 small jars marking pen Popsicle sticks for stirring measuring spoons	tincture of iodine (from Walgreen's or other pharmacy) bread timer wax paper marking pen cup

Materials at a Glance

By type with total quantities

Equipment	Materials (cont.)	Food Items	Just For Fun
computer with internet access (optional) cookie sheet cup eye dropper jar, large glass jars, small, 7 or more measuring cups measuring spoons ruler saucepan, large scissors timer	glue, Elmer's blue (or another glue different from white glue), 60 ml [1/4 cup] glue, Elmer's white, 60 ml [1/4 cup] iodine, tincture of (from Walgreen's or other pharmacy), several droppers laundry starch, liquid (or 30 ml [2 Tbsp] each of borax and cornstarch) paper paper, absorbent white paper, wax pen pens, inexpensive ballpoint (1 each: black, blue, red, green, etc.) or multicolored pen with 7-8 colors pen, marking pencil periodic table of elements (from <i>Focus On Middle School Chemistry Student Textbook</i>) rubbing alcohol, 135 ml [1/2 cup] sticks, Popsicle, several tape toothpicks, 1 pkg	baking soda, 15-30 ml [1-2 Tbsp.] bread butter, 75 ml [1/3 cup] cabbage, red (one head) egg whites (1 or 2) food coloring gumdrops (optional replacement for marshmallows), 1 pkg jelly beans (optional replacement for marshmallows), 1 pkg lemon juice, 15-30 ml [1-2 Tbsp.] marshmallows, large, 1 pkg marshmallows, small, colored, 1 pkg milk, 420 ml [1 3/4 cup] raw foods (1 or 2 pieces each): pasta bread, 2 slices celery potato banana other fruits salt, 15-30 ml [1-2 Tbsp.] soda pop, 15 ml [1 Tbsp.] vegetable oil, 90 ml [3/8 cup] vinegar, 345 ml [1.5 c.] vinegar, balsamic, 15-30 ml [1-2 Tbsp.] optional, but recommended water, distilled, 1.1 liter [4.5 cups] water, mineral, 15 ml [1 Tbsp] water, tap	Optional Activities Exper. 3: Peanut Brittle 360 ml (1 1/2 cups) sugar 240 ml (1 cup) white corn syrup 120 ml (1/2 cup) water 360 ml (1 1/2 cups) raw peanuts 5 ml (1 teaspoon) baking soda sauce pan buttered pan Exper. 6: Easy Chocolate Cake 710 ml (3 cups) flour 470 ml (2 cups) sugar 120 ml (1/2 cup) cocoa 5 ml (1 tsp) salt 175 ml (3/4 cup) shortening 2 eggs 240 ml (1 cup) buttermilk 240 ml (1 cup) boiling water 10 ml (2 teaspoons) baking soda saucepan mixing bowl mixing spoon or mixer 3 layer-cake pans
Materials			
<i>Focus On Middle School Chemistry Laboratory Workbook</i> ammonia, 200 ml [1 cup] box, cardboard shoe box or similar size coffee filters, white (several) dictionary (book or online) dish soap, 45 ml [3 Tbsp.] encyclopedia (book or online) labels from food products			

Laboratory Safety

Most of these experiments use household items. However, some substances, such as iodine, are extremely poisonous. Extra care should be taken while working with all chemicals in this series of experiments. The following are some general laboratory precautions that should be applied to the home laboratory:

- Never allow students to put things in their mouth unless the experiment instructs them to do so. This means that food items should not be eaten unless tasting or eating is part of the experiment.
- Have students use safety glasses while working with glass objects or strong chemicals such as bleach.
- Have students wash their hands after handling all chemicals.
- Provide adult supervision while students are working with iodine or glassware and while conducting any step requiring a stove.

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