Changes in Materials for *Magnets and Motors*

The STC Program™

Since publication of the *Magnets and Motors* Teacher's Guide and Student Activity Book, metal bolts have replaced brass bolts. Similarly, metal washers and metal fasteners have replaced brass washers and brass fasteners in the Bags-O-Stuff II. This change in materials affects Lessons 3 and 10 of the Teacher's Guide and requires minor revisions to the instructions in the unit's printed materials.

In addition, corrections have been made to information found in Figures 14-5 and 14-6 in the Student Activity Book.

This errata set includes the following:

- For the *Magnets and Motors* Teacher's Guide, Materials List—revised page x
- For the *Magnets and Motors* Teacher's Guide, Lesson 3—revised pages 16 and 19
- For the *Magnets and Motors* Teacher's Guide, Lesson 10—revised page 68
- For the *Magnets and Motors* Student Activity Book, Lesson 14—revised page 53

Photocopy and distribute these new instruction pages as needed.

If you have questions about these changes or about the module in general, call Carolina's product information staff at 800-227-1150 (8 a.m.–5 p.m. ET, M–F), or email *stc@carolina.com.*

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Materials List

Below is a list of the materials needed for the *Magnets and Motors* unit. Please note that the metric and English equivalent measurements in this unit are approximate.

- 1 Teacher's Guide
- 15 Student Activity Books
- 90 flexible magnets, 25 x 20 x 5 mm (1" x ¾" x 3/16") with a 5-mm (3/16-inch) hole
- 40 plastic cups
- 40 plastic lids
- 1 spool of light string
- 2 pencils, No. 2
- 30 wooden sticks, 15 cm x 4 mm (6" x ⅛") or 30 long toothpicks
- 15 tongue depressors, or wide "craft sticks"
- 15 boxes, cardboard, 10 x 5 x 20 cm (4" x 2" x 8")
- 10 packages of assorted objects, each containing:
  - steel washer
  - steel nail
  - aluminum screen
  - aluminum foil
  - metal fastener
  - metal washer
  - rubber band
  - paper clip
  - copper wire
  - pipe cleaner
  - recording tape
  - golf tee
  - aluminum wire
  - twist-tie
- 20 jumbo paper clips
- 150 No. 1 paper clips
- 500 steel washers, USS standard No. 10
- 30 magnetic compasses
- 30 straight pins, 2.5 cm (1 inch)
- 90 plastic drinking straws
- 120 single-color stickers
- 30 D-cell batteries
- 30 battery holders
- 30 bulbs
- 60 bulb sockets
- 1 wire-stripper tool
- 2 aluminum nails, 12D or larger
- 30 nails, common 12D
- 2 metal bolts, 8 cm x 6 mm (3" x ¼")
- 30 steel bolts, 12 mm x 8 mm (½" x ⅜")
- 30 steel bolts, 8 cm x 6 mm (3" x ¼")
- 2 steel bolts, 3.5 cm x 6 mm (1¼" x ¼")
- 2 steel bolts, 8 cm x 4 mm (3" x ⅛")
- 2 steel bolts, 8 cm x 8 mm (3" x ⅜")
- 2 steel bolts, 8 cm x 12 mm (3" x ½")
- 2 steel bolts, 10 cm x 6 mm (4" x ¼")
- 2 steel bolts, 13 cm x 6 mm (5" x ¼")
- 8 transparency marker pens
- 10 envelopes
- 16 sheets of construction paper, including:
  - 4 sheets pink
  - 4 sheets blue
  - 8 sheets yellow
- 60 alligator clips
- 1 roll (23 m, 50 feet) #20 bare wire
- 2 rolls (7.5 m, 25 feet) #20 coated hook-up wire, 1 roll each of two different colors
- 3 rolls (30 m, 100 feet) #22 coated hook-up wire (90 m)
- 1 roll (23 m, 75 feet) #28 enameled wire
- 30 sandpaper squares, 5-cm square (2-inches square)
- 6 screwdrivers
- 30 small, electric motors, Mabuchi RE-260, with wire leads (30 cm, 12 inch)
- 1 roll of PVC electrical tape, to make 30 double wires
- 60 rubber bands, No. 16
- 60 rubber bands, No. 84 or larger
- *30 student notebooks
- *10 plastic transparency sheets
- * Several sheets of newsprint
- * Overhead projector
- * Cellophane tape
- * Glue stick or paste
- * Large world map or globe

***Note:** These items are not included in the kit. They are available in most schools or can be brought in from home.

moving through these materials will make them temporarily magnetic. The magnetic effect of electric current will be easier for students to comprehend if they first learn that not all metal wires are magnetic. Students may point out that the wires in twist-ties and pipe cleaners **are** magnetic. Asking questions like "Are all metals the same?" and "What are some ways that you can tell different metals apart?" will help students to investigate and clarify this distinction.

Materials

For every student

1 student notebook

For every two students

1 flexible magnet, 25 x 20 x 5 mm (1" x 3/4" x 3/16"), with a 5-mm (3/16-inch) hole in the center

1 mystery box

For every four students

1 package containing assorted materials:

- Aluminum foil
- Aluminum screen
- Aluminum wire
- Metal fastener
- Metal washer
- Copper wire
- Golf tee
- Paper clip
- Pipe cleaner
- Recording tape
- A piece of rubber band
- Steel nail
- Steel washer
- Twist-tie

Preparation

1. Provide one package of assorted materials for every four students (two pairs will share).
2. See **Appendix C** for instructions to assist you or helpers in constructing enough mystery boxes for every two students to share. Alternatively, students could construct the boxes as part of this lesson, using the **Appendix C** instructions. See Step 9 of **Procedure**.

Procedure

1. Ask students how they would decide whether something is magnetic or not. Several students will probably say that they would be able to see if the objects were attracted to a magnet or not. Ask how they would be able to "see." Ask them to suggest ways to tell if an object is only very slightly attracted to a magnet.
2. Next, ask them to discuss how they would distinguish between a magnet (an object that attracts and repels another magnet) and something that

2. Challenge the students to find things in their home that use magnets. Ask them to keep a record in their notebooks of what they find.

3. This lesson provides an opportunity for students to think about the names objects have and the reasons for naming things. You may want to discuss with students the possible origins of words such as "washer," "pipe cleaner," "tee," "foil," "twist-tie," "paper clip," and others. Which words are descriptive? What else could these items be called?

4. The various materials in the assortment package present an identification challenge for students. Where does steel come from? How are paper clips made? You may want to invite students to write what they suppose to be true about a related topic, then to do some independent research and write an account of what they found out.

5. Ask students whether they think a U.S. nickel is magnetic or not. Ask them to find out what a nickel is made of. Nickels are currently 75 percent copper and 25 percent nickel so they are only very slightly magnetic. One way to demonstrate this is to suspend a nickel from a thread with tape and observe the effect that a strong magnet has on it. The effect is *very* slight. You may want to discuss the composition or origin of coins after this. Ask students if they can think of any problems that strongly magnetic coins might cause for vending machine manufacturers.

- 1 jumbo paper clip
- 1 battery and battery holder
- 1 piece of #22 coated hook-up wire, 20 cm (8 inches) long
- 1 piece of #22 coated hook-up wire, 80 cm (32 inches) long
- 1 steel bolt, 8 cm x 6 mm (3" x ¼")
- 1 set of experimental materials:
  - 2 sets of 3 pieces of #22 coated hook-up wire 40 cm, 60 cm, and 100 cm (16 inches, 24 inches, and 40 inches) long
  - 2 sets of 3 steel bolts, 8 cm (3 inches) long with diameters of 4 mm, 8 mm, and 12 mm (⅛ inch, ⅜ inch, ½ inch)
  - 2 sets of 3 steel bolts, 6 mm (¼ inch) diameter with lengths of 3.5 cm, 10 cm, and 13 cm (1¼ inches, 4 inches, 5 inches)
  - 2 sets of 3 different core materials (1 pencil, 1 metal bolt, and 1 aluminum nail)
  - 2 sets of 3 batteries and battery holders and 2 pieces of #22 coated hook-up wire, 20 cm (8 inches) long

Note: Students may need all or only some of these experimental materials, depending on the experiments they have planned.

Preparation

1. Check the Planning Boards from Lesson 9 to be sure that you have the materials each team will need.
2. Prepare the materials for distribution.
3. If you have not conducted this lesson before, you may want to pick one or two experiments and try them out yourself.

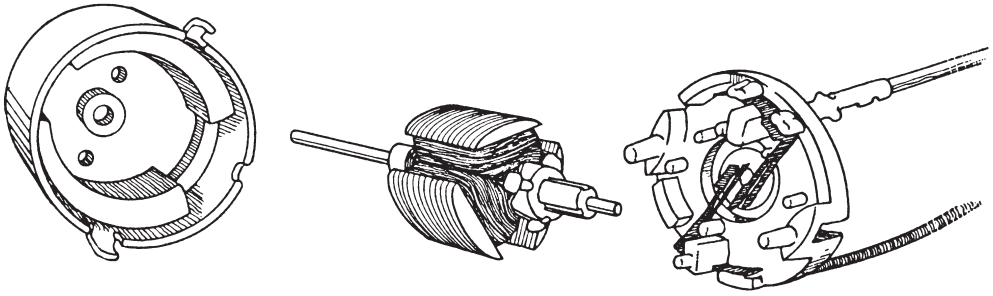
Procedure

1. Begin by reminding the students of the question they are investigating: How can you make an electromagnet weaker or stronger? Discuss with them their various plans for experimenting with an electromagnet. Ask them what they think the various experiments might show. The Student Activity Book also asks these questions.
2. Review with the students the tasks that they will share as they work together in their teams: hooking up the circuit, recording the data, wrapping the electromagnet, and measuring the strength of the electromagnet.
3. Distribute the materials to the teams.
4. While the students conduct their experiments, assist as needed but try not to overcoach. Some teams will need reassurance that there is no "right" answer. The point is that students simply observe what happens and record their findings.

   Encourage the students to discuss their discoveries with other members of their team. If appropriate and time allows, they may want to perform the experiment again.

Figure 14-4

The three parts of the motor



6. Look closely at each of the three parts. Think about how they were connected when the motor was assembled.

   How do the parts remind you of parts of the motors you built in the last two lessons? Look back at Lessons 12 and 13 to help you remember.

7. All the parts of the motor help in some way to make the motor run. Look at your motor and at Figures 14-5 and 14-6. What do you think the different parts of the motor do? Why do you think that? Write your ideas in your notebook.

Figure 14-5

Three-quarter view of a motor

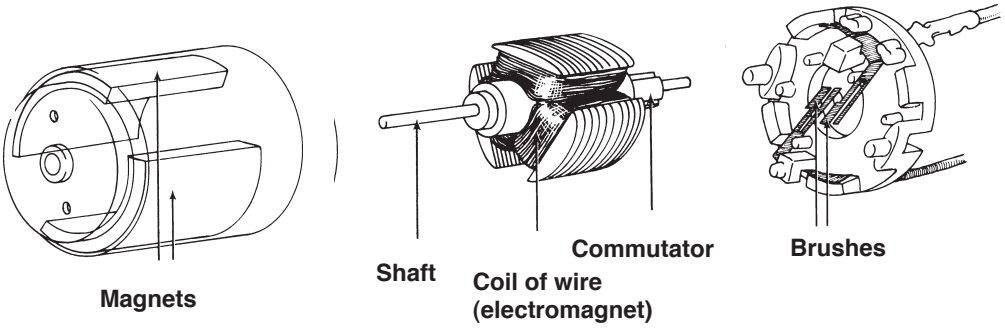


Figure 14-6

A cross-section view of a motor