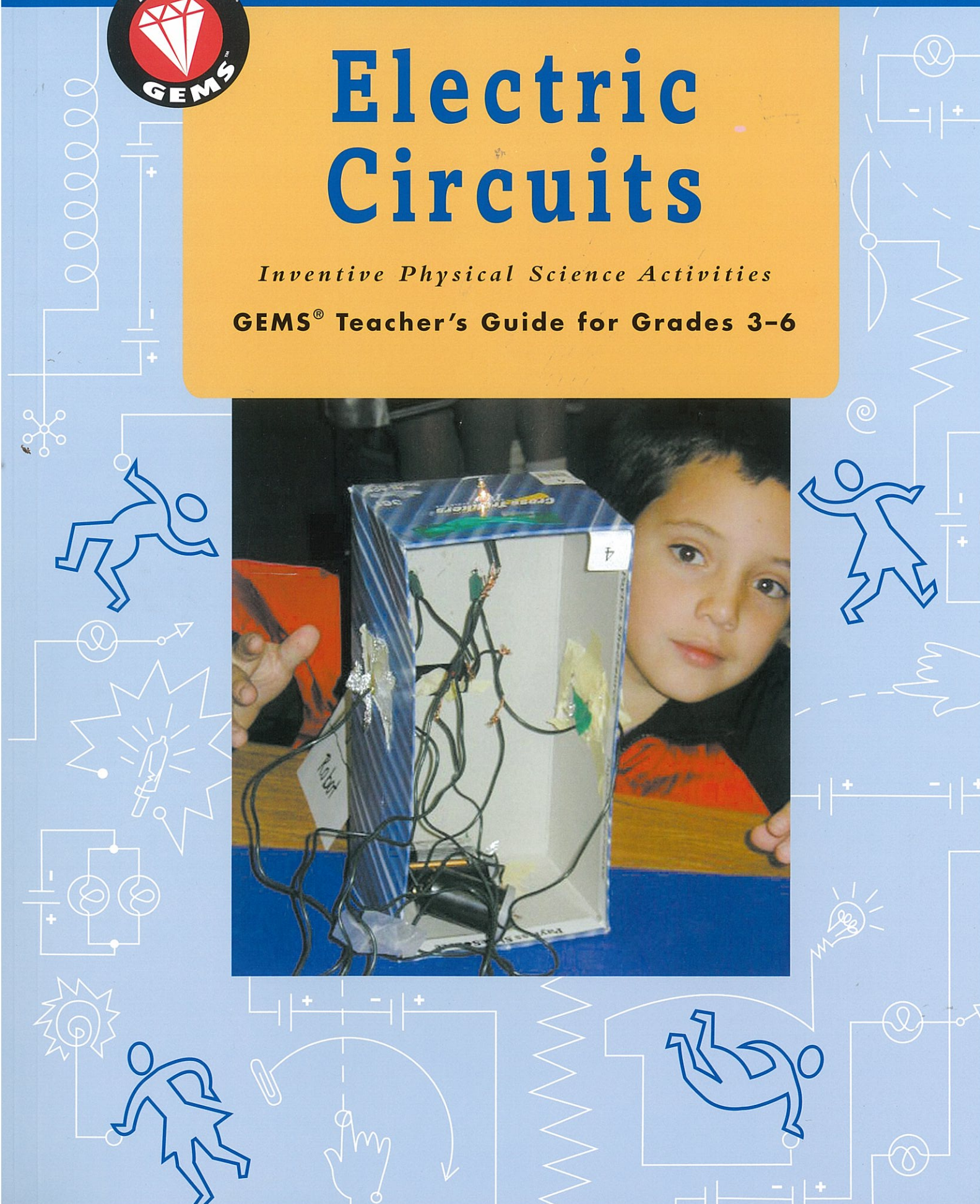
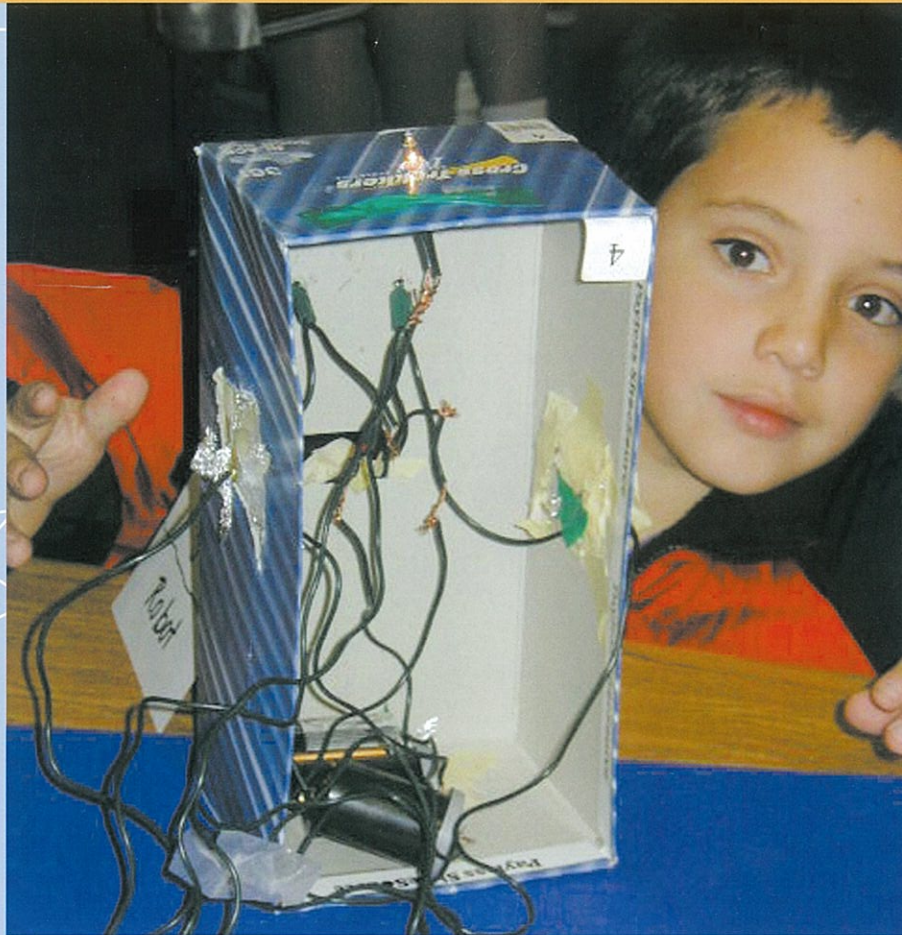




Electric Circuits

Inventive Physical Science Activities

GEMS® Teacher's Guide for Grades 3-6



WHAT YOU NEED FOR THE WHOLE UNIT

The quantities below are based on a class size of 32 students. You may, of course, require different amounts for smaller or larger classes. This list gives you a concise “shopping list” for the entire unit. Please refer to the “What You Need” and “Getting Ready” sections for each individual activity, which contain more specific information about the materials needed for the class and for each team of students.

Before beginning the sessions in this unit, you’ll first need to prepare the materials—the lightbulbs, wires, and film canisters—students will use to explore electric circuits. Be sure to read the “Acquiring and Preparing Materials” section on page 190 and refer to the “For the Homemade Electric Devices” materials listed in Consumables and General Supplies below.

Nonconsumables

For the Sessions:

- 6 two-sided copies of **Stories about Electric Accidents** (pages 50–51)
- a minimum of 32 prepared film canisters and lids
- a minimum of 36 paper fasteners (brads)
- a minimum of 30 holiday lightbulbs with stripped leads
- a minimum of 30 pieces of 4-inch-long wire with stripped ends
- 32 pieces of 4-inch-long wire with **non-stripped ends** for Station 6
- 32 pieces of 20-inch-long wire with stripped ends
- a minimum of 32 C-cell batteries
- 2 containers (anything large and strong enough) to put at the front of the room to hold finished circuit devices and batteries
- at least 5 conducting (metal) objects (such as a paper clip, bottle cap, coin, washer, bolt, metal spoon) for Station 3
- at least 5 insulating (non-metal) objects (such as a plastic spoon, straw, craft stick, piece of wood, small piece of paper, rubber band) for Station 3
- 1 container (such as a plastic bowl) to hold the stripped wires at Station 6
- 3 or more pairs of wire cutters and wire strippers
- 1 pair of pliers
- the homemade electric devices for the stations (see “Homemade Electric Devices,” page 196)
- (optional) simple motors and buzzers

One copy each of the following posters:

- No 120V** (page 21)
- Battery** (page 85)
- Lightbulb** (page 86)
- Wire or Other Conductor** (page 87)
- No Short Circuits!** (page 105)
- Switch** (page 119)
- Connection/No Connection** (page 143)

An overhead transparency of each of the following:

- Mystery Inventor's Journal** transparencies 1–6
(pages 22–27)
- Electrical Inventors** (page 28)
- Lewis Howard Latimer** (page 29)
- Light the Bulb** station sign (page 55)
- Building Circuits from Diagrams** sheets
(pages 106–107)

Copies of the following station signs:

- 1 copy of **Shocking Stories** (page 49)
 - 4 copies of **Build a Circuit** (page 52)
 - 2 copies of **Conductors and Insulators** (page 53)
 - 2 copies of **How Many Bulbs?** (page 54)
 - 2 copies of **Light the Bulb** (page 55)
 - 2 copies of **Wire Stripping** (page 56)
 - 1 copy each of **Quiz Board** and **Thread the Needle**
(pages 57 and 58)
 - 1 copy of **Repair Shop** (page 63)
- Optional, but highly recommended:*
- 1 copy each of **Ice Fishing**, **Count Up**, **What Matches?**,
and **Upstairs/Downstairs** (pages 59–62)

Consumables

For the Sessions:

- the plug you cut off the holiday light string (see “Acquiring and Preparing Materials” on page 191)
- 1 roll of aluminum foil
- 8 sets of “Experimenter’s Kits,” each made up of the following materials:
 - 1 strip from the **Experimenter’s Kit List** (page 108)
 - 1 C-cell battery
 - 1 resealable plastic bag

- ___ 3 holiday lightbulbs with stripped leads
- ___ 4 pieces of 4-inch-long wire with stripped ends
- ___ 2 prepared film canisters and lids
- ___ 4 paper fasteners (brads)
- several scraps of cardboard, of various thicknesses
- various items for building (popsicle sticks, pipe cleaners, straws, etc.)
- 32 copies of the **Electric Invention Assignment Sheet** (page 166)
- (optional) 32 pieces of paper labeled as “Rover’s Recording Sheet”

32 copies each of the following journal pages:

- Electrical Inventor’s Journal** (pages 30–33)
- Electric Exploration Stations** (pages 64–71)
- Building Circuits from Diagrams** (pages 106–107)
- Switch Invention Spec Sheet** (pages 117–118)
- Series Circuits** (page 133)
- Parallel Circuits** (page 142)
- Switches in Series and Parallel Circuits** (page 158)
- Invention Spec Sheet** (pages 167–168)

For the Homemade Electric Devices:

- 1 copy of the **Quiz Board** template (page 220)
- 1 copy of the **Thread the Needle** template (page 221)
- 1 copy of the **Ice Fishing** template (page 222)
- 1 copy of the **Count Up** template (page 223)
- 1 copy of the **What Matches?** template (page 224)
- 1 copy of the **Back of What Matches?** template (page 225)
- 1 copy of the **Upstairs/Downstairs** template (page 226)
- 6 pieces of stiff cardboard, 8 1/2 x 11 inches or slightly larger
- 8 film canisters and lids with slits cut in tops and bottoms
- 39 paper fasteners (brads)
- 8 C-cell batteries
- 9 pieces of 6-inch-long wire with stripped ends
- 1 piece of 8-inch-long wire with stripped ends
- 3 pieces of 9-inch-long wire with stripped ends
- 2 pieces of 10-inch-long wire with stripped ends
- 9 holiday lightbulbs with stripped leads
- 1 miniature aluminum pastry dish, 4–5 inches across
- several pieces of aluminum foil

General Supplies

For the Sessions:

- 1 red marker
- 2 pens for Station 5
- clear tape
- masking tape
- scissors
- an assortment of metal paper clips, large and small
- stickers for students to label unfinished switches or inventions
- an overhead projector
- (optional)* a three-hole punch
- (optional)* 1 three-ring binder or folder in which to keep journal pages
- (optional)* several sheets of chart paper or sentence strips for writing out key concepts
- (optional)* 32 different-colored pens for drawing circuits in journals

For the Homemade Electric Devices:

- 8 small paper clips
- 8 large paper clips
- glue or glue stick
- tape
- paring knife or scissors with sharp point
- a hole punch
- (optional)* 1 pair of pliers
- (optional)* clear contact paper