

Barbie™

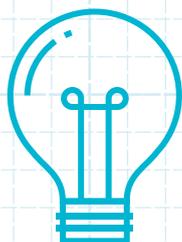
STEM KIT

SCIENCE SAVES THE DAY!





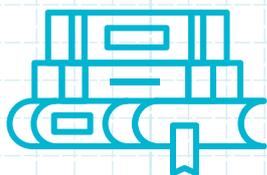
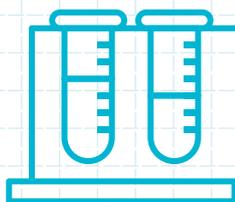
SCIENCE SAVES THE DAY!



Check off the projects as you complete them.

Project Checklist

- | | | | | |
|--------------------------|--|-------------------------|-----------------------------------|---------|
| <input type="checkbox"/> | | BUILD | Spinning closet rack | Page 4 |
| <input type="checkbox"/> | | EXPERIMENT | Speed up the spinning closet rack | Page 6 |
| <input type="checkbox"/> | | BONUS EXPERIMENT | Motorize the spinning closet rack | Page 7 |
| <input type="checkbox"/> | | EXPERIMENT | Chromatography dress | Page 8 |
| <input type="checkbox"/> | | BUILD | Test tube holder | Page 9 |
| <input type="checkbox"/> | | EXPERIMENT | Rainbow in a test tube | Page 10 |
| <input type="checkbox"/> | | EXPERIMENT | Optical illusion dresses | Page 11 |
| <input type="checkbox"/> | | BUILD | Washing machine | Page 13 |
| <input type="checkbox"/> | | EXPERIMENT | Speed up the washing machine | Page 14 |
| <input type="checkbox"/> | | BONUS EXPERIMENT | Washing machine gravity motor | Page 14 |
| <input type="checkbox"/> | | BUILD | Rotating shoe rack | Page 16 |
| <input type="checkbox"/> | | BUILD | Greenhouse with fan | Page 18 |
| <input type="checkbox"/> | | EXPERIMENT | Leaf-print dress | Page 20 |
| <input type="checkbox"/> | | BUILD | Dress-design platform | Page 21 |
| <input type="checkbox"/> | | EXPERIMENT | Dyeing a flower | Page 22 |
| <input type="checkbox"/> | | BUILD | Necklace and accessory holder | Page 23 |
| <input type="checkbox"/> | | BUILD | Hammock with fan | Page 25 |



Story by Ted McGuire
 Illustrations by Jiyong An
 and Ashley Greenleaf
 Experiments by Camille Duhamel

Kit Contents



| ✓ | No. | Description | Quantity | Item No. |
|---|-----|-----------------------|----------|---------------|
| ○ | 1 | 3-hole cross rod | 4 | 7026-W10-X1W1 |
| ○ | 2 | 3-hole rod | 8 | 7026-W10-Q2W1 |
| ○ | 3 | 5-hole dual rod B | 1 | 7026-W10-S2W1 |
| ○ | 4 | 5-hole rod | 2 | 7413-W10-K2W1 |
| ○ | 5 | 5-hole cross rod | 10 | 7413-W10-K3W1 |
| ○ | 6 | Small gear | 2 | 7026-W10-D2O1 |
| ○ | 7 | Medium gear | 1 | 7346-W10-C1P1 |
| ○ | 8 | Large gear | 4 | 7026-W10-W5K |
| ○ | 9 | Large sprocket | 2 | 3569-W10-C1B1 |
| ○ | 10 | Medium pulley wheel | 2 | 7344-W10-N2O |
| ○ | 11 | Crank | 1 | 7063-W10-B1P |
| ○ | 12 | Axle (35 mm) | 3 | 7413-W10-O1W |
| ○ | 13 | Axle (70 mm) | 1 | 7061-W10-Q1W |
| ○ | 14 | Axle (150 mm) | 1 | 7026-W10-P1W |
| ○ | 15 | 90-degree converter X | 3 | 7061-W10-J1W1 |
| ○ | 16 | 90-degree converter Y | 1 | 7061-W10-J2W1 |
| ○ | 17 | Joint pin | 8 | 1156-W10-A1P |
| ○ | 18 | Shaft plug | 4 | 7026-W10-H1O |
| ○ | 19 | Shaft pin | 1 | 7026-W10-J3B |
| ○ | 20 | Short anchor pin | 18 | 7344-W10-C2P |

| ✓ | No. | Description | Quantity | Item No. |
|---|-----|-----------------------------------|----------|---------------|
| ○ | 21 | Anchor pin | 12 | 7061-W10-C1K1 |
| ○ | 22 | Two-to-one converter | 2 | 7061-W10-G1W1 |
| ○ | 23 | Button pin | 8 | 7061-W10-E1W1 |
| ○ | 24 | String (100 cm) | 1 | R39-W85-100 |
| ○ | 25 | Part separator tool | 1 | 7061-W10-B1Y |
| ○ | 26 | Rounded square frame | 4 | 3941-W10-B1W |
| ○ | 27 | Rounded short frame | 4 | 3941-W10-A1W |
| ○ | 28 | Rounded curved rod | 8 | 3941-W10-C1W |
| ○ | 29 | Belt connector | 3 | 3941-W10-D1K |
| ○ | 30 | Smart furniture adapter A | 1 | 3941-W10-E1O |
| ○ | 31 | Smart furniture adapter B | 1 | 3941-W10-E2O |
| ○ | 32 | Die-cut plastic sheets (Set of 3) | 1 | K41#3941-US |
| ○ | 33 | Test tube | 1 | 717120 |
| ○ | 34 | Test tube lid | 1 | 717949 |
| ○ | 35 | Black felt-tip marker | 1 | 714020 |
| ○ | 36 | Set of 6 paint colors and brush | 1 | 717947 |
| ○ | 37 | White cotton fabric sheet | 2 | 717948 |
| ○ | 38 | Barbie or Nikki scientist doll | 1 | 718061 |
| ○ | 39 | Small sprocket | 1 | 3569-W10-D2B |

For some experiments, you will also need: scissors, bowl or plastic tub, water, two hardcover books, paper clips, tape, paper towel, seam sealant (optional), measuring cup, food coloring, spoon, 6 drinking glasses or cups, baster, sugar, a few coins, plant leaves, paper plate or paint palette, newspaper, pin or clip, fresh white carnation (or a stalk of celery), double-sided tape

If you are missing any parts, please contact Thames & Kosmos customer service.

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Spinning Closet Rack



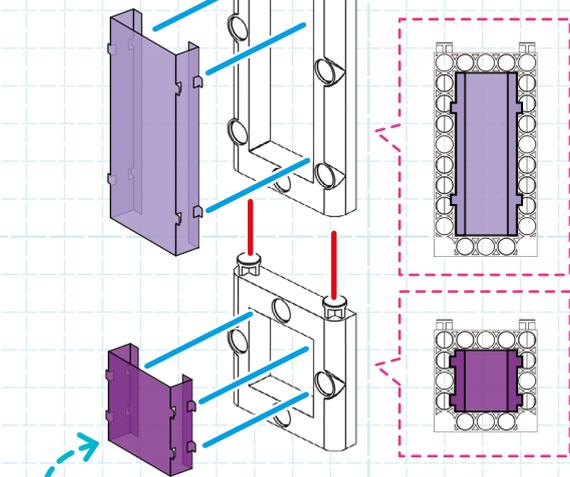
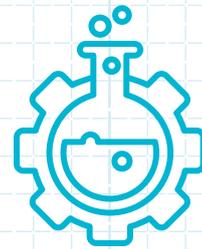
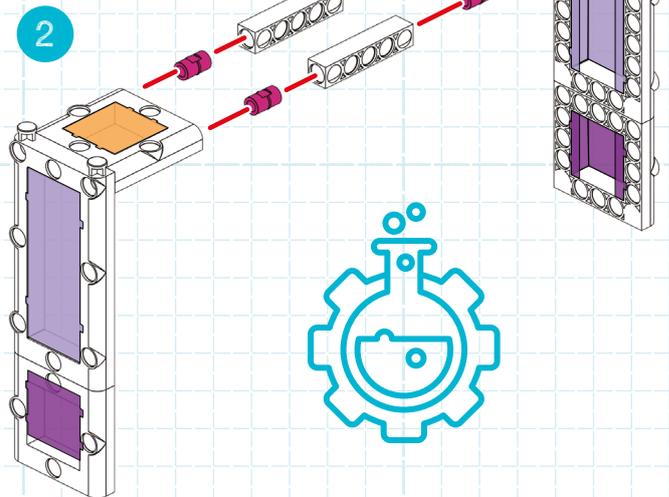
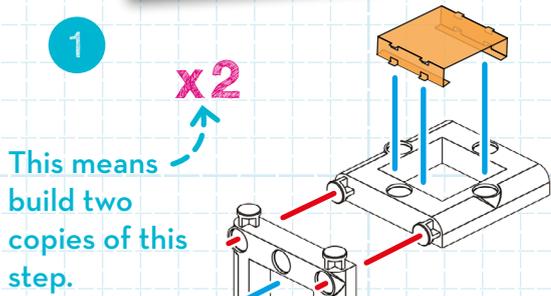
"Here's my solution." Barbie showed the sketch to Nikki. "It's a spinning closet rack. It doubles the usable hanging space, and it rotates so the clothes come back around."

"Sounds like a fun project. Let's build it!" Nikki beamed.

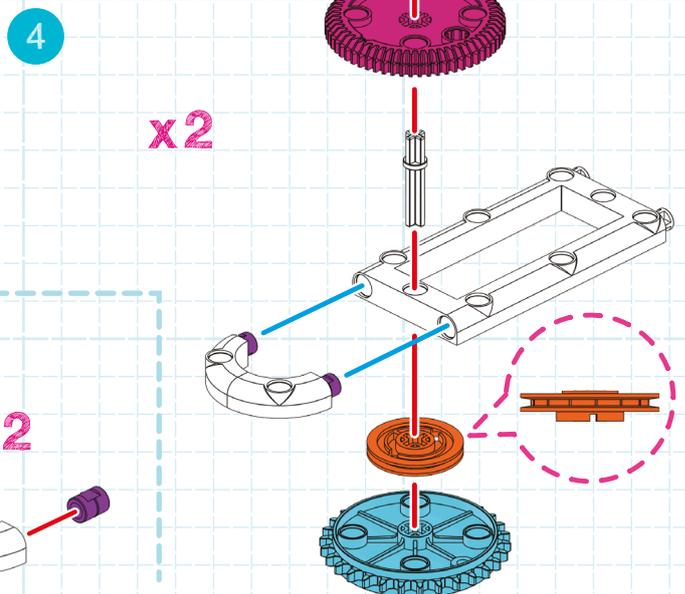
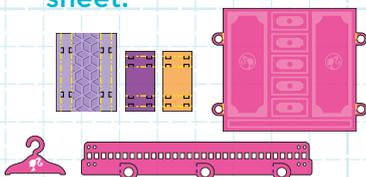


BUILD

Help Barbie and Nikki build the spinning closet rack. Follow the assembly steps in order. The lines drawn between parts show you how the parts go together.



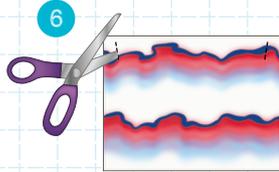
These parts are from the die-cut plastic sheet.



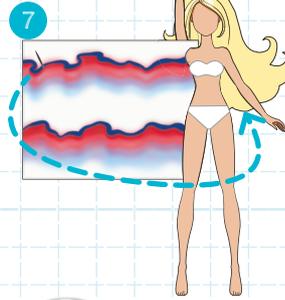
Chromatography Dress

Done!

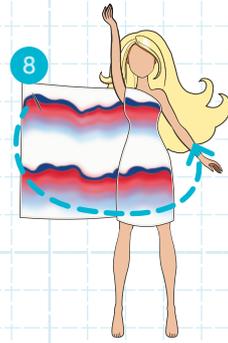
6 Cut small slits in the two upper corners of the fabric.



7 Insert the doll's arm into one of the slits and wrap the dress around the doll.



8 Insert the other arm through the other slit.



Adjust the wrap dress on the doll. You can belt it with a small strip of fabric.



WHAT'S HAPPENING?

What happened to the ink from the marker in this experiment? A lot of materials appear to be uniform, but they are actually a mixture of different substances. In this experiment you saw that the ink from the black marker is actually a combination of different color dyes!

The method used in this experiment to separate the different dyes in the marker ink is called *chromatography*. Chromatography comes from the Greek words *chroma*, which means "color," and *graphein*, "to write." So when you are doing chromatography, you are writing in color!

Chromatography works by dissolving the substance that you want to separate, in this experiment the dyes in the marker ink, into what is called the *mobile phase*. The mobile phase is then passed through a stationary phase. In chromatography the mobile phase moves, just as the name suggests, while the stationary phase does not. In this experiment what do you think was the stationary phase? What part of the separation process did not move?

In this experiment the stationary phase was the cloth. When the water and ink pass through the cloth, the different dyes are separated because they are attracted to the cloth by different amounts. The dyes that have a strong attraction to the cloth do not move much, so they stay at the bottom edge of the cloth.

It may seem strange that the dye would be attracted to the cloth. But the water is actually able to move vertically up the cloth because it is pulled by its attraction to the cloth. This phenomenon is called *capillary action*.



"That looks so cool," Nikki said. "Let's do the same thing to our lab coats! We'll really stand out in chem class!"

"These colorful gradients are really speaking to me. Maybe

I want to wear a rainbow spectrum dress to the Gala," Nikki said.

"That would look really good. But how do you make a rainbow?" Barbie asked.

"One time, we made a rainbow in a test tube," Nikki answered. "Let's try it. We need some stuff from the kitchen."



BUILD

Help Barbie and Nikki make a rainbow in a test tube. First, follow these steps to build a test tube holder.

