

OPTICAL SCIENCE & ART



Experiment Manual

SCIENCE EDUCATION SET

WARNING — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

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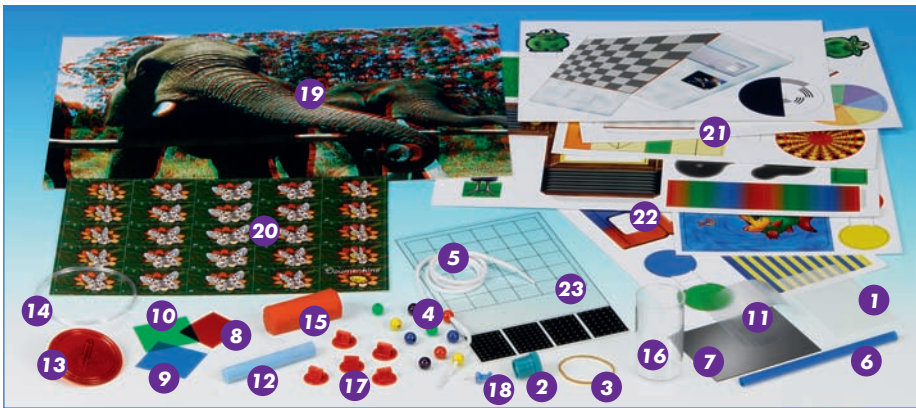
A Word to Parents and Adults

What does light have to do with seeing? How do our eyes work and can we really trust them? This experiment kit will give your child a basic, but well-rounded, introduction into the world of optics. It will show how easy it is to outsmart our eyes, and how not everything is the way it appears.

The topic of optics is complex, and experiments with optical illusions often require a certain amount of practice, concentration, calm, and patience. Please stand by your child with help and advice, and provide support when it is needed.

Please also pay attention to the basic rules for safe experimentation on the inside front cover. It is best to read them together with your child before starting. We wish you and, above all, your young researcher a lot of fun, a lot of astonishment, and a lot of "Aha!" moments.

Kit Contents



No.	Description	Qty.	Part No.	No.	Description	Qty.	Part No.
1	Transparent paper	1	705 800	13	Top	1	703 548
2	Lens	1	702 342	14	Optical fiber	1	707 450
3	Rubber ring	1	161 412	15	Modeling clay	1	000 588
4	Wooden beads	10	772 632	16	Cup	1	707 451
5	Cord	1	350 134	17	Mounting stand	5	701 384
6	Drinking straw	1	707 448	18	Push pin	1	707 452
7	Mirror	1	702 221	19	3D poster	1	707 446
8	Red film	1	161 415	20	Flip book paper sheet	1	707 445
9	Blue film	1	702 230	21	Die-cut sheet 1 (thick cardboard)	1	707 443
10	Green film	1	161 416	22	Die-cut sheet 2 (thin cardboard)	1	707 444
11	Spectral film	1	707 449	23	Film sheet	1	707 447
12	Blue chalk	1	705 361				

✓ You will need:

Scissors, tape, glue, flashlights, pencil

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02 Experiment

Rainbow Colors

What color is light? Is the answer white? After all, the walls of a room are usually white. Or is it light blue, like the color of the sky on a cloudless day? Or is it like the yellow-red of a candle flame? Let's investigate this in the next experiment.

✓ You will need:

Mirror, flashlight, sheet of white paper, shallow bowl (filled with water)

➔ Procedure:

Pull the protective film off of the mirror and place it at a slight angle in the shallow bowl filled with water. Then shine the flashlight on it.

The mirror will reflect the light. You will have to capture this light with the sheet of paper. You'll have to move the paper around a little before you can find the light rays. But then, what do you see? Out of the ordinary white or yellow light from the flashlight, a colorful rainbow emerges.

i Explanation:

White light is actually composed of light from all possible colors, from purple to deep red. In water, the various-colored rays are bent a little bit. Each color bends a little more or less than the others.

In this way, you get rainbow colors. After a thunderstorm, a fine mist remaining in the air can create the same effect. Now you can have a better understanding of the colors that exist all around us. A red rose looks red to us because it absorbs all the other colors from sunlight and only reflects the red rays back to our eyes. Something green absorbs everything except green rays. And so on.

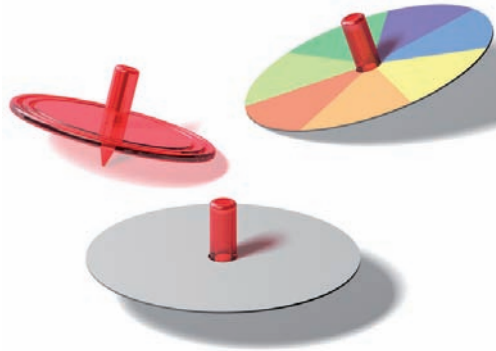


You can also think about this in reverse: What color do you get when all the colors of the rainbow mix together?

✔ **You will need:**

Disk from die-cut sheet 2, top

Stick the rainbow disk onto the top and give it a powerful twist. Now you can see that all the colors produce white when they are mixed together. It may appear more as gray to you, but you should see flashes of white.



DID YOU KNOW?

Electromagnetic Waves

Have you ever thrown pieces of gravel into a lake? When you do that, you can see how each pebble creates a small circular ripple in the water. The same thing happens when a ship passes by the shore of the ocean or a river. If you watch closely, you may also be able to tell that larger stones create bigger waves than smaller stones do.

According to one explanation by scientists, light also spreads out like a wave. Each color in the rainbow is a slightly different wave with its own wavelength, as you can see in the picture below. Light is just one part of a much larger spectrum of waves — specifically, the part that we can see with our eyes. Other waves from this spectrum, called the **electromagnetic spectrum**, flow as electric current out of your wall outlet, or supply your radio with music.

