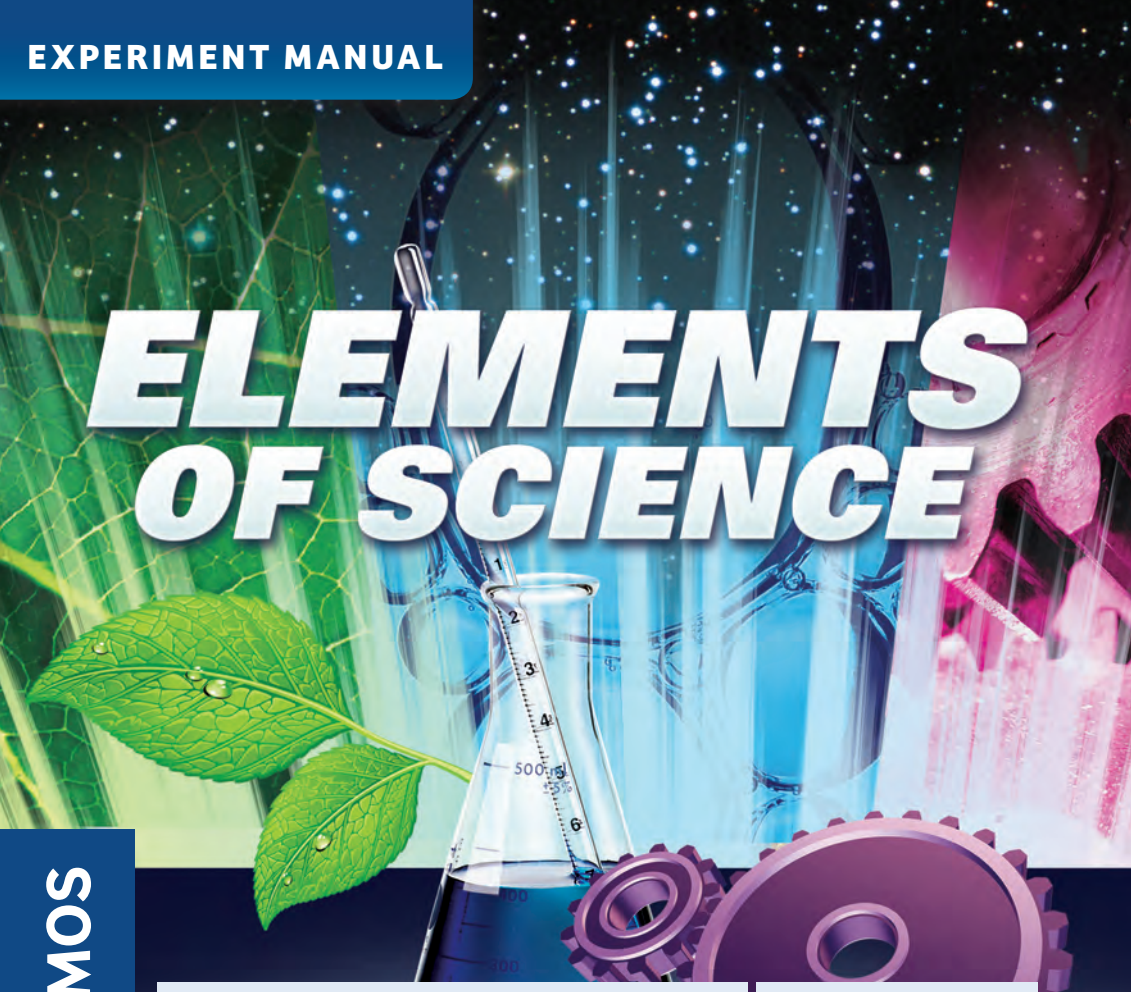
EXPERIMENT MANUAL

# ELEMENTS OF SCIENCE



THAMES & KOSMOS

**WARNING.** Not suitable for children under 10 years. For use under adult supervision. Contains some chemicals which present a hazard to health. Read the instructions before use, follow them and keep them for reference. Do not allow chemicals to come into contact with any part of the body, particularly the mouth and eyes. Keep small children and animals away from experiments. Keep the experimental set out of reach of children under 10 years old. Eye protection for supervising adults is not included.

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

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# Experiment Manual

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# Contents



631116-02-200116


| No. | Description | Qty. | Part No. |
|---|---|---|---|
| 1 | Die-cut card | 1 | 702238 |
| 2 | Cutout sheet | 1 | 702236 |
| 3 | Sticker sheet | 1 | 702217 |
| 4 | Black paper sheet | 1 | 702303 |
| 5 | Tracing paper | 1 | 350137 |
| 6 | Blotting paper | 1 | 000569 |
| 7 | Packet of film with contents as follows: | 1 | 770783 |
| | 7a Red plastic film (1) | | |
| | 7b Green plastic film (1) | | |
| | 7c Blue plastic film (1) | | |
| | 7d Yellow plastic film (1) | | |
| 8 | Mounting foot | 4 | 701384 |
| 9 | Safety glasses | 1 | 717019 |
| 10 | Citric acid | 1 | 032132 |
| 11 | Iron filings | 1 | 033512 |
| 12 | Sodium bicarbonate | 1 | 033532 |
| 13 | Sodium carbonate | 1 | 033412 |
| 15 | Dye tablets | 1 | 039051 |
| 16 | Lid opener | 1 | 070177 |
| 17 | Measuring spoon | 1 | 035017 |
| 18 | Pipette | 2 | 232134 |
| 19 | Large measuring cup | 2 | 087077 |
| 20 | Small measuring cup | 3 | 061150 |
| 21 | Tubing | 1 | 702214 |
| 22 | Funnel | 1 | 000410 |
| 23 | Wooden stick | 4 | 020042 |
| 24 | Drinking straw, red/white | 4 | 000414 |
| 25 | Drinking straw, transparent | 1 | 701377 |

| No. | Description | Qty. | Part No. |
|---|---|---|---|
| 26 | Rubber band | 2 | 161412 |
| 28 | Clay | 1 | 000588 |
| 29 | 5 balloons in a pouch | 1 | 770982 |
| 30 | Packet with contents as follows: | 1 | 770751 |
| | 30a Paper clips (20) | | |
| | 30b Metal cap (3) | | |
| | 30c Needle (1) | | |
| 31 | Styrofoam ball | 1 | 701382 |
| 32 | Plastic plate | 1 | 000579 |
| 33 | Mirror foil without hole | 1 | 702221 |
| 34 | Mirror foil with hole | 1 | 702222 |
| 35 | Styrofoam disk | 1 | 702235 |
| 36 | Sandpaper | 1 | 700880 |
| 37 | Light socket | 2 | 702218 |
| 38 | Light bulb | 2 | 702219 |
| 39 | Piece of copper wire with plastic insulation | 5 | 702785 |
| 40 | Spool of copper wire | 1 | 702213 |
| 41 | Bar magnet | 2 | 011287 |
| 42 | Ring magnet | 1 | 011288 |
| 43 | Iron core | 1 | 011297 |
| 44 | Compass | 1 | 000276 |
| 45 | Magnifying cup | 1 | 702830 |
| 46 | Large lens (purple) | 1 | 702341 |
| 47 | Small lens (green) | 1 | 702342 |
| 48 | Plastic screw | 1 | 702343 |
| 49 | Adapter cap | 1 | 702344 |
| 50 | Insertion tube (dark blue) | 3 | 702345 |

Note: Do not discard the styrofoam tray that holds the parts in this kit, as it is used for some experiments.

**Caution!**

**Do not bring the magnets close to music cassettes, computer disks, or videotapes: The data stored on them could be damaged and lost! Be careful not to inhale the iron filing dust. Immediately after the experiment, dispose of the leftover iron filings in the garbage or vacuum them up! Always close the container immediately after use!**

# 39 Iron Love

You have three magnets in your lab, one round one and two bar magnets. Try seeing how strongly they attract other materials — and which ones.

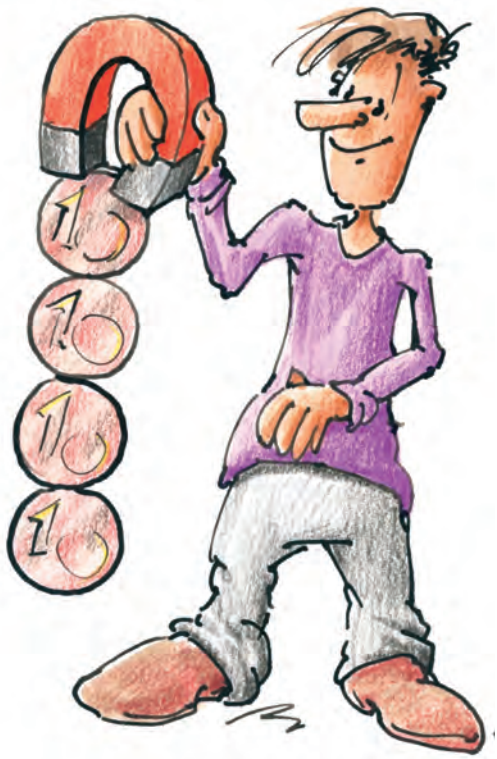
**You will need:** round magnet, 2 bar magnets, iron filings, lid opener, measuring spoon, iron core, paper clips, *various objects from your kit and home*

**Here's how:** Hold the magnets up to various parts from the kit and see if they are attracted. Take them through your home and test various materials. You will determine that only certain things are attracted to a magnet, while others show no attraction whatsoever.

**What's going on?** A magnet will only attract metallic iron (and some rarer metals nickel and cobalt) — for example, the iron rods or iron filings in your kit. It has no effect on wood, aluminum, plastic, brass, copper wire, or other materials. Sometimes you can't see that something contains iron: for example, a copper-coated paper clip or some types of hardware. But the magnet recognizes the iron anyway.

## Supplemental Experiment

Suspend the iron core from a magnet and then bring a paper clip near it. The paper clip will be attracted, too. The magnet transfers part of its power to pieces of iron that are attached to it, but only temporarily. If you remove the magnet again, the paper clip will fall away. You can also create a magnet chain with some paper clips, hardware, or small nails. The magnet will even transfer some of its power to the iron core when it just comes near it.



# 40 Penetrating Force

Air apparently presents no obstacle to the strange force of attraction between magnets and iron. And how about other materials?

**You will need:** round magnet, iron core, plastic plate, mirror, 1 large measuring cup, *1 sheet of white paper, 1 iron pot, household materials*

**Here's how:** Test whether objects inserted between the magnet and iron core weaken the magnetic force of attraction. First use the magnet to test whether the iron pot is really made of iron.

**What's going on?** The strength of the magnetic force depends on distance. But the magnetic force can easily penetrate most materials such as wood, porcelain, plastic, water, and other metals. However, other magnetic materials may cause interference with a magnet.

## Did you know...

**...that there are kinds of steel that contain iron but that are nevertheless nonmagnetic?**

Usually, they contain certain added materials such as chrome or nickel metals, or they are heat-treated in certain ways. Your measuring spoon is made of this kind of material. The advantage is that, unlike plain iron, it will not rust.



# 41 Trash Separator

The fact that a magnet only attracts iron can come in very handy — for example, when separating mixtures of things.

**You will need:** measuring spoon, iron filings, iron core, round magnet, 1 large measuring cup, lid opener, *fine sand*

**Here's how:** Mix some sand and iron filings in the measuring cup. Now, if you tried to separate the two parts of the mixture with tweezers, you would be at it a long time. Place the round magnet on the iron core, which will magnetize the iron core until you remove the magnet again. This means that you can turn your magnetic separator on and off. If you hold the magnet and iron core over the mixture and shake it a little, the iron filings will jump up to the magnet and the sand will stay behind in the