

 Thames & Kosmos®



ELEMENTS OF SCIENCE

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.



No.	Description	Qty.	Part No.	No.	Description	Qty.	Part No.
1	Die-cut card	1	702238	26	Rubber band	2	161412
2	Cutout sheet	1	702236	28	Clay	1	000588
3	Sticker sheet	1	702217	29	5 balloons in a pouch	1	770982
4	Black paper sheet	1	702303	30	Packet with contents as follows:	1	770751
5	Tracing paper	1	350137	30a	Paper clips (20)		
6	Blotting paper	1	000569	30b	Metal cap (3)		
7	Packet of film with contents as follows:	1	770783	30c	Needle (1)		
7a	Red plastic film (1)			31	Styrofoam ball	1	701382
7b	Green plastic film (1)			32	Plastic plate	1	000579
7c	Blue plastic film (1)			33	Mirror foil without hole	1	702221
7d	Yellow plastic film (1)			34	Mirror foil with hole	1	702222
8	Mounting foot	4	701384	35	Styrofoam disk	1	702235
9	Safety glasses	1	052297	36	Sandpaper	1	700880
10	Citric acid	1	032132	37	Light socket	2	702218
11	Iron filings	1	033512	38	Lightbulb	2	702219
12	Sodium bicarbonate	1	033532	39	Piece of copper wire with plastic insulation	5	702785
13	Sodium carbonate	1	033412	40	Spool of copper wire	1	702213
15	Dye tablets	1	039051	41	Bar magnet	2	011287
16	Lid opener	1	070177	42	Ring magnet	1	011288
17	Measuring spoon	1	035017	43	Iron core	1	011297
18	Pipette	2	232134	44	Compass	1	000276
19	Large measuring cup	2	087077	45	Magnifying cup	1	702830
20	Small measuring cup	3	061150	46	Large lens (purple)	1	702341
21	Tubing	1	702214	47	Small lens (green)	1	702342
22	Funnel	1	000410	48	Plastic screw	1	702343
23	Wooden stick	4	020042	49	Adapter cap	1	702344
24	Drinking straw, red/white	4	000414	50	Insertion tube (dark blue)	3	702345
25	Drinking straw, transparent	1	701377				

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.

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

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.

