

My magnet **ACTIVITY BOOK**

Learn with Professor Gauss!



MAGNET EXPERT[®]
EXPERTS IN MAGNETICS



My name is Professor Gauss, I am the magnetic genius at Magnet Expert! Before We start to learn about magnets, fill in your name!



**THIS BOOK
BELONGS TO:**

FUN FACT



The Earth is one **HUGE** magnet!

Contents

1. What is a magnet
3. What is an electromagnet
5. How they are made
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19. Different forms of magnets
21. What can affect a magnet
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24. Find the magnets
25. Answers

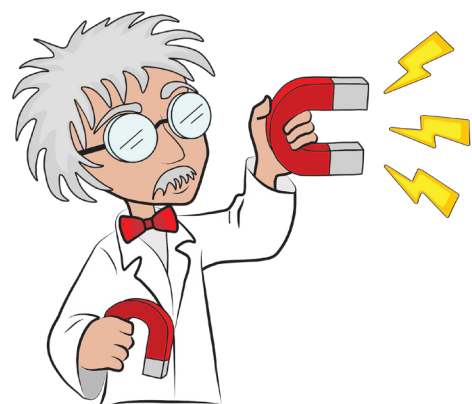


WHAT IS A MAGNET

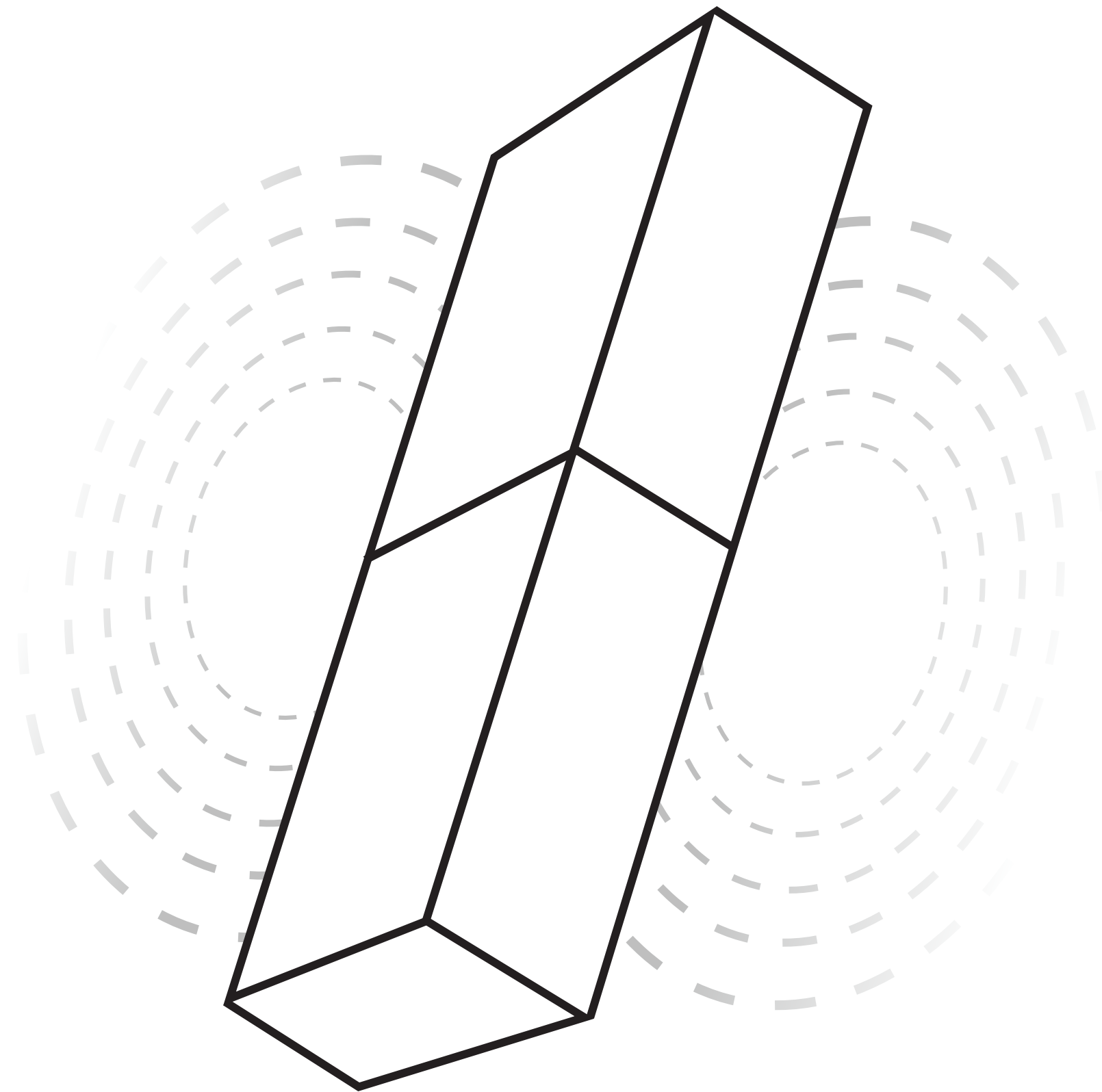
A magnet is an object that gives off an invisible magnetic field.

Each magnet has a south pole and a north pole, and opposite poles attract.

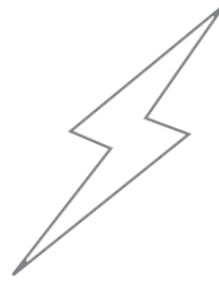
If you put the same poles together, the magnets will repel (push away) from each other!



1



2

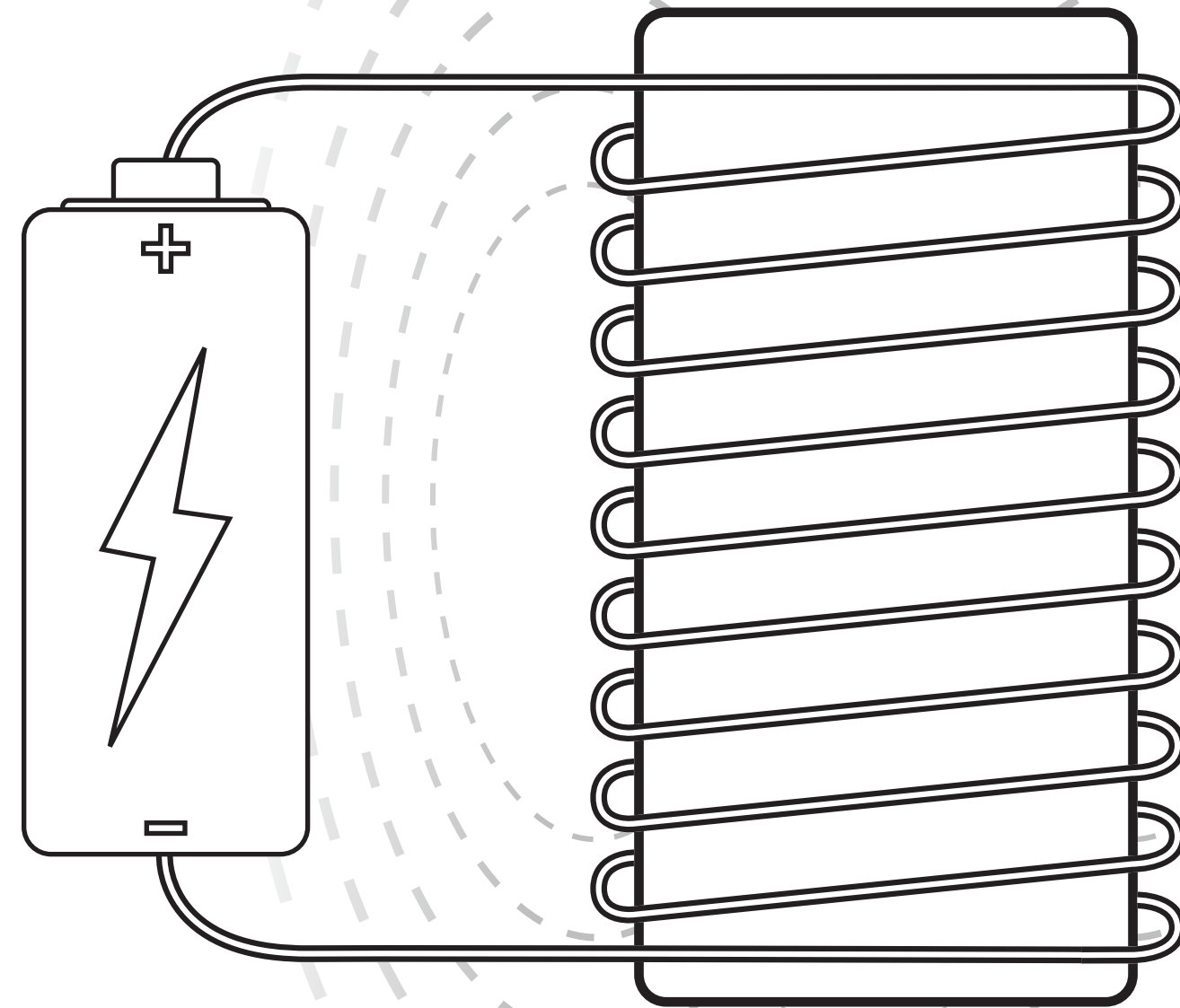


WHAT IS A ELECTROMAGNET

An electromagnet is made when wrapping wire around a coil and then connecting this to a battery or power supply, so the magnet can be turned on and off!



When an electric current flows through a wire, a magnetic current is produced around it.



HOW MAGNETS ARE MADE!

STAGE ONE

Creating a rare earth magnet starts with digging up the rare earth material. The rare earth material is then separated by melting in an extremely hot airless space.

STAGE TWO

The mixture is then grinded into a very fine powder in a mill! This powder is then pressed into pre-made shapes (which we call moulds), and magnetic energy is applied to the mould.

STAGE THREE

The material then has its magnetic field taken away and heated through a process called sintering to make the powdered magnet particles stick together!

STAGE FOUR

The material then gets very cold, extremely fast! This is the when the raw magnets are cut into their shape, because they are so hard, diamond cutting tools are needed!

STAGE FIVE

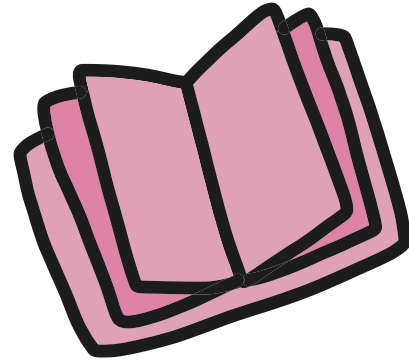
Magnets are very hard, so it is very easy to damage them! They must be coated, cleaned, dried and plated.

FINAL STAGE!

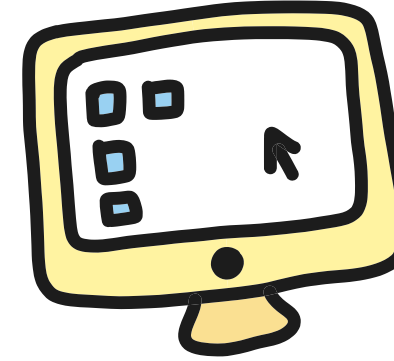
once plated, the finished material is then put inside a coil and an electric current is passed through to create a magnetic field. A magnet is born!



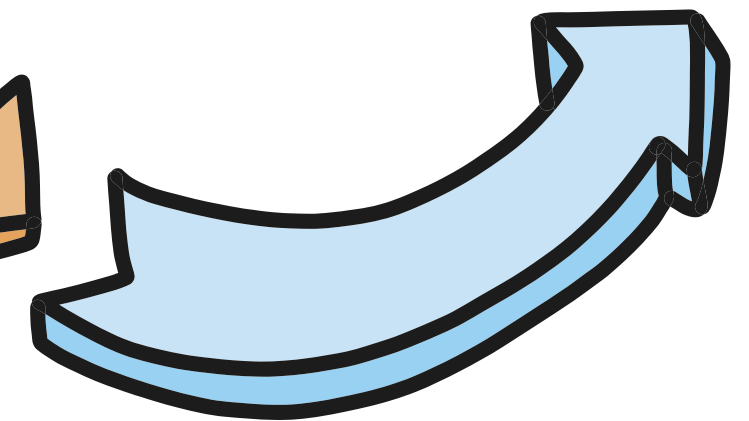
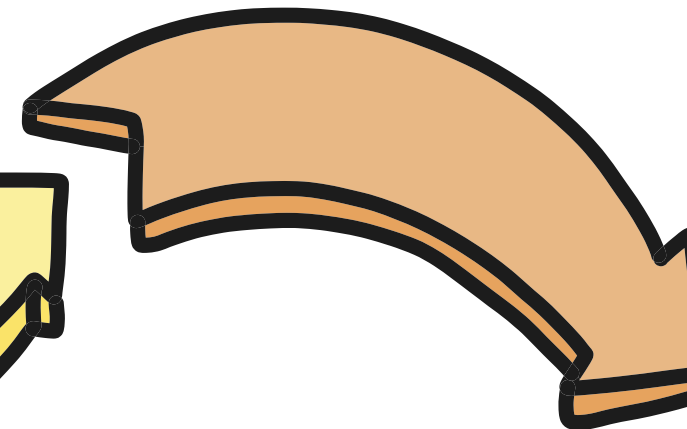
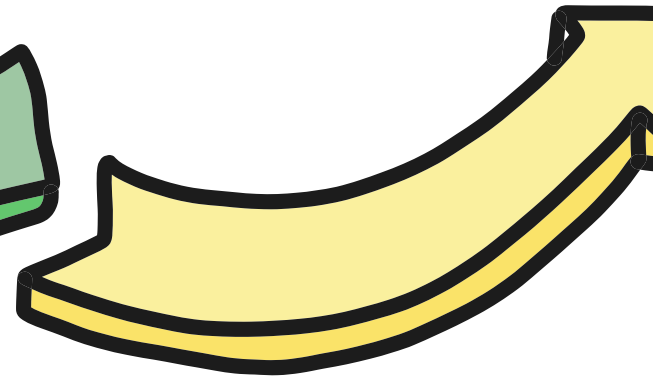
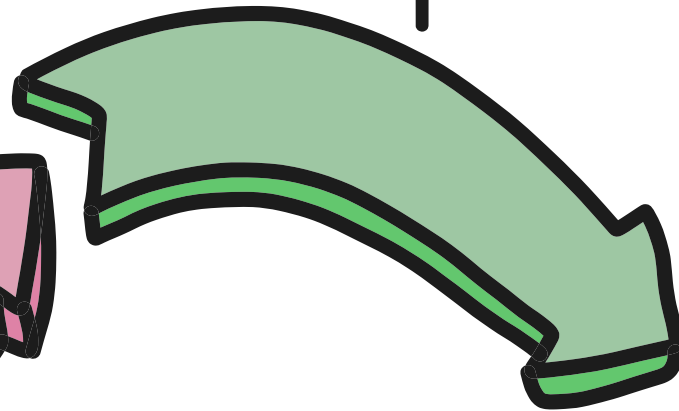
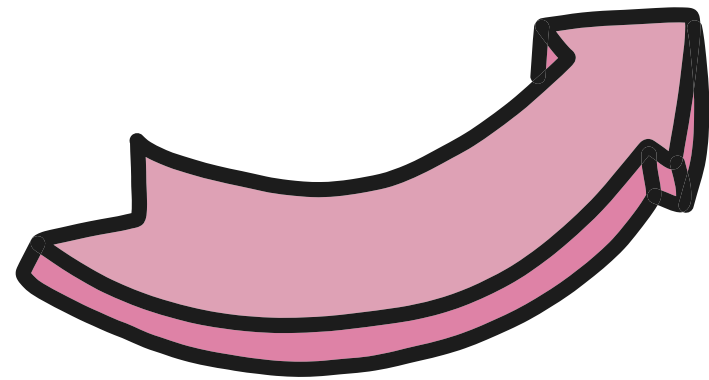
BRIEF HISTORY



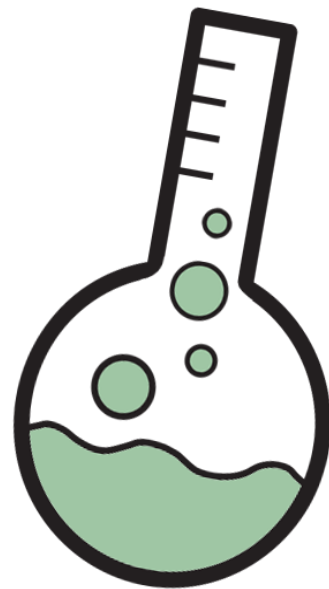
IN 1820 TWO DIFFERENT SCIENTISTS MADE A DISCOVERY, HANS-CHRISTIAN ORSTED AND ANDRE- MARIE AMPER CONFIRMED THE RELATIONSHIP BETWEEN ELECTRICITY AND MAGNETISM. THIS ROCKED THE SCIENTIFIC WORLD LEADING TO THE FIRST ELECTROMAGNET AND ELECTRIC MOTOR!



IN 1968 HEWLETT-PACKARD BEGAN MARKETING THE FIRST PERSONAL COMPUTER. THE HD9100A WAS ACTUALLY MARKETED AS A CALCULATOR AS THE MARKET WOULD NOT HAVE ACCEPTED IT IS A COMPUTER BECAUSE THE BELIEF WAS THAT A COMPUTER HAD TO BE LARGE!



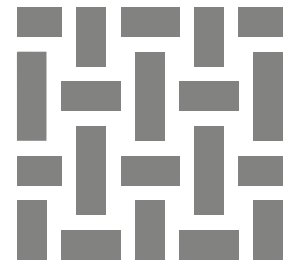
IN 1175 ALEXANDER NECKEM, AN ENGLISH MONK FIRST DESCRIBED THE WORKINGS OF A COMPASS. NECKEM WAS THE FIRST TO REALISE THAT A MAGNET IS DRAWN TO ALIGN WITH THE EARTH'S MAGNETIC FIELD! LETS SKIP FORWARD TO SEE HOW MAGNETS IMPACTED SCIENCE!



IN 1930 THE FIRST ALNICO MAGNETS ARE PRODUCED. GERMAN SCIENTIST HERMANN KEMPER STUDIED THE USE OF MAGNETIC FIELDS IN CONJUNCTION WITH TRAIN AND AIRPLANES. THIS QUICKLY INFLUENCED INVENTORS, IN 1943 THE FIRST PROGRAMMABLE ELECTRONIC COMPUTER WAS BUILT!



IN 1952 THE FIRST COMMERCIAL CERAMIC/ FERRITE MAGNETS ARE PRODUCED. 14 YEARS LATER IN 1966 K.J. STMAT AND G. HOFFER FROM THE US AIR FORCE MATERIALS LABORATORY BEGIN TO DEVELOP RARE-EARTH MAGNETS.

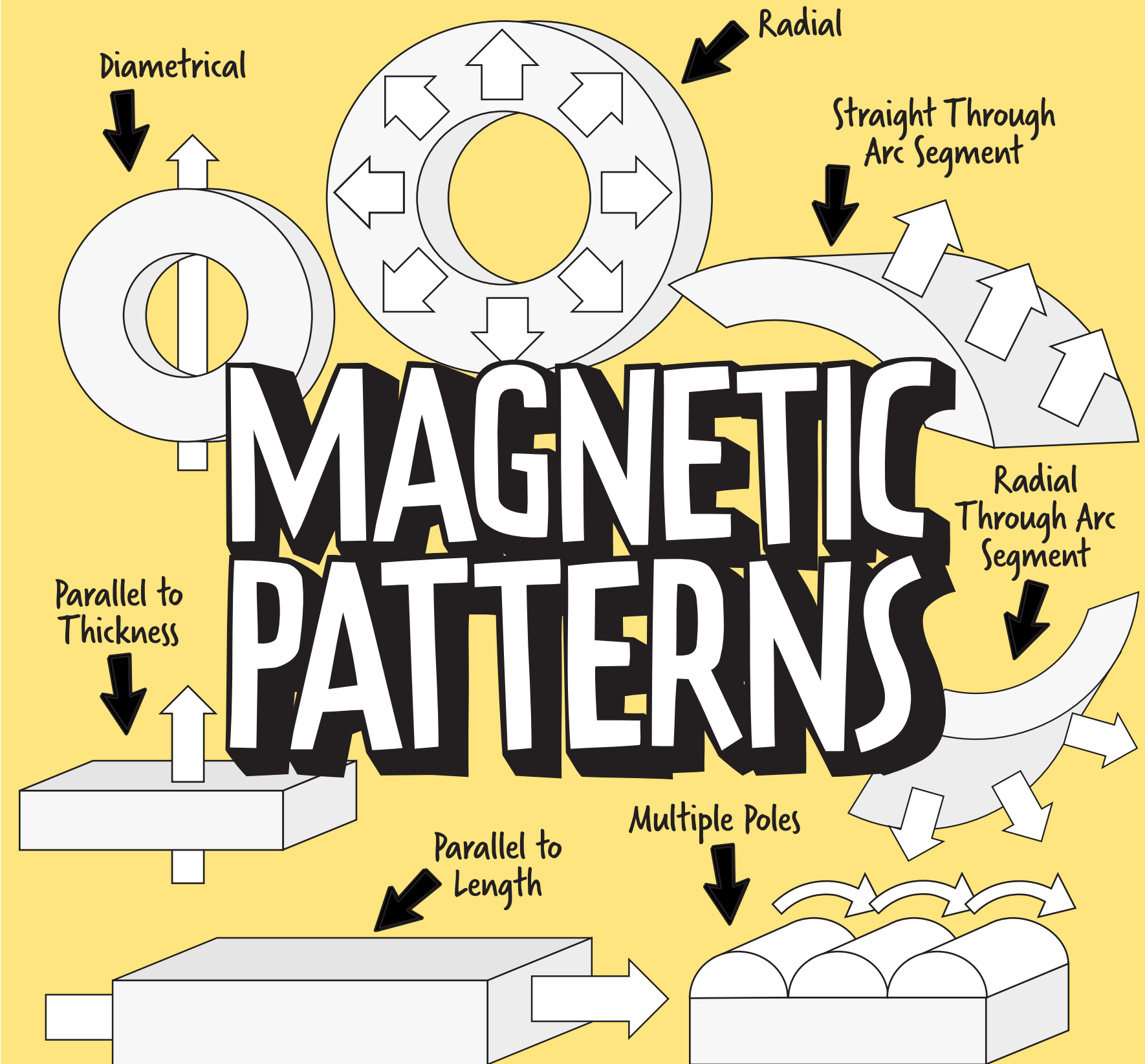


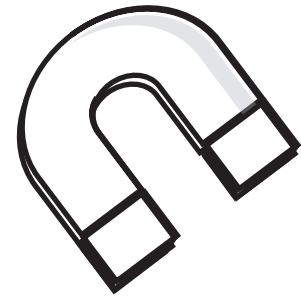
MAGNETIC PATTERNS

A magnet's poles are the surfaces from which lines of magnetism leave a magnet and reconnect on return to the magnet.



If you want to see the magnetic fields produced by a magnet, try sprinkling iron filings onto a piece of paper around the magnet!

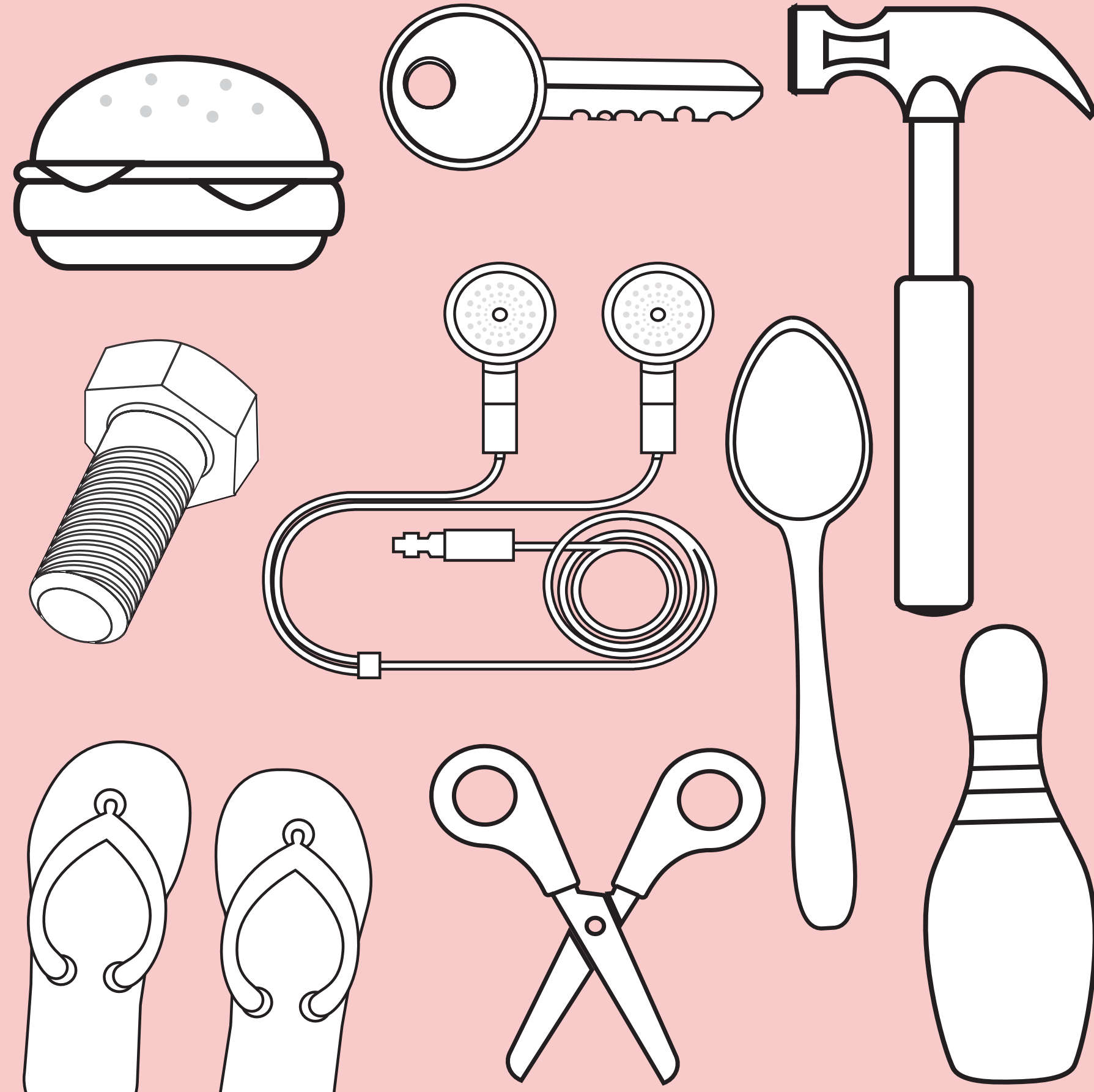
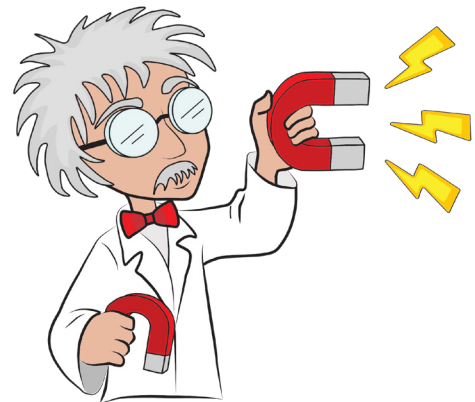




WHICH ITEMS ATTRACT

Magnets will only attract some materials, such as iron, steel and nickel. A magnet will not attract materials such as wood, glass or plastic.

Which items in the picture do you think a magnet will attract to?





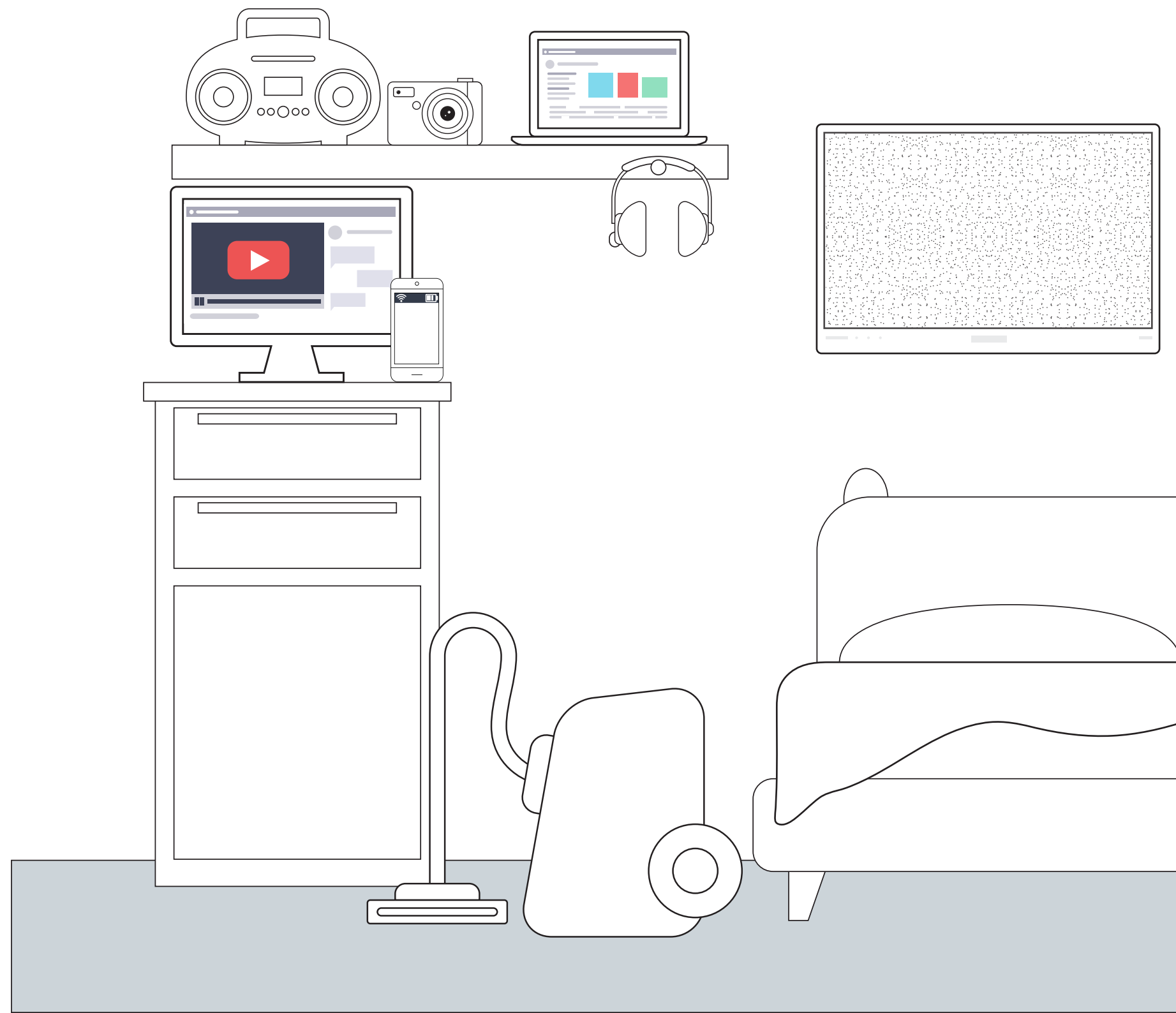
WHERE TO FIND MAGNETS

Did you know there are many magnets in your house already? You may not be able to see all of them, but they are in your computer, TV, headphones, speakers and more!

The electricity running through these items comes from magnetism!



How many items in your house have magnets?

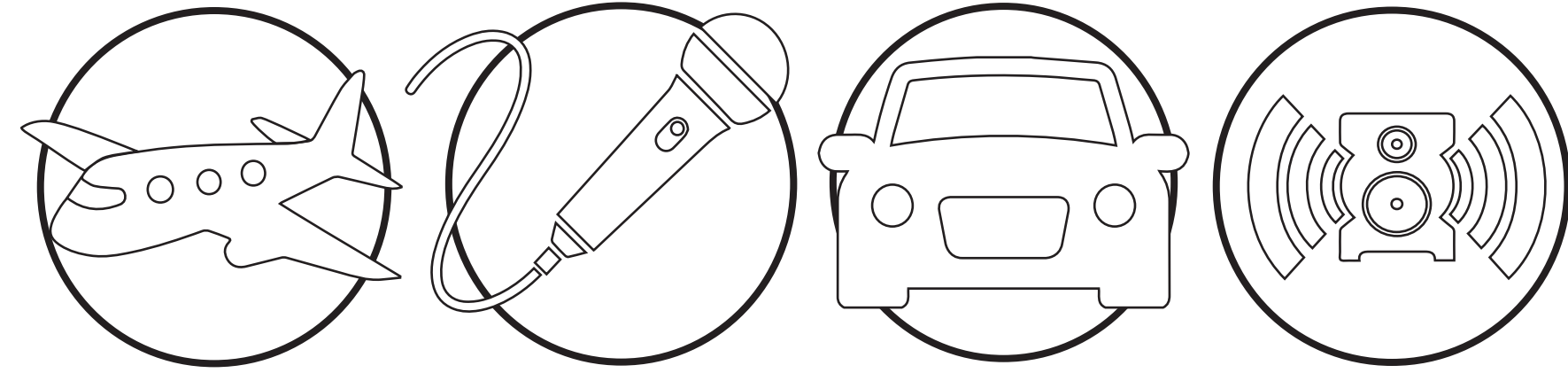
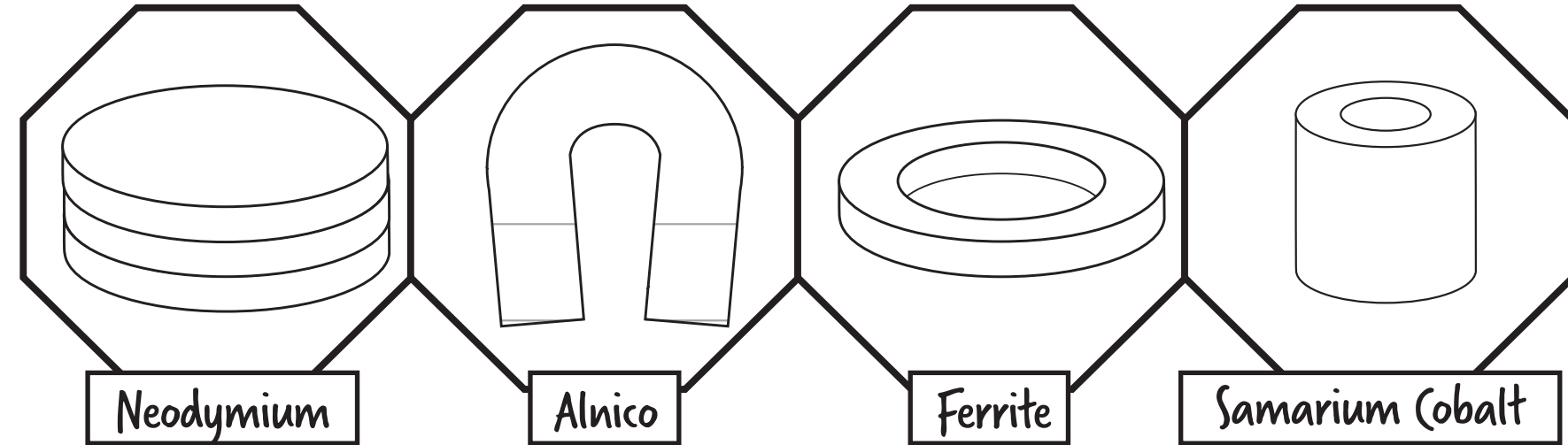


MATCH THE MAGNETS WITH THEIR COMMON USE

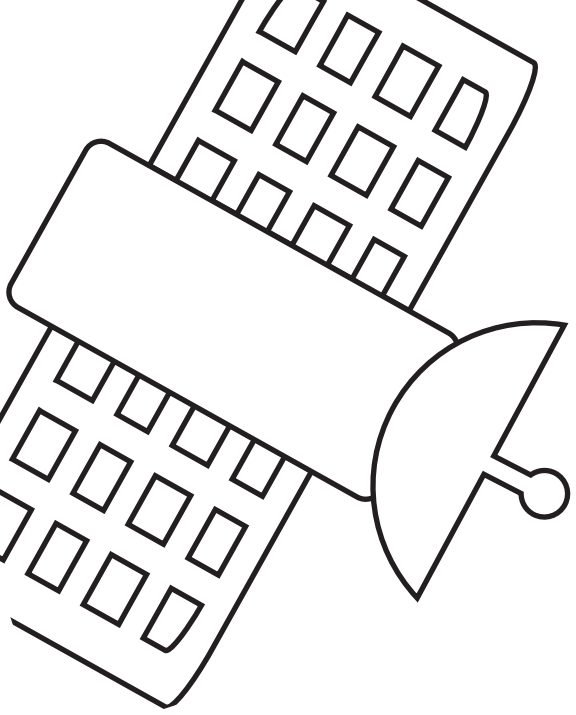


COMMON USES

Magnets have many uses in many different applications. Look around you and consider the devices you use daily and how you travel - they will all use magnets or will need magnets to work!



ANSWERS:
 SAMARIUM COBALT -> CAR - SAMARIUM COBALT MAGNETS ARE COMMONLY USED IN MOTORS AS THEY ARE ABLE TO OPERATE AT EXTREMELY HIGH TEMPERATURES
 NEODYMIUM -> MICROPHONE - NEODYMIUM MAGNETS PRODUCE A MAGNETIC FIELD WHICH CUTS THROUGH THE COIL WITHIN A MICROPHONE WHICH CAUSES THE COIL TO MOVE BACK AND FORTH, CREATING AN ELECTRICAL CURRENT.
 FERRITE -> LOUDSPEAKER - FERRITE MAGNETS CREATE A MAGNETIC FIELD WHICH CAUSES VIBRATIONS WITHIN THE SPEAKER. THE BIGGER THE MAGNET, THE LOUDER THE SPEAKER.
 ALNICO -> AEROSPACE - ALNICO MAGNETS ARE USED WITHIN AEROSPACE APPLICATIONS AS THEY MAINTAIN THEIR PERFORMANCE UNDER EXTREME HEAT



NATURES MAGNET

The earth is like one very big, weak magnet.

The Earth's core is a mix of iron and nickel, which gives it its very own magnetic field.

Like a normal magnet, the Earth has a North Pole and a South Pole!



Did you know, birds use the Earth's magnetic field to help them fly around the globe?





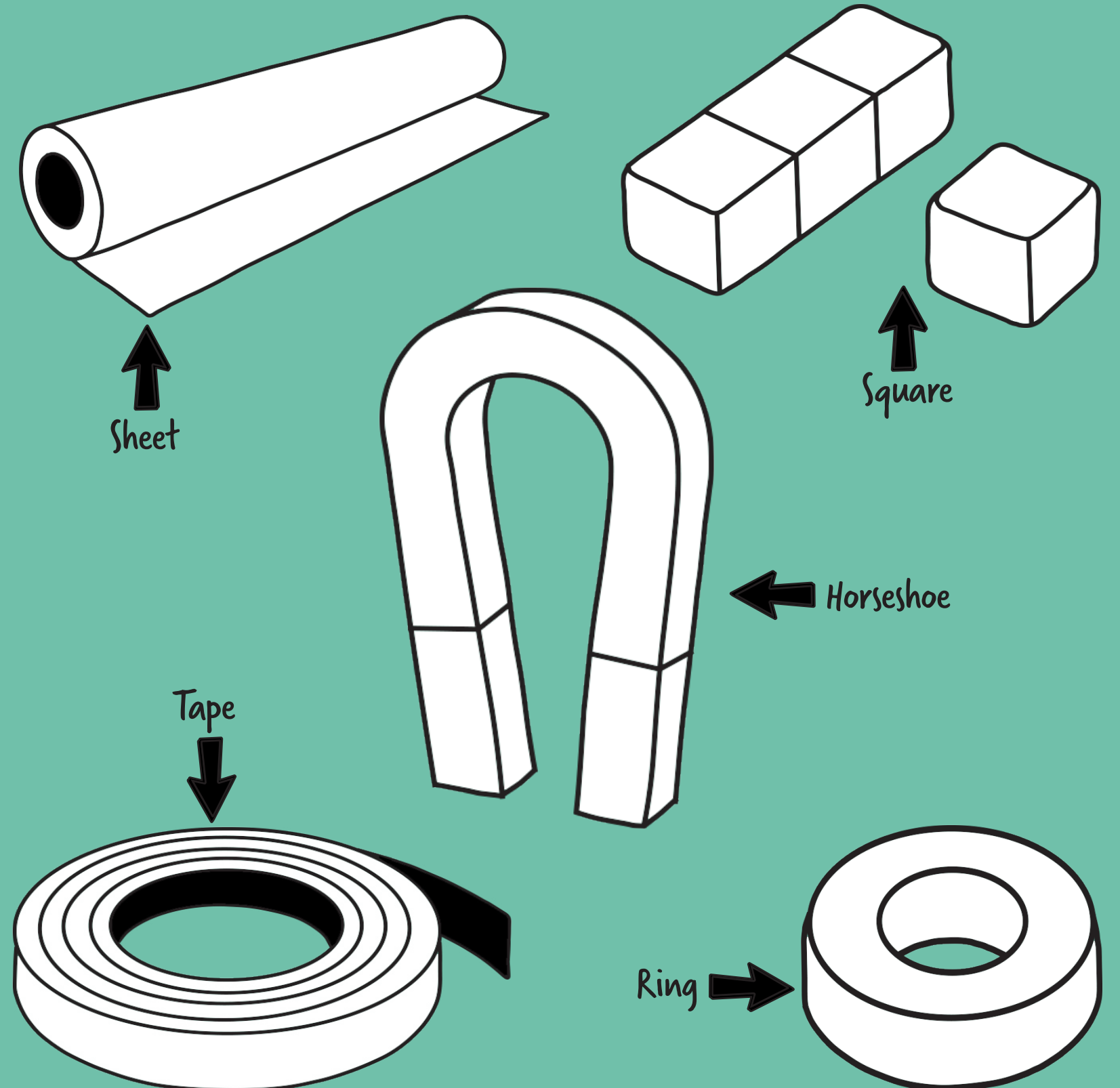
DIFFERENT FORMS OF MAGNETS

Magnets come in all shapes, sizes and colours, here are just a small number!

Each shape is designed for a specific reason, whether it is for retail displays, for use in machinery or for learning how magnetism works.



You may recognise the Horseshoe magnet from your science classes!





WHAT CAN AFFECT A MAGNET?

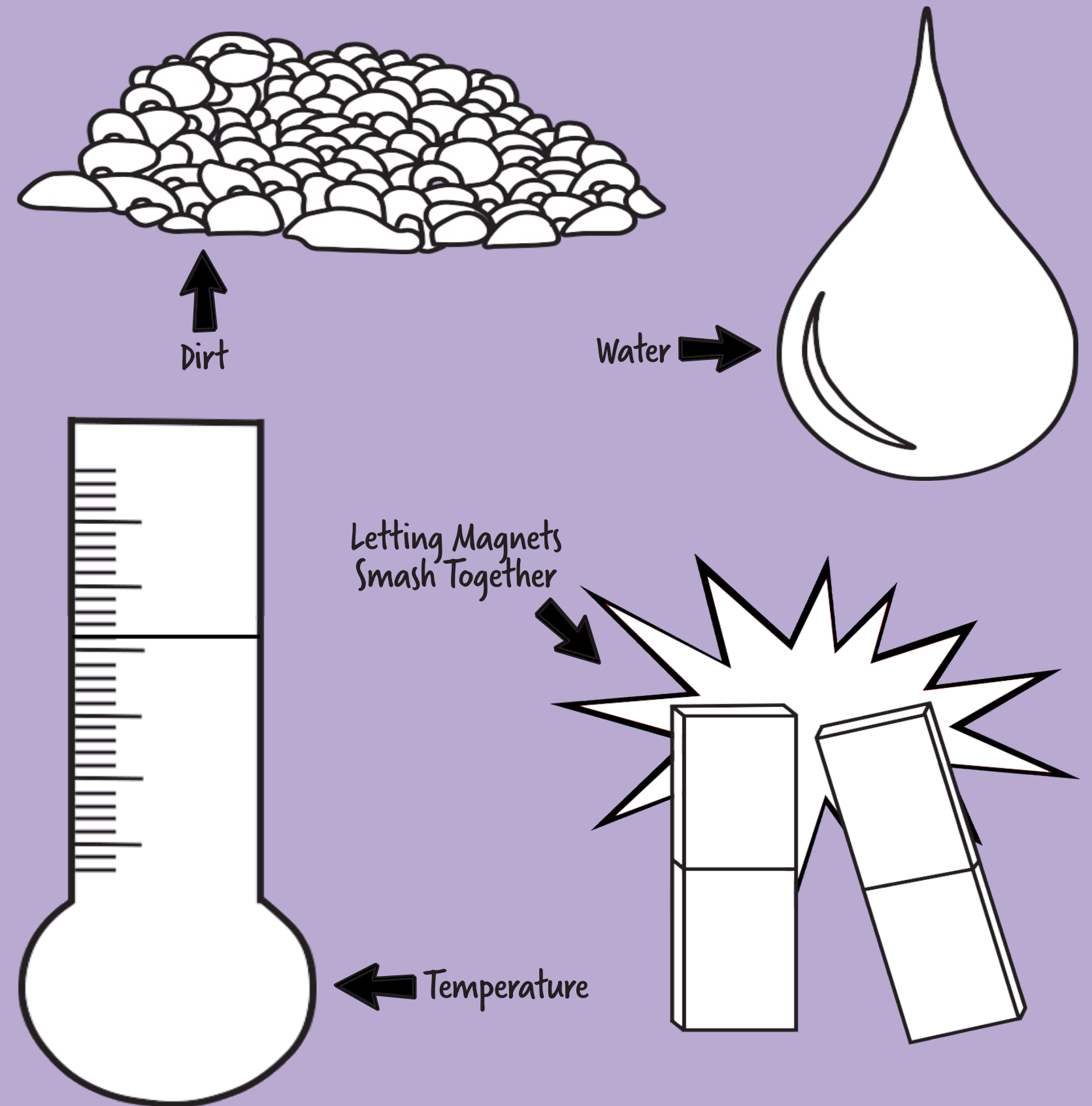
There are many factors that can affect the performance of a magnet.

Dirt or dust can cause 'air gaps' when the magnet is attracted to another magnet.

Magnets can lose performance under extreme heat as the magnetic domains can jumble.

If magnets get too close together, they can jump to each other, causing cracks and chips.

If the plating on a magnet is damaged and water can get inside, the magnet will rust, and the performance will be reduced.





TERMINOLOGY

Now it's time for a word search!

Can you find all of the words that we have learnt about?

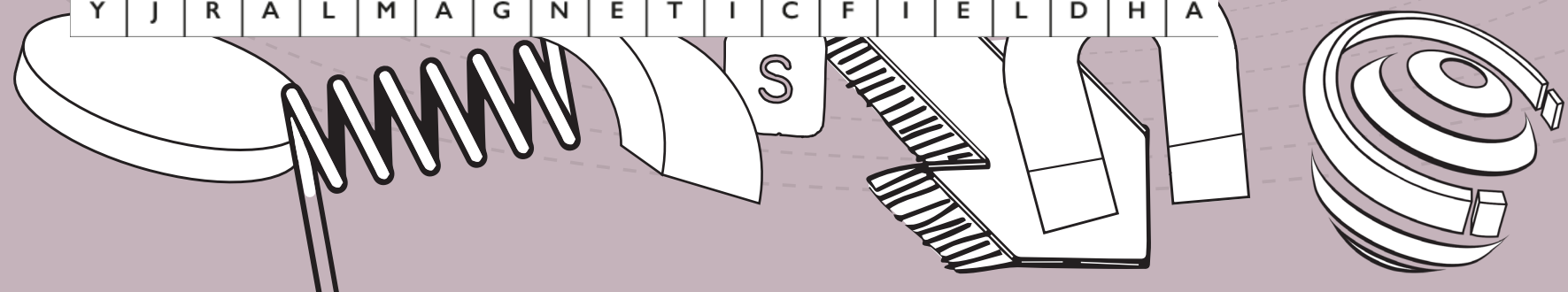
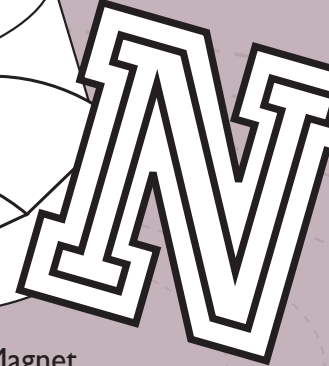


If you need some help, the answers are on the next page, but only look if you have to!

MAGNETIC WORDSEARCH

D	J	A	S	P	O	L	R	H	E	F	Q	C	F	E	R	R	O	U	S
M	A	H	U	H	A	B	O	G	P	E	B	F	I	X	Z	S	C	G	K
L	F	A	R	N	M	A	G	N	E	T	W	B	E	R	I	L	D	X	R
S	G	E	B	E	G	R	K	A	I	O	L	T	E	I	C	T	P	R	U
F	T	L	A	U	W	A	F	U	N	B	I	E	A	C	D	U	T	S	Y
B	R	E	P	E	L	Y	C	H	O	R	J	M	F	P	C	T	I	B	F
V	B	C	C	E	L	R	I	X	R	D	B	U	W	Y	L	G	N	T	V
W	U	T	V	S	I	A	Z	E	T	O	S	N	V	A	H	F	Y	W	A
S	D	R	O	C	C	Y	F	P	H	A	C	E	B	W	L	Z	T	N	X
A	H	O	R	S	E	S	H	O	E	Q	D	O	H	U	V	N	A	D	Y
T	E	M	P	E	R	A	T	U	R	E	C	D	X	I	B	L	I	S	G
U	Q	A	K	P	D	I	M	F	R	M	R	Y	V	A	R	U	R	C	P
R	U	G	Y	S	A	H	B	P	U	B	D	M	K	O	Y	H	G	M	O
A	L	N	K	C	Q	U	L	I	K	B	W	I	W	R	J	X	A	M	L
T	R	E	H	A	I	F	R	G	C	A	S	U	S	C	Q	Z	P	H	A
I	V	T	T	S	O	A	K	X	Y	O	R	M	X	C	Y	J	Z	T	R
O	G	S	U	H	M	W	O	G	L	I	L	F	U	T	M	G	O	Q	I
N	Y	A	O	A	T	T	R	A	C	T	W	K	V	B	O	Y	D	Z	T
Q	T	J	S	Y	Q	V	D	Z	F	U	I	L	Y	X	M	P	A	W	Y
Y	J	R	A	L	M	A	G	N	E	T	I	C	F	I	E	L	D	H	A

- Magnet
- Neodymium
- Ferrite
- Samarium Cobalt
- Alnico
- Repel
- Attract
- North
- South
- Magnetic Field
- Ferrous
- Polarity
- Electromagnets
- Horseshoe
- Disc
- Bar
- Air gap
- Saturation
- Temperature
- Circuit
- Flux



ANSWERS

D	J	A	S	P	O	L	R	H	E	F	Q	C	F	E	R	R	O	U	S
M	A	H	U	H	A	B	O	G	P	E	B	F	I	X	Z	S	C	G	K
L	F	A	R	N	M	A	G	N	E	T	W	B	E	R	I	L	D	X	R
S	G	E	B	E	G	R	K	A	I	O	L	T	E	I	C	T	P	R	U
F	T	L	A	U	W	A	F	U	N	B	I	E	A	C	D	U	T	S	Y
B	R	E	P	E	L	Y	C	H	O	R	J	M	F	P	C	T	I	B	F
V	B	C	C	E	L	R	I	X	R	D	B	U	W	Y	L	G	N	T	V
W	U	T	V	S	I	A	Z	E	T	O	S	N	V	A	H	F	Y	W	A
S	D	R	O	C	C	Y	F	P	H	A	C	E	B	W	L	Z	T	N	X
A	H	O	R	S	E	S	H	O	E	Q	D	O	H	U	V	N	A	D	Y
T	E	M	P	E	R	A	T	U	R	E	C	D	X	I	B	L	I	S	G
U	Q	A	K	P	D	I	M	F	R	M	R	Y	V	A	R	U	R	C	P
R	U	G	Y	S	A	H	B	P	U	B	D	M	K	O	Y	H	G	M	O
A	L	N	K	C	Q	U	L	I	K	B	W	I	W	R	J	X	A	M	L
T	R	E	H	A	I	F	R	G	C	A	S	U	S	C	Q	Z	P	H	A
I	V	T	T	S	O	A	K	X	Y	O	R	M	X	C	Y	J	Z	T	R
O	G	S	U	H	M	W	O	G	L	I	L	F	U	T	M	G	O	Q	I
N	Y	A	O	A	T	T	R	A	C	T	W	K	V	B	O	Y	D	Z	T
Q	T	J	S	Y	Q	V	D	Z	F	U	I	L	Y	X	M	P	A	W	Y
Y	J	R	A	L	M	A	G	N	E	T	I	C	F	I	E	L	D	H	A



Excellent work, you are now officially a young magnet expert! Now if you excuse me, I must go back to my lab. After all, my work with magnets is never finished!



ENJOYED THIS?

SEE OUR VIDEOS FOR MORE MAGNET FUN



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