

ANTI GRAVITY MAGNETIC LEVITATION

WARNING:
CHOKING HAZARD - Small parts.
 Not for Children under 3 years.

To Parents: Read all instructions before providing guidance to your children.

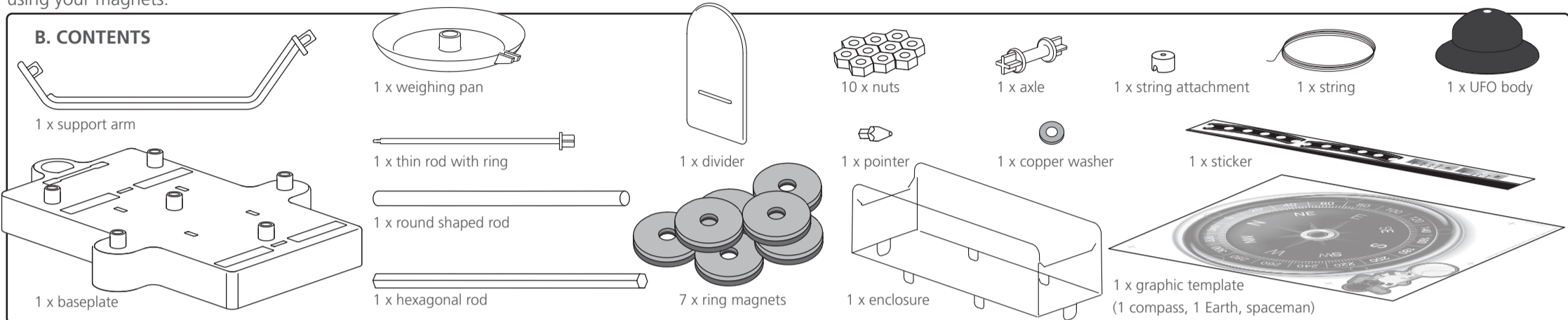
Questions & Comments

We value you as a customer and your satisfaction with this product is important to us. If you have comments or questions, or you find any part of this kit missing or defective, please do not hesitate to contact our distributor in your country. You will find the address printed on the package. You are also welcome to contact our Marketing Support Team: Email: infodesk@4m-ind.com, Fax (852) 25911566, Tel: (852) 28936241, Web site: WWW.4M-IND.COM

A. SAFETY MESSAGES

1. Please read through these instructions before you start.
2. Adult assistance and supervision are recommended.
3. This kit is intended for children over 8 years of age.
4. This kit and its finished product contain small parts which may cause choking if misused. Keep away from children under 3 years old.
5. Use your magnets with care. Magnets could cause damage to electrical appliances like televisions, computer screens, etc. They can also erase or damage the information on audiotapes, videotapes, credit cards and floppy disks. Do not place your magnets near the items mentioned above. Never put your magnets close to pacemakers and hearing aids. Always ask for an adult's assistance when using your magnets.

B. CONTENTS



Adhesive tape is also required but not included.

Note: A magnet has two poles, known as the north pole and south pole. These are represented by the **RED** (for north) and **BLUE** (for south) parts of the ring magnet casings. In the diagrams below, the north pole is represented by **DARK GREY** and the south by **LIGHT GREY**.

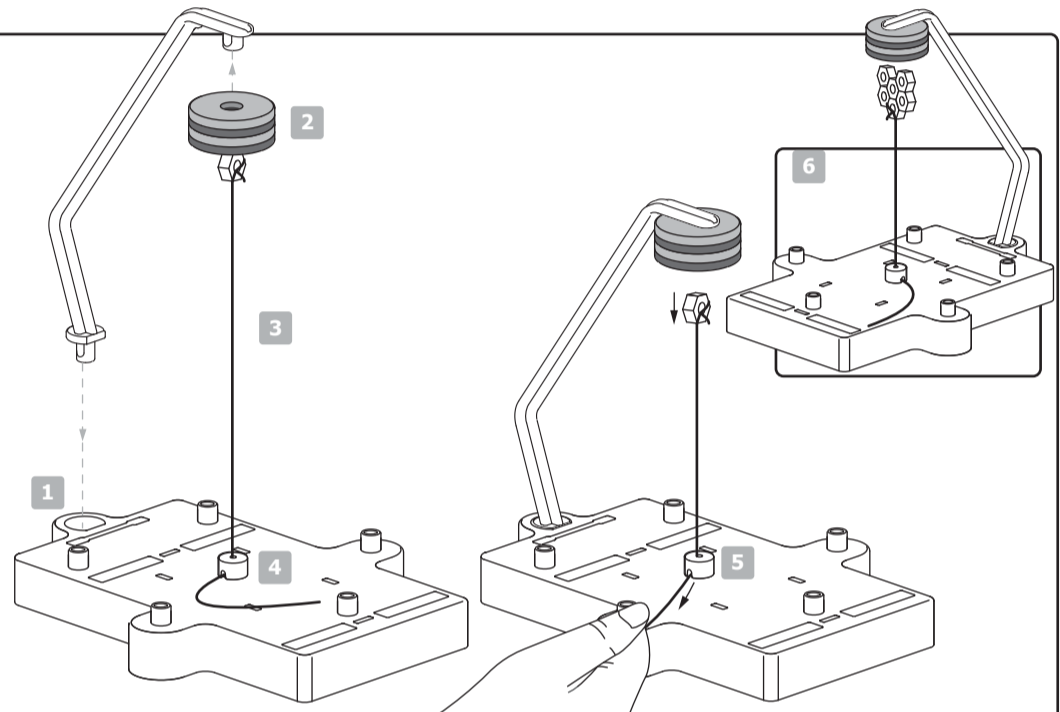
C. ANTI-GRAVITY SCULPTURE

Equipment required from kit: baseplate, support arm, 2 x magnets, string attachment, 10 x nuts, string

1. Insert the arm into the hole at the end of the baseplate.
2. Push a magnet onto the end of the arm, and attach another magnet under the first (this will only work if the second magnet has its colours the same way up as the first magnet, so that the magnets attract each other).
3. Cut a piece of string about 25 cm long. Tie one end to the nut. Attract the nut to the magnet.
4. Push the other end of the string down through the string attachment. Attach the string attachment to the baseplate.
5. Pull the string through it until the nut moves away from the magnet. Don't pull too far, or the nuts will fall. Now the nut dangles in the mid air as if it is defying the gravity.
6. Now, one by one, add more nuts to the first to build a sculpture that hangs upside down! You could add more magnets at the top to increase the strength of the magnetic attraction (you'll need to adjust the length of the string to do this). You could also replace the nuts with any small metal objects from home, such as nails and screws.

HOW IT WORKS

The nuts are made of steel, which is mostly iron. Iron is a magnetic material, which means it's attracted to magnets. It doesn't have to touch a magnet to be attracted to it. When the top nut is close to the magnets, it becomes a magnet too, and so do all the other nuts. So they all stick together. The attraction from the magnet is stronger the closer you get to the magnet. That's why if you pull the string too far, the weight of the nuts pulling down overcomes the magnetic attraction pulling them up, and the sculpture falls.



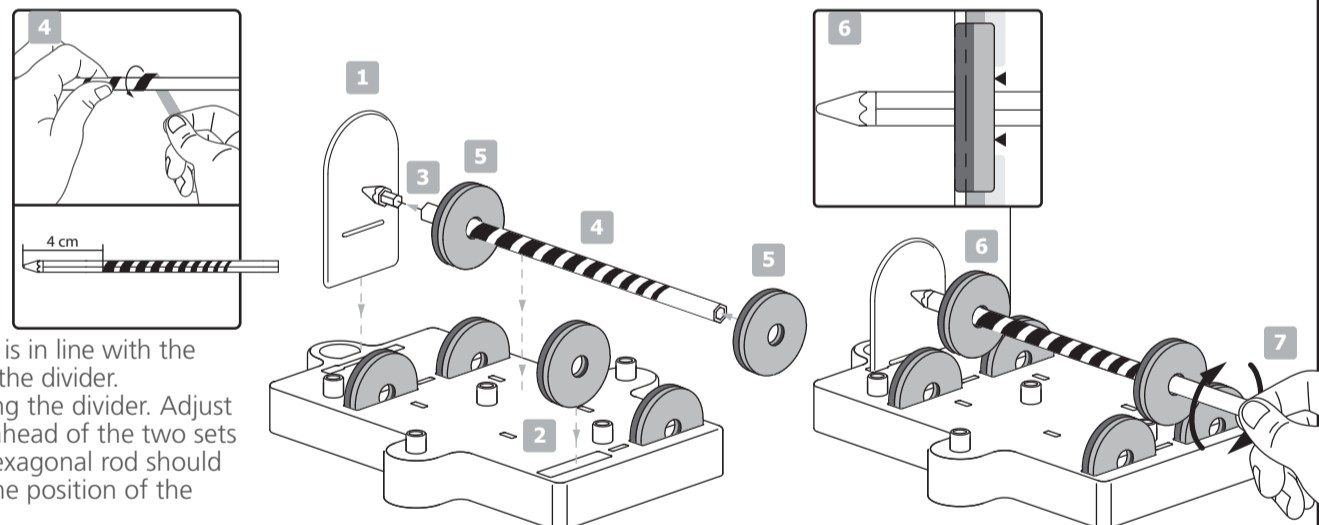
D. THE FLOATING SPINNER

Equipment required from kit: baseplate, 6 x magnets, hexagonal rod, pointer, divider, sticker

1. Push the divider into the slot in the baseplate.
2. Take four magnets and push them into the four slots in the baseplate, with the **RED** sides all facing the divider.
3. Push the pointer onto the hexagonal rod.
4. Decorate the hexagonal rod in the middle with a spiral sticker.
5. Place the hexagonal rod next to the baseplate with the pointed end towards the divider. Take another magnet. Keeping the **RED** side towards the divider, slide it onto the hexagonal rod until it is in line with first set of magnets on the baseplate plate. Take another magnet and slide it onto the hexagonal rod until it is in line with the second set of magnets on the baseplate plate, again with the **RED** side facing the divider.
6. Hold the hexagonal rod above the baseplate with the tip of pointer touching the divider. Adjust the magnets along the hexagonal rod so they are directly above and slightly ahead of the two sets of magnets in the baseplate. Release your hold slowly and gently. Now the hexagonal rod should float above the baseplate. (You need patience to get this done — fine tune the position of the magnets if the spinner keep jumping out of place).
7. Give the hexagonal rod a spin. The rod will float and spin in the mid air for a while. It's like magic!

HOW IT WORKS

Like poles on different magnets always repel each other. The poles are on faces of these magnets, but they can also repel each other when arranged edge to edge. The force of repulsion keeps the hexagonal rod floating above the baseplate, even when it's spinning.



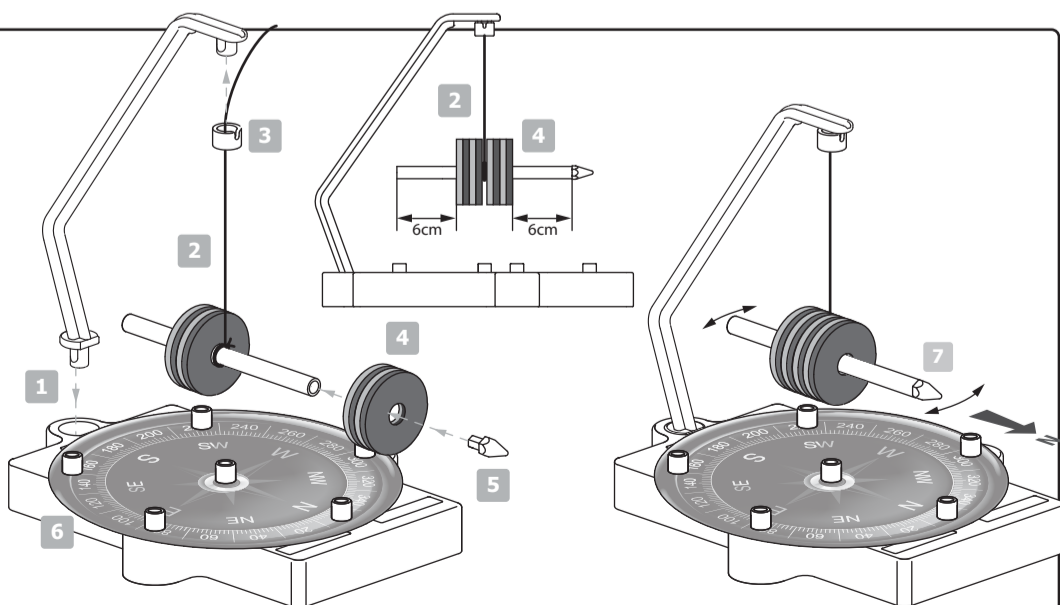
E. MAGNETIC COMPASS

Equipment required from kit: baseplate, support arm, 4 x magnets, string attachment, string, round shaped rod, pointer, compass template

1. Insert the support arm into the hole at the end of the baseplate.
2. Cut a 20 cm piece of string, then tie the string to the centre of the rod so that the rod hangs about half way between the top of the arm and the baseplate.
3. Push the other end of the string through the string attachment and push the string attachment onto the top of the arm. Carefully move the knot along the rod until the rod balances horizontally.
4. Slide two magnets onto each end of the rod, making sure the poles on all the magnets face the same way, so that the magnets attract each other.
5. The **RED** ends of the magnets (which are the north poles) will all be facing one end of the rod. Insert the pointer onto this end of the rod.
6. Place the compass template on the baseplate with the 'South' marking facing the support arm. Your home made compass is completed.
7. How to make use the compass: Allow the rod to swing until it comes to a stop. The pointer will be aiming to the Earth's north magnetic pole. Rotate the baseplate so that 'North' on the compass template lines up with the pointer. Now the compass points on the baseplate will be pointing in the correct directions. Try gently turning the rod, then releasing it. The pointer will always turn to face north. You've made a magnetic compass!

HOW IT WORKS

All magnets have two places where their magnetism is strongest. These are called poles. The Earth acts like a giant magnet, with one pole near the north geographic pole in the Arctic and the other near the south geographic pole in the Antarctic. These are called the Earth's magnetic poles. When a magnet is suspended, it always turns so that its poles point at the north magnetic pole and south magnetic pole. The magnet's poles are named after the pole they point to. So a magnet has a north pole, which points north, and a south pole, which points south. Like poles on two different magnets (south and south or north and north) always repel each other (push each other away), and opposite poles (north and south) always attract each other.



F. MAGNETIC WEIGHT SCALE AND MAGNETIC SPRING

Equipment needed: baseplate, 4 x magnets, weighing pan, divider, 1 x round shaped rod

1. Push the round shaped rod into the hole at the end of the baseplate.
2. Put together two magnets with their **RED** sides facing up. They will be attracted to each other. Put the magnets over the round-shaped rod.
3. Put another magnet over the round-shaped rod with its **RED** side facing down. This top magnet should float above the bottom two.
4. Slot the divider into the baseplate.
5. Put the weighing pan over the round-shaped rod so it rests on the upper magnet. Make sure that the edge of the divider edge is in the slot in the weighing pan pointer.
6. Stick the scales sticker on the divider so that the 'zero' is in line with the pointer.
7. Put some small weights, such as stones, into the weighing pan. Watch what happens.

The more weight you add to the weighing pan, the lower the pan goes. The magnets are acting as a weighing scale!

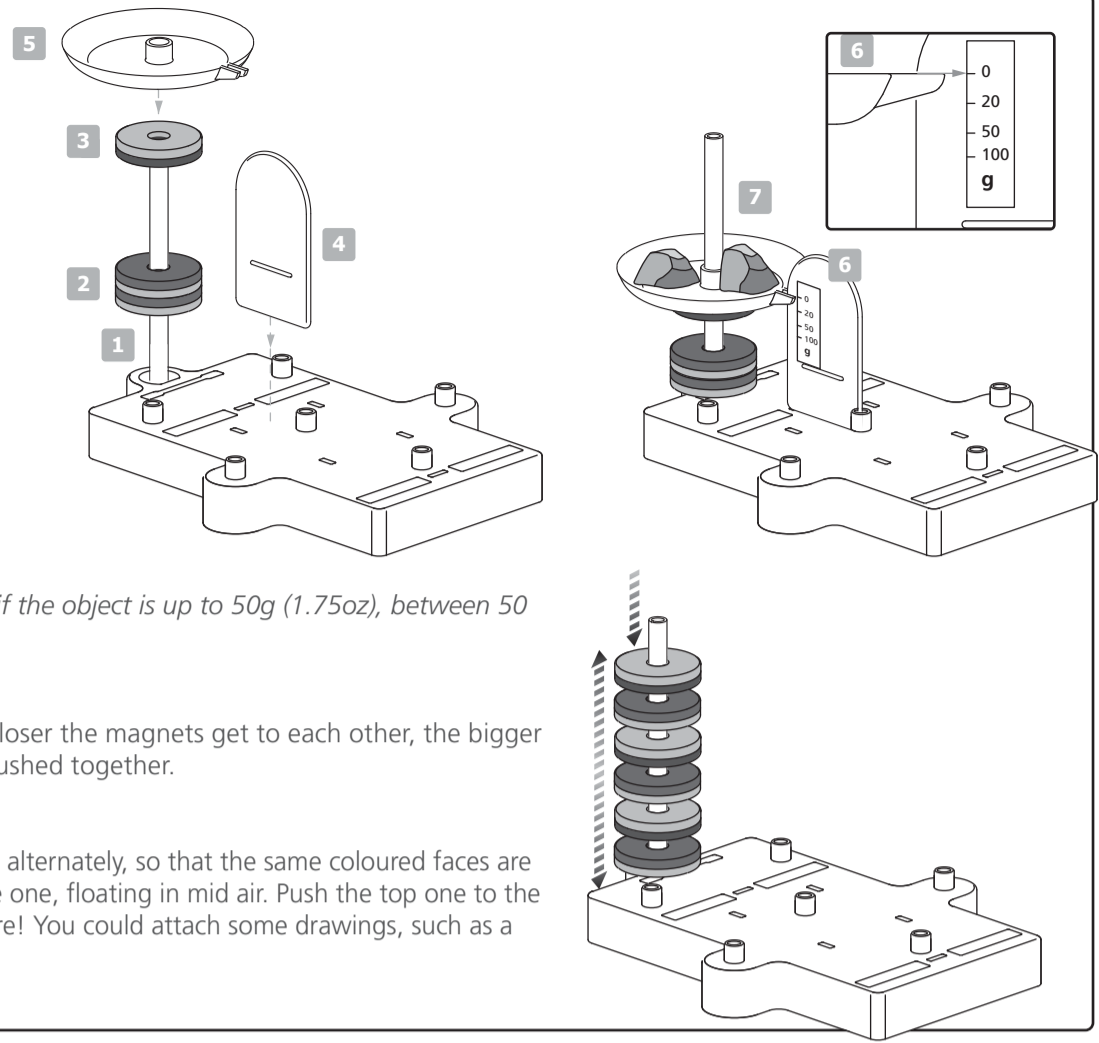
Note: Real weighing scales are very precise pieces of equipment, whereas the one you have made is just a fun device to demonstrate magnetism. It only roughly shows an object's weight, if the object is up to 50g (1.75oz), between 50 and 100g (1.75oz and 3.5oz), or over 100g. It can not show very accurate readings.

HOW IT WORKS

The two sets of magnets have their 'like poles' facing each other, so they repel each other. The closer the magnets get to each other, the bigger the repelling force gets. The larger the weight in the weighing pan, the more the magnets are pushed together.

MAGNETIC SPRING

Remove the weighing pan and divider, then arrange all six magnets **RED** side up then **BLU**E side up alternately, so that the same coloured faces are facing each other all the way up. What happens? You will see all the magnets, except the baseplate one, floating in mid air. Push the top one to the bottom and release it. All the magnet will jump up, like a spring. It's a cool floating magnet sculpture! You could attach some drawings, such as a frog or a rocket to the magnets and watch them jumping up and down.



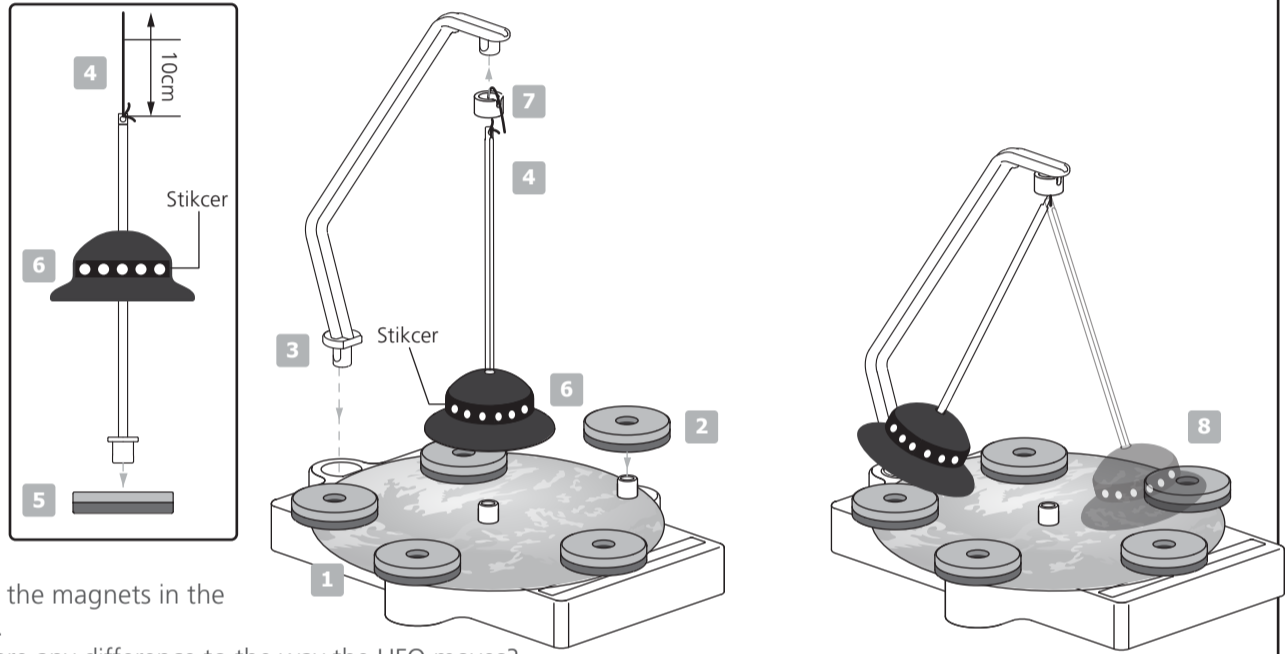
G. RANDOM PROPELLING MACHINE (U.F.O.)

Equipment needed: baseplate, support arm, 6 x magnets, string attachment, string, thin rod with ring, earth template, UFO body and sticker

1. Place the earth template on top of the baseplate with the Earth surface graphic facing upwards.
2. Take five magnets. Keeping all the magnets with their **RED** faces pointing downwards, push one magnet into each of the holes in the baseplate.
3. Insert the arm into the hole at the end of the baseplate.
4. Cut a 15 cm piece of string. Tie one end of the string to the ring on the rod.
5. Hold the rod vertical with its ring at the top. Push a magnet onto the bottom end of the rod with its **RED** face pointing downwards, so that it attracts the magnets in the baseplate. Push the top end of the rod through the hole of the UFO cover.
6. Apply the sticker to the UFO body.
7. Push the other end of the string through the string attachment and push the string attachment onto the top of the arm. Pull the string through until the ring is just under the string attachment.
8. Now swing the rod. It will sway wildly around until it finally stops over one of the magnets in the baseplate. It's like UFO flying mysteriously over the Earth finding a place to land. Try turning over all the magnets (so that their **BLU**E faces face downwards). Is there any difference to the way the UFO moves?

HOW IT WORKS

The swinging magnet is attracted to each magnet as it swings, but at first it swings too fast for a magnet to capture it. After a while its swing slows down and finally a magnet does trap it.



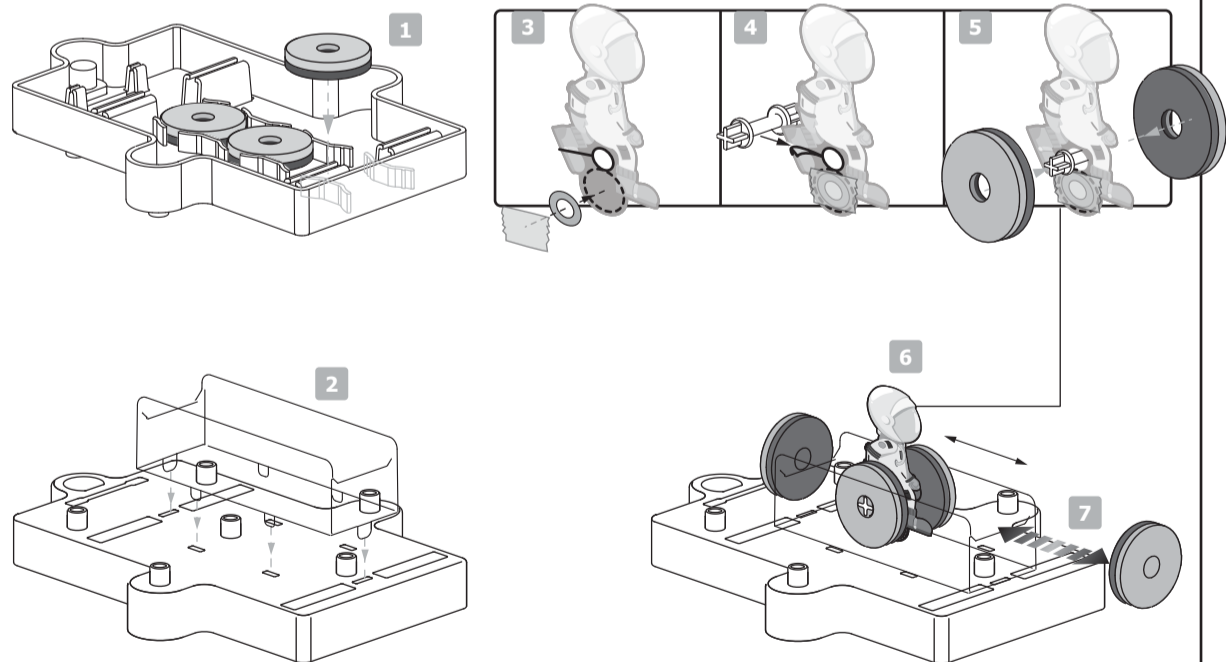
H. MAGLEV PERSONAL TRANSPORTER

Equipment required from kit: baseplate, 6 x magnets, axle, enclosure, spaceman template, 1 x copper washer. Also required from home: adhesive tape.

1. Take three magnets. Keeping the magnets all facing same way (all **RED** sides facing downwards) push them into the three slots underneath the baseplate. Turn the baseplate the right way up.
2. Push the enclosure into the slots in top of the baseplate.
3. Find the spaceman template. With adhesive tape, attach the copper washer to the bottom of one side of the spaceman template.
4. Gently slot the axle through the template.
5. Take two more magnets and turn them so that both their **RED** sides are facing each other. Keeping them facing the same way, push one onto each end of the axle to make a spaceman with a wheel. The washer should keep the spaceman upright.
6. Drop the spaceman with its magnetic wheels into the enclosure. The spaceman should float inside the enclosure.
7. Take another two magnets. Hold the **RED** sides facing both ends of the enclosure and the axle. Now move one of the magnets back and forwards quickly towards the enclosure. You will see the spaceman float and move back and forward in the mid air. It is like the spaceman is riding on a personal transporter across the Moon that uses magnetic levitation. Try watching the spaceman at eye level to see the gap under the wheels.

HOW IT WORKS

The force of magnetic repulsion is at work again. The magnets hidden under the baseplate repel the magnets on the axle, so the axle floats. The two side magnets exert horizontal forces that move the spaceman along.



I. FUN FACTS

- Only some materials are magnetic, which means they are attracted to magnets. The most common material is iron.
- Most magnets are made from iron alloys, which are a mixture of iron and other metals.
- The area around a magnet where its magnetic force can be felt is called its magnetic field.
- The Earth's magnetic poles move around as the years pass. That means that magnetic compasses point in a slightly different direction each year. You have to be aware of this when you are finding your way with a compass.
- The first compasses were called lodestones. They were made with lumps of magnetic rocks.
- An electromagnet is a magnet made by sending an electric current through a coil of wire.
- In a maglev railway, the trains are supported above the track by super-powerful electromagnets. Magnets also propel the train along the track.
- A Japanese experimental maglev train has reached a speed of 581 kilometres per hour (361 miles per hour).
- When they are migrating thousands of kilometres across the globe, birds navigate using the Earth's magnetic field, which they can sense.