WARNING!
NOT SUITABLE FOR CHILDREN UNDER 8 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 THESE EXPERIMENTS.
KEEP THE EXPERIMENTAL SET OUT OF REACH OF CHILDREN UNDER 8 YEARS OLD.
EYE PROTECTION FOR SUPERVISING ADULT IS NOT PROVIDED.
ADVISE FOR SUPERVISING ADULTS

- Read and follow these instructions, the safety rules and the first aid information, and keep them for reference.
- The maximum use of chemicals can cause injury and damage to health. Only carry out those experiments which are listed in the instructions.
- This experiment is for use by children over 8 years of age.
- Because children additively eat so much, some allergenic agents, supervising adult should assess themselves as to which experiments are suitable and safe for them. The instructions should enable supervisors to assess any potential to avoidance or suitability for a particular child.
- The supervising adult should discuss the warnings and safety information with the child or children before commencing the experiment. For those reactions which should be paid to the safe handling of chemicals, materials.
- The area surrounding the experiment should be kept clear of any obstructing and away from the reach of children. It should be well lit and ventilated and close to a water supply. Ai circuit with a heat resistant apron should be provided.
- No extension or non-resistant packaging should be used up completely during the course of the experiment after opening the packaging.
- Keep experiment area to your result, dispose of immediately in household waste and wash your hands.
- Some solutions in the kit can stain clothing and surfaces. Cover the area area with newspaper and wash damage.

FIRST AID INFORMATION

- In case of eye contact, wash out eye with plenty of water, hold eyes open if necessary. Seek immediate medical advice.
- In case of contact: wash out with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
- In case of inhalation: Remove person to fresh air.
- In case of skin contact: wash or rinse. When affected area with plenty of water for at least 15 minutes.
- In case of dust, seek medical advice without delay. Take the chemical, its container and this leaflet with you.
- In case of injury seek emergency advice.

SAFETY RULES

- Read these instructions before use, follow them and keep them for reference.
- Keep younger children and animals and keep watch wearing eye protection away from the experimental area.
- Avoid wear any, no protection.
- Store this experimental area out of reach of children under 5 years of age.
- Close equipment after use.
- Make sure that all containers are fully closed and properly stored after use.
- Ensure that all empty containers and/or non-reusable containers are disposed of properly.
- Wash hands after completing all activities.
- Do not use any equipment which has not been supplied with the set or recommended by the instructions for use.
- Do not eat or drink in the experimental area.
- Do not allow chemicals to come into contact with eyes or mouth.
- Dispose of all components in household waste unless otherwise stated in the instructions.
**Contents:**

a) Mars stone
b) Pancake-wheel
c) Thread
d) Plastic vases containing Mars rover and water packs
e) Seed
f) 2 lab glasses G250 mL and 75 mL

g) Glass jar
h) Green water card
i) Oxygen (not shown)
j) Instructions

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**Welcome**

Welcome to Mission To Mars. Prepare for blast off and journey to the red planet and perform 8 amazing experiments.

All the components you need are included in the box apart from a few common household items which you will have to ask a kind grown up to supply. Are you ready? I'm sure they won't mind - after all you will be learning some important scientific principles whilst having fun playing with the set.

So let's get started...

**Safety First**

These kits are completely safe when used in the way we describe in the instruction booklet. Always read the instructions before starting and ask for adult help when requested.

If any of your projects start to leak, boil or emit strange, grow mould, puke stuff, purple stuff, or any other 'Stuff', throw it out. When in doubt... throw it out!
Some facts about Mars:

- Mars is the fourth planet from the Sun and is the second smallest planet in our solar system.
- Martian surface gravity is only 38% of the Earth's, meaning you could leap nearly 3 times higher on Mars.
- Mars has the largest dust storms in the solar system. They can last for months and cover the entire planet.
- Mars has the tallest recorded mountain in the whole solar system. Olympus Mons is a shield volcano that is 3 times the height of Mount Everest. It has a height of nearly 22km and a diameter of 600km.
- A day on Mars only lasts 40 minutes more than one on Earth.
- Mars has 2 moons called Phobos & Deimos.
- The length of a year on Mars is 687 Earth days.
- It would take more than 8 of Mars to fill the volume of Earth.
- The temperatures on Mars can be as high as +40 Celsius, but can plummet to a chilling -140 Celsius at its coldest.
- The journey from Earth to Mars takes about 300 days. Every 2 years, the cost of Mars in its closest orbit (only 55 million km from Earth) is the ideal time to send a spacecraft.

Experiment 1: Creating Martian Soil

Here you will need that are not included in this kit: salt, water and an old spoon.

1. Pour the Sand mix into the large bowls of the Mars Scene (x) and (y).
2. Pour the Iron filings (f) on top.
3. Stir with an old spoon.
4. Place 1 teaspoon of regular table salt into 40mL of cold tap water and stir until dissolved.
5. Pour some of the salty water onto the Sand mix filling mixture. Pour just enough to make it, but not cover it.
6. Leave the tray where it won't be disturbed for 3 days.
7. Stir the sand each day to create a mixture of sand and water.
8. The sand will slowly turn rusty red - like Martian soil.
9. TIP TIP: Keep a close watch of the sand in the bag if it changes in size that you can see how much the colour has changed.

What's happening in this experiment? This is what would happen if you left your bike outside in all weathers, it gets dirty. On Earth, rust forms when iron reacts with oxygen in the air. This process, called oxidation, speeds up when water is present. There are a lot of rust on Mars which are lots of iron, and when they are exposed to the atmosphere, they oxidise and turn reddish. Then when rusty dust from these rocks gets kicked up in the atmosphere, it makes the Martian sky look red. From a long way away, the whole planet looks red.
Experiment 2: Land Your Mars Rover

Items you will need that are not included in this kit: scissors, a calculator, a stopwatch and a willing adult volunteer.

1. Break the Rover pieces (shaded 1, 2, 3 and 4) off of the Gunie 1.
2. Push the pieces together as shown.
3. Ask an adult to use scissors and cut out the Parachute designs (d).
4. Ask an adult to make the holes in each Parachute in the positions indicated.
5. Ask an adult to cut the following pieces of thread (c):
   - 4 x 200mm long pieces.
   - 4 x 300mm long pieces.
6. Tie one end of each of the 200mm length Thread pieces to each of the holes around the edge of the small Parachute and tie each of the 300mm length pieces to each of the large Parachute.
7. We will now test one Parachute at a time. Starting with the smaller Parachute, push the lower ends of 2 of the Threads through the plastic loop on the left end of the Rover and the other 2 through the plastic loop on the Rover’s right end.
8. Tie the Threads in place.

IMPORTANT: Ask an adult to help with the next part of the experiment.
9. If it fails to do so, stand on a chair. Make sure you hold the back of the chair with one hand and hold the parachute by the top with the other hand.
10. Make sure the Threads are untangled.
11. With your helper using a stopwatch on a smartphone, release the parachute and record the time it takes for the Rover to roll into the ground.
12. Repeat several times. Make sure the parachute is at the same starting height each time.
13. Work out the average travel time. Do this by adding the travel times together and divide the result by the number of times you conducted the experiment.
14. How funny with the larger parachute... which gives the Rover the safest landing?
What's happening in this experiment? Throw a ball up in the air and it always falls back to the ground. That's because Earth's pull is acting on it with a force called gravity. You've probably learned in school that the strength of Earth's pull is roughly the same all over the world and that if you drop a heavy stone and a light brick from the top of a skyscraper, if there were no air, the brick and the stone would hit the ground at the same time. In practice, the stone reaches the ground much faster, not because it weighs more but because the feather weighs less and falls slower.

Parachutes work by increasing air resistance. In your experiment, the smaller parachute has been surface area than the larger one, so has less air resistance. The object should fall to the floor more quickly than when using the larger parachute.

As the larger parachute covers the same distance as the smaller parachute, but in a shorter period of time, it must therefore have a lower speed and will therefore give the object a softer landing.

**Experiment 3: Create Craters**

2. Cut the matching halves together to form 2 sections.
3. Once you have created the Martian soil used in experiment 1, simulate a meteor hitting Mars by dropping and pushing the meteor into the sand and see what happens.

What's happening in this experiment? Meteoroids are formed when asteroids collide. Asteroids orbit the Sun between the orbits of Mars and Jupiter in a region called the asteroid belt. As asteroids smash into each other, they produce rocky debris. When meteoroids hit the Earth's atmosphere, they re-enter at high speed, creating friction, which produces heat. The heat vaporizes most meteoroids, creating what we call meteor showers. The atmosphere of Mars, however, is very thin, so even small meteoroids are able to reach the surface. In this experiment, pushing the meteor into the sand recreates the impact force when the meteor hits the soft Mars surface. This is what creates a crater.
Experiment 4: Launch a Rocket

Items you will need that are not included in this kit: half a soluble Vitamin C tablet.

WARNING: THIS EXPERIMENT IS MESSY. DO THIS EXPERIMENT OUTSIDE.

1. Take the red section of the Rocket gj and place 2 teaspoons of cold tap water inside.

DO THE NEXT PART QUICKLY.

2. Drop half a soluble Vitamin C tablet inside the red rocket and immediately attach the grey Rocket base section.

NOTE: DO NOT CRUSH UP THE TABLET AS THIS WILL MAKE THE REACTION HAPPEN TOO QUICKLY.

3. Make sure the base is wrapped on all the way around the Rocket gj and place it on a flat surface.

4. Now STAND BACK!

5. It may take a couple of minutes for the experiment to work, so don’t go back to it once you have reached it’s stage. What do you think is going to happen?

What’s happening in this experiment? Water soluble tablets are made up of powdered acid and something called a base -- a substance that neutralizes an acid. When the tablets are dry they can’t react, but when dissolved in water, the acid reacts with the base, making carbon dioxide gas. The gas builds up inside the rocket looking for a way to escape. The only way it can escape is by blowing the sections apart. This release of pressure lifts the top section into the air.
Experiment 5: Augmented Reality Scenery

Items you will need: Are not included in this kit. An Android or iOS smartphone and internet access to download our free app.

1. Download the app we have created by visiting the Play Store (Android) or the Apple App Store (iOS) and searching for "Mission to Mars VR".
2. Place the Green Screen Card BS in the slot in the back of the Mars Scene (F).
3. Launch the app and follow the instructions.
4. View the Green Screen! Point through your phone and watch it create a video backdrop for your play scene.

Please note that the video is just for fun and does not represent what would actually be seen from the surface of Mars.

What’s happening in this experiment? Augmented Reality (AR) is the name for technology which combines augmenting real-world images with computer-generated information or graphics. The camera on your phone is used to "see" images from the camera on the phone and the "green screen" card. It triggers a trigger to start the app to generate the video backdrop. The app can recognize location points on the printed green screen which enables the video to always fit to the size of the green screen card.

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