

THE TERRESTRIAL PLANETS

The four inner planets in the Solar System are known as the Terrestrial Planets. Mercury, Venus, Earth and Mars are all rocky planets but are each unique in their features and properties.

MERCURY

Distance to the Sun: 58 million km
 Temperature range: -173 to +427°C
 Equatorial radius: 2439.7 km
 Gravity: 38% of Earth's
 Orbit: 88 Earth days

Mercury has no rings or moons.

The smallest planet in the solar system.

One day on Mercury lasts 59 Earth days.

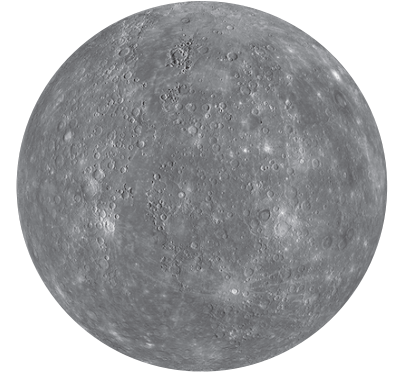


Image credit: NASA

The image above shows one side of the surface of Mercury. What do you notice? How would you describe the planet's surface?

Mercury's surface is heavily cratered. The bright spots and pits that you can see litter the planet's surface making it look similar to the Earth's moon in many ways.

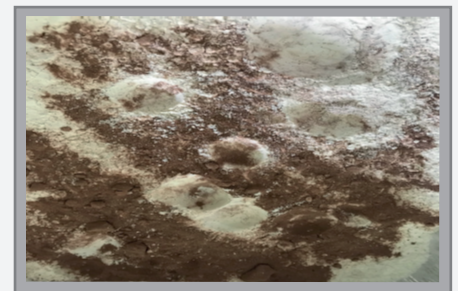
Craters are formed when an asteroid or comet collides with the planet's surface. Mercury's craters vary in size with some very large impact basins. Caloris basin is 1550 km in diameter!

CREATE A CRATERED SURFACE

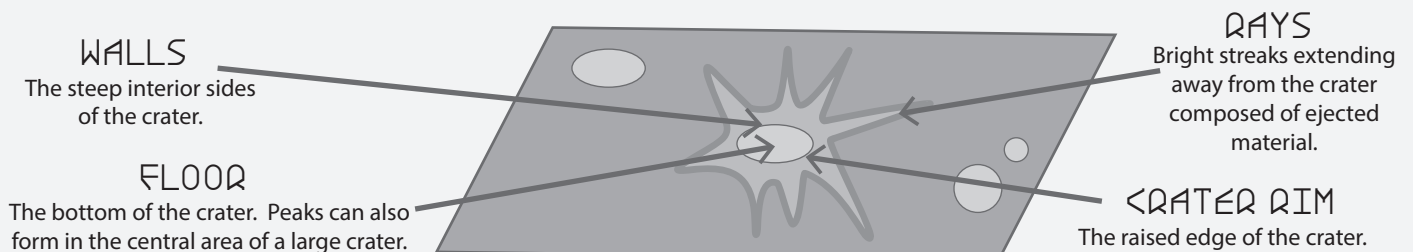
1. Fill a tray with a layer of flour (at least 2cm), gently shake the tray to make an even layer.
2. Dust with a thin layer of cocoa powder - be careful not to disturb the tray after this.
3. Drop small balls or rocks from roughly 25cm above the tray. Remove them carefully once they have landed trying to not disturb the newly formed crater!
4. Continue making craters across the whole tray. Experiment dropping at different heights or different angles if you can.
5. Some craters can overlap, but don't overcrowd the tray, otherwise it will be difficult to observe the features of the craters.

EQUIPMENT:

A tray
 Flour
 Chocolate powder
 (e.g. drinking chocolate or cocoa)
 Rocks/small balls



3 MAIN FEATURES OF CRATERS:



VENUS

Distance to the Sun: 108 million km

Temperature: 471°C (the hottest planet)

Equatorial radius: 6,052 km

Gravity: 91% of Earth's

Orbit: 225 Earth days

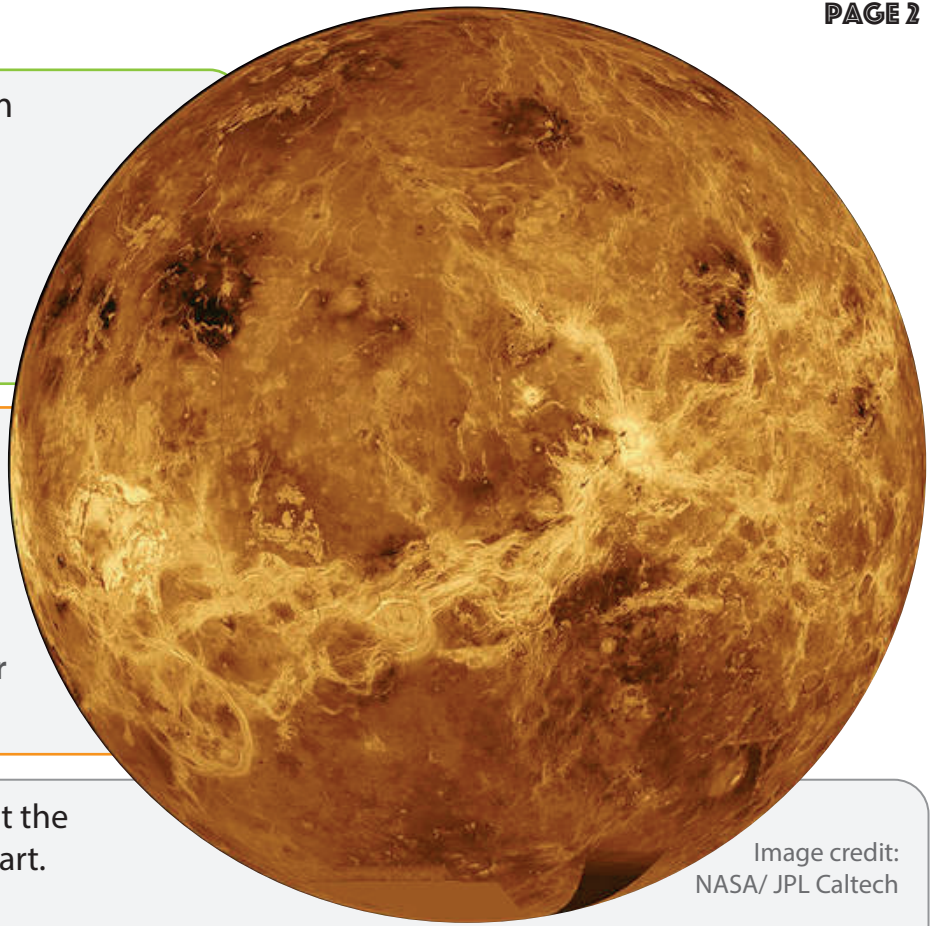


Image credit:
NASA/ JPL Caltech

Venus has no rings or moons.

A day on the surface of Venus is longer than its year. One day is 243 Earth days!

Venus is a volcanic planet with over 1600 major volcanic features.

Venus is similar in size to the Earth, but the conditions of its surface are worlds apart.

THE ATMOSPHERE OF VENUS

Venus is the hottest planet in our solar system. Its thick atmosphere traps heat in a runaway greenhouse effect, creating a surface so hot it could melt lead!

What is the greenhouse effect?

This is when gases in the atmosphere such as carbon dioxide trap the Sun's heat causing an increase in global temperatures.

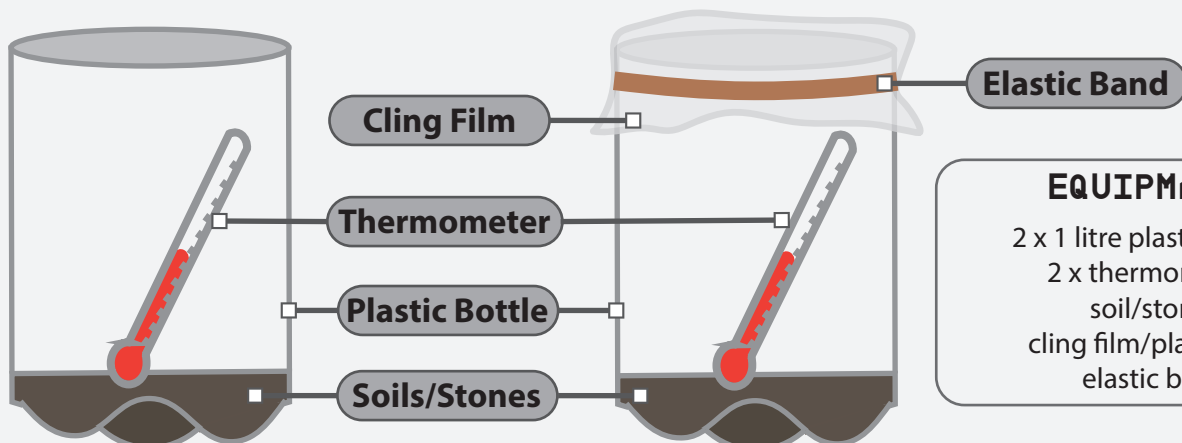
In this experiment we are going to investigate the green house effect. The two bottles will represent two different planets and the cling film/plastic bag will represent a thick atmosphere.

Step 1: Set up your experiment as shown in the diagram below. You will need a sunny spot by a window or in your garden to place them. If you only have one bottle, or one thermometer, run the experiment firstly uncovered and then repeat with the bottle covered in cling film. .

Step 2: Once it is set up, leave your experiment in the Sun for 50 minutes.

Step 3: After 50 minutes have passed, read the temperature on your thermometers, which one was hotter? Why?

Be careful with this experiment as it may get very hot!



EQUIPMENT:

2 x 1 litre plastic bottles
2 x thermometers
soil/stones
cling film/plastic bag
elastic band

Distance to the Sun: 150 million km
 Average temperature: 14 °C
 Equatorial radius: 6,052 km
 Gravity: 100% of Earth's
 Orbit: 365.25 Earth days

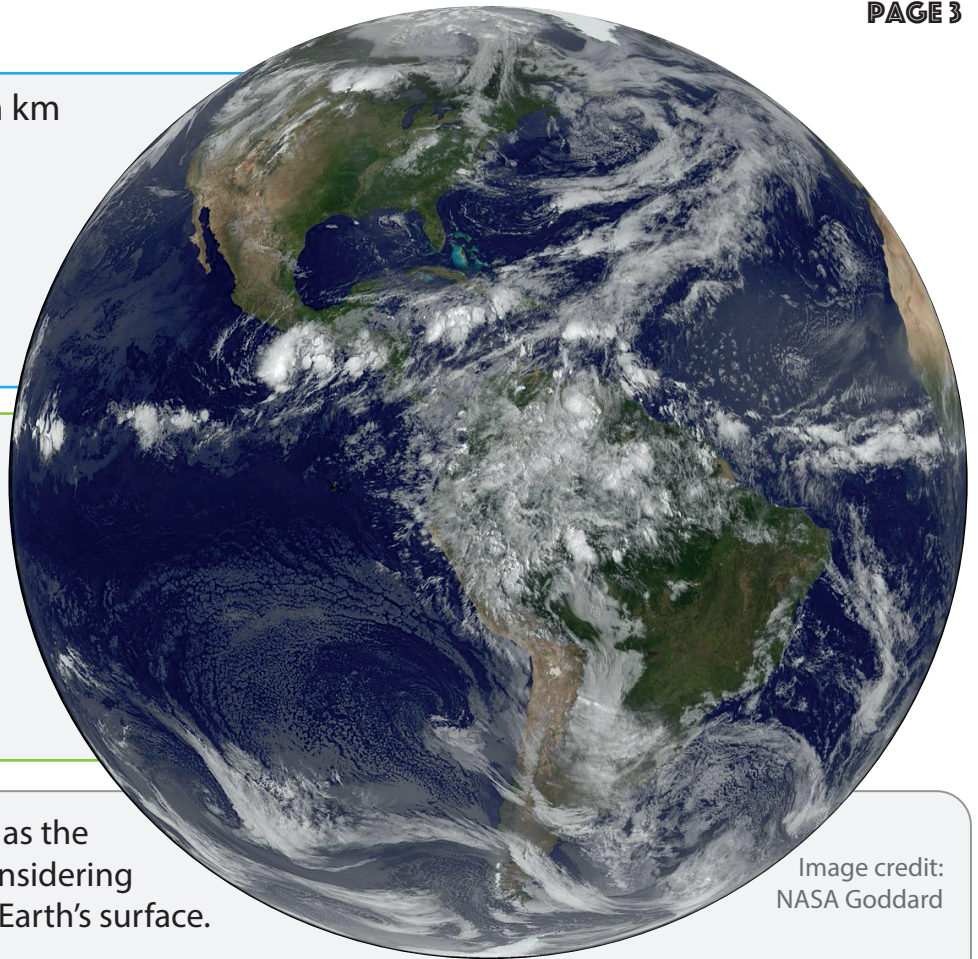


Image credit: NASA Goddard

Earth has no rings but one moon.
 It takes 8.5 minutes for the Sun's light to reach the Earth.
 Earth is the largest terrestrial planet.

The Earth is sometimes referred to as the blue planet. This isn't surprising considering that oceans cover over 71% of the Earth's surface.

WHY ARE THE OCEANS BLUE?

Sunlight is made up of many different visible colours ranging from the long wavelength red light to the short wavelength blue light. Water absorbs the long wavelengths better than the short and so much of the red, orange, yellow and green light is absorbed. This leaves behind the blue light which results in the ocean appearing blue.

WHY IS THE SKY BLUE?

The sky appears blue as a result of rayleigh scattering.

EQUIPMENT:

A clear tub
 (e.g clear plastic lunch box,
 clear glass dish)
 torch
 milk

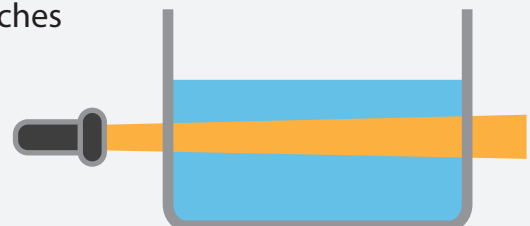
What is Rayleigh scattering?

Sunlight is scattered by the molecules in atmosphere. The scattering is greater at short wavelengths.

When sunlight travels through the atmosphere it scatters the light. Blue light is scattered the most which results in the sky appearing blue. But why does the sunset appear red? When the sun is close to the horizon the sunlight travels a longer path through the atmosphere. The extra scattering of light results in only the long wavelengths remaining which are the red hues.

Step 1: Set up the equipment as shown in the diagram. Fill the plastic tub with water and shine the torch through the water. Be careful not to shine bright torches directly into your eyes.

Step 2: Add drops of milk to the water until you can clearly see the beam of light through the water.



Step 3: Observe the light from the side. What do you notice? The light will change from blue-white to yellow-orange along the length of the beam. Why might this be?

Distance to the Sun: 228 million km

Temperature range: -153 to +20 °C

Equatorial radius: 3396 km

Gravity: 0.38 g (38% of Earth's)

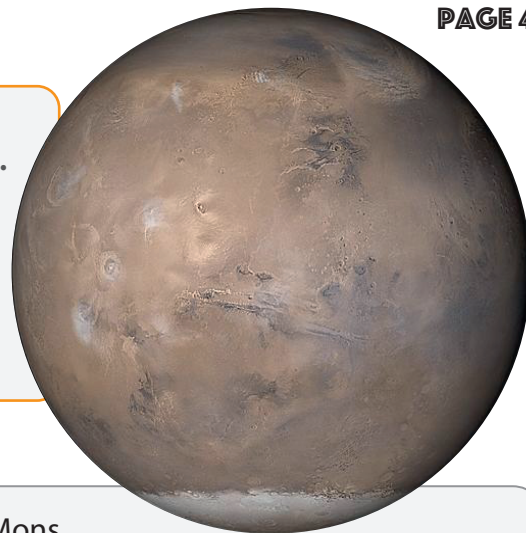
Orbit: 687 Earth days

Mars has no rings but does have two moons.

Commonly called the Red Planet.

One day on Mars lasts 24.6 hours.

Image credit: NASA/JPL/Malin Space Science Systems



Mars has volcanoes, polar ice caps, weather and canyons. Olympus Mons, the largest volcano in the solar system, can be found on the surface of Mars. Olympus Mons stretches 25 km into the Martian sky (over 2.5 x the height of Mount Everest) and is 624 km in diameter.

MAKING A VOLCANO

Olympus Mons is a large shield volcano. Shield volcanoes can be found on Earth too and are characterised by their hot runny lava and gently sloping sides.

Be careful as this experiment can get messy!

Step 1: Place a small container in the middle of a piece of paper/aluminium foil. This will be your volcano vent. Use one colour/ball of dough (recipe shown below) and build around your container to create a volcano cone shape. *Make sure to leave the opening of your container clear.*



Step 2: Fill your container with 1/2 vinegar and 1/2 water (~2 tbsps of each). When you are ready, add a tsp of baking soda. Your volcano will erupt and bubble over, spilling onto the sides of your volcano and onto the piece of paper/aluminium foil. Using a pen or pencil, draw around the edges of your lava flow. When you have recorded your eruption, use a tissue to clear away any liquid.

Step 3: When lava cools it turns into rock. Use your outline of the lava flow to create a new layer of igneous rock. To do this, repeat step 2 with a new ball of dough (in a different colour to the cone of dough you have already made) and fill in your outline. This should show where your mixture flowed in your volcanic eruption.

Step 4: You now have a volcano made of layers of dough, just like real volcanoes which are made of layers of igneous rock. The oldest rock will be the deepest and the youngest rock (from the most recent eruption) will be on top.

EQUIPMENT:

- 1 cup of flour (~ 250 g)
- 1/2 cup of table salt (~ 125 g)
- 1/2 cup of water (~ 125 ml)
- 3 x different colours of food colouring
- pen
- paper or aluminium foil
- 3 tsp baking soda
- 6 tbsp of water
- 6 tbsp of vinegar
- small container (empty yoghurt pots work well)

HOW TO MAKE SALT DOUGH

Step 1: Add 1 cup of flour and 1/2 cup of salt to a large mixing bowl and stir using a spoon.

Step 2: Add a small amount of water to the bowl, and mix it well with the flour and salt.

Step 3: Continue adding water and kneading until you have formed a thick dough. It shouldn't be too sticky (if it is just add a little more flour!)

Step 4: Split your dough into three equal balls.

Step 5: Take one ball of dough and add 2-3 drops of food colouring, mixing to create coloured dough. Repeat for the two remaining balls of dough to create three differently coloured doughs.