
Let's Learn About
Space!
Activity Book
Created by: Francis Watts
UNIVERSITY OF LEICESTER

This Activity Book was created to help people learn about Space and celebrate the UK's long involvement in the Space Sector!

It was designed to be a hands-on educational resource, aimed at children aged 7-11, for young Space enthusiasts or for use in the classroom.

The content included covers and expands on material met during Key Stage 2.

Studies have shown that hands-on learning is the best way to take in and remember new information.

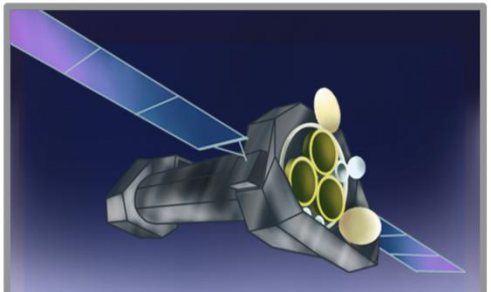
My hope is that by providing educational activities that are fun, young people will feel like a future in Space and science is more within their reach.

This Activity Book was developed as part of the Physics in Education module for my Undergraduate Degree in Astrophysics at the University of Leicester.

Written and illustrated by Francis Watts.

The UK in Space

XMM-Newton



The 'XMM' stands for 'X-ray Multi-Mirror'.
It was launched in 1999 by the European Space Agency (ESA).
The University of Leicester and the UK Space industry played a big part in designing, engineering, testing and using XMM-Newton.
Because the Earth's Atmosphere blocks out X-rays, the telescope had to be sent out to Space.
It uses X-rays to study all sorts of high energy things in Space, like Black Holes and even the origin of the Universe!

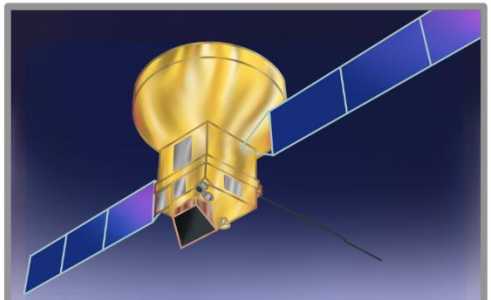
Bepi-Colombo

Bepi-Colombo is actually made up of 2 spacecraft - Bepi and Colombo. It is a joint European Space Agency (ESA) and Japanese Aerospace Exploration Agency (JAXA) mission. It launched in 2018, and one of its main pieces of equipment was designed and made by the University of Leicester!
It travelling to Mercury, and will study the layers of the planet, especially it's Core, Mercury's Magnetic Field, and even search for water!
Scientists noticed there was ice in some of the craters on the cold side of the planet, and they want to learn more!

Rosalind-Franklin Rover

Rosalind-Franklin Rover is a European Space Agency (ESA) Rover that will search for life on Mars! It is planned to launch in 2028.
One of the main pieces of equipment that will help break down what is in the rocks and dirt that make up the surface of Mars, was designed and made by the University of Leicester!
Once it has been launched and landed on the planet, Space Park Leicester will play a big part in running the mission.
At the moment, they are figuring out to best study Martian rock samples!

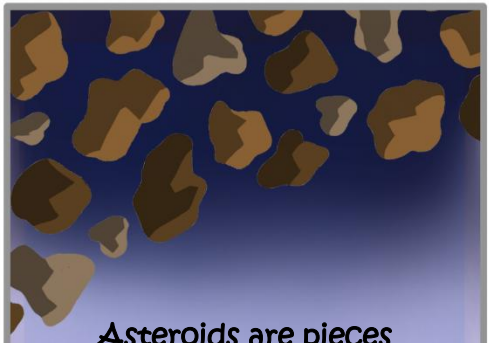
SMILE



'SMILE' stands for 'Solar wind Magnetosphere Ionosphere Link Explorer'.
It is a joint European Space Agency (ESA) and Chinese Academy of Sciences (CAS) mission. It launched 19th May 2026, and one of its main pieces of equipment was designed and made by the University of Leicester!
The mission's goal is to use UV and X-ray cameras to study the Earth's Auroras and Magnetic Field, in order to find out more information on how the Earth's Magnetic Field reacts to space weather!

Space Rocks!

Asteroids



Asteroids are pieces of rock that orbit the Sun. When our Solar System was forming, dust, rocks and gas all clumped together to make the moons and planets we see today. Asteroids are the pieces of debris that are left over!

The smallest ones are about the size of a car and the biggest, Ceres, is roughly 940km wide - that is almost the entire length of the UK!

Most of the Asteroids in our Solar System live in an area known as the 'Asteroid Belt' between Mars and Jupiter.

Meteors

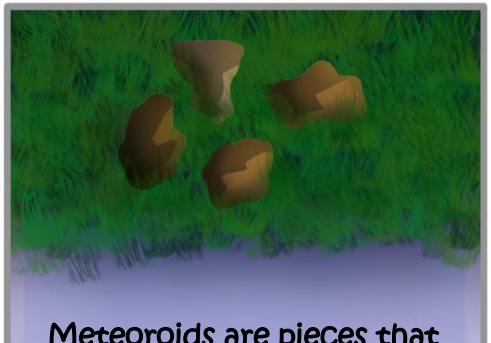
Meteoroids are pieces that break off from Asteroids, moons, comets, and even planets!

Meteors, also known as 'Shooting Stars', are the smallest type of space rocks and fly through space towards the Earth.

As they fall through our Atmosphere at very high speeds, these tiny rocks and dust heat up and burn away in brilliant streaks of light across the sky.

Around 44 Tonnes of Meteors fall to the Earth every DAY!

Meteorites



Meteoroids are pieces that break off from Asteroids, moons, comets, and even planets!

Meteorites are the same as Meteors, except they survive the journey through the Earth's Atmosphere.

Almost all Meteorites are made up of different amounts of Iron and Nickel.

There are 3 main types:

Stony

Iron

Stony-Iron

We have even found Meteorites from pieces of Mars and the Moon!

Comets

Comets can be thought of as 'icy-dirtballs'. They have a rocky centre, called the Nucleus, which is covered in lots of ice.

Comets follow a very stretched orbit around the Sun, called an Elliptical orbit. They call the Kuiper Belt home, and sometimes come from even further away, such as the Oort Cloud or outside of our Solar System!

As Comets get closer to the Sun, the ice starts to melt, which forms a huge, glowing tail behind it.

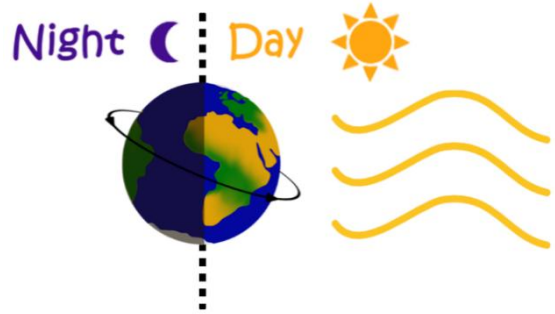
Comets may have brought water and life to Earth!

How the Earth Moves

The Earth spins very fast as it moves around the Sun - roughly 1,600 km/hr!
It takes 24 hours to finish a single spin, and as we turn, different parts of the Earth face the Sun.

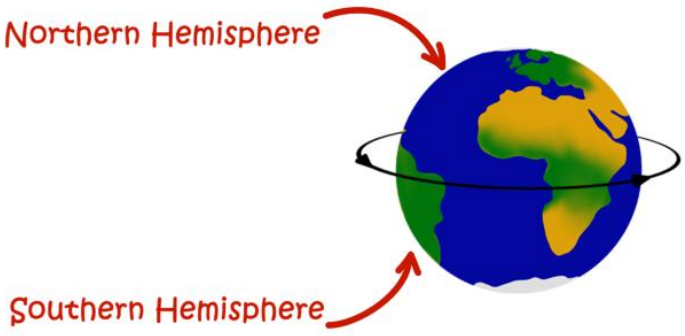
The side of the planet facing the Sun is Day time, and the side facing away is Night time.

The Sun appears to move across the sky as the Earth turns. You can track this by using a Sundial, which is how people told the time before clocks were invented (the oldest Sundial ever found dates back to Egypt in 1500BC).



Mid-day is when the Sun is highest in the sky, which we see when your position on the Earth is directly facing the Sun. Then, as the Earth continues to turn away, the Sun sets against the horizon, until we turn back around to face it again the next morning, for Sun Rise!

The Earth is also split in half, in an imaginary line, called the Equator.
In Space, there is no 'Up' or 'Down', but throughout history, humans have made maps and drawn North to be 'Up'.
The Earth is a similar shape to a ball, which is also known as a Sphere - half a Sphere is called a Hemisphere! So we take this half-way point around the Earth and split it into the Northern and Southern Hemispheres.
Here in the UK, we live in the Northern Hemisphere!



The path a planet travels around the Sun is called its Orbit. We call the length of time it takes a planet to complete 1 Orbit, a Year - on Earth, this is 365 Days.

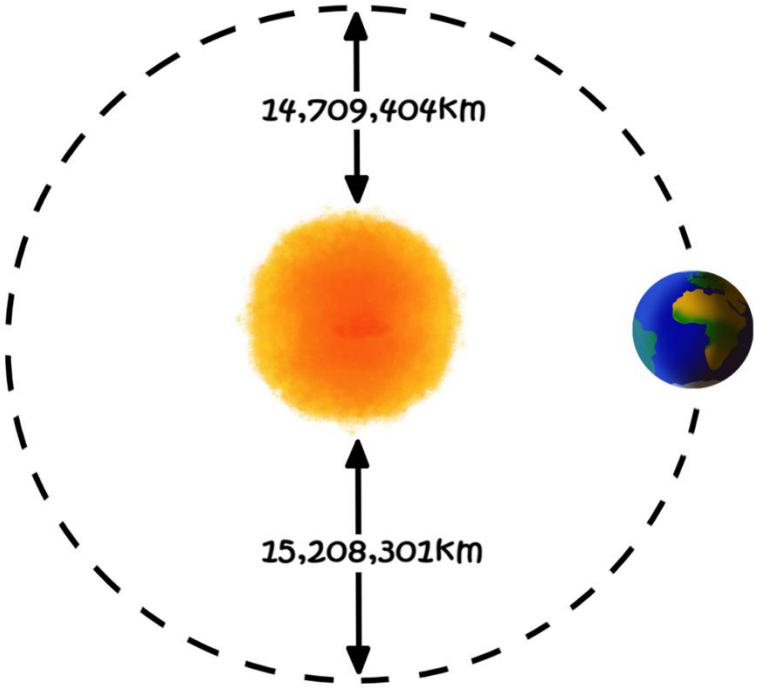
This means every birthday marks a full journey around the Sun!

Earth's Orbit is slightly lopsided, where the farthest point from the Sun (the Aphelion) is 15,208,301km, and the closest point (the Perihelion) is 14,709,404km.

That's a difference of almost 500,000km!

You would need to fly around the Earth almost 13 times to travel the same distance!

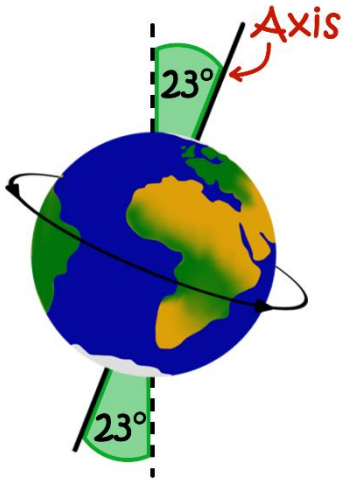
But because we are looking at such big distances, the difference isn't very much in comparison, so we tend to think of our Orbit as a circle.



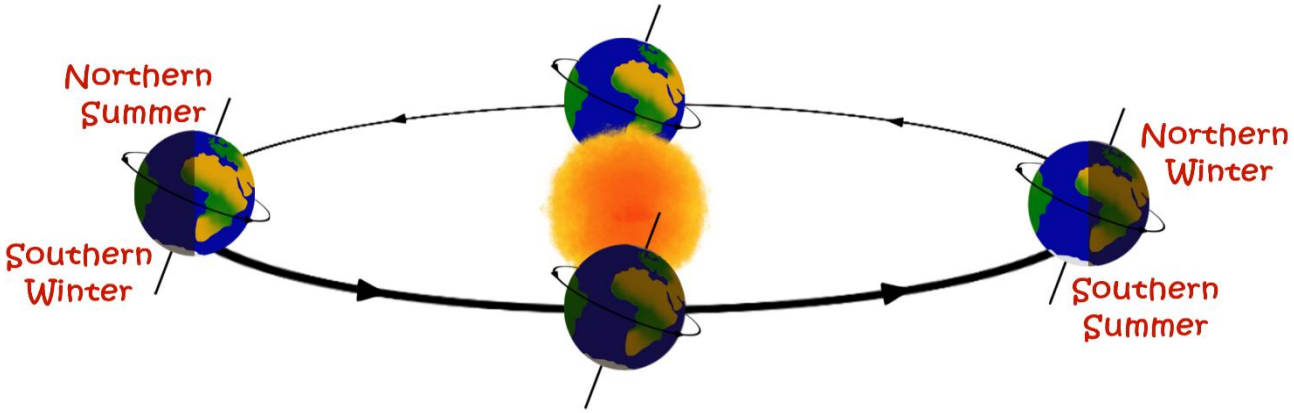
You might think that our Seasons are caused by how close or far away we are from the Sun. But actually, we reach the Perihelion in July - which is Summer in the UK. This tells us the (relatively) small change in the Earth's distance from the Sun has very little impact on the Earth's temperature.

So why do our Seasons change?

Imagine a line passing through the centre of the Earth, going from the North Pole to the South Pole. This invisible line is called the Axis.
Earth's Axis is tilted at an angle of about 23°



Almost 4.5 Billion Years ago, when the Earth was very young, scientists believe another planet (which they named Theia, after the Mother of Selene - the Greek Goddess of the Moon) crashed into us.
This crash is thought to have created our Moon and caused the Earth's tilt.

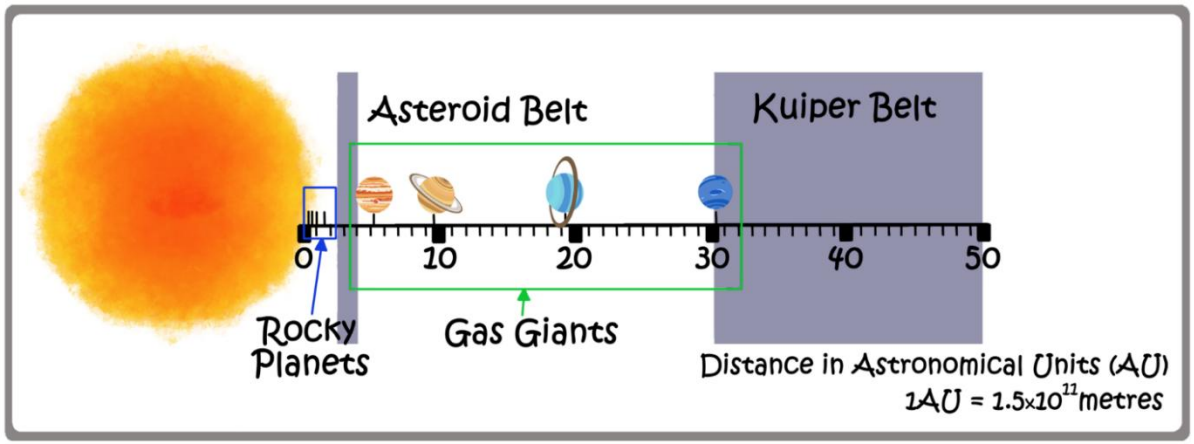


As we travel around the Sun, our wonky Axis means that different parts of the planet are angled towards or away from the Sun at different times throughout the Year.

When the North Pole is tilted towards the Sun (around June), the Northern Hemisphere experiences Summer. Then, when the Earth is at the opposite side of the Sun, the Northern Hemisphere is now tilted away from the Sun, so they experience Winter.

The opposite is true for the Southern Hemisphere - Summer in the UK is Winter in Australia!

Planets to Scale



Sun

Mercury Venus Earth Mars

Rocky Inner Planets

Jupiter Saturn Uranus Neptune

Outer Gas Giants

Mercury

Order from the Sun:	1st
Distance from the Sun:	58 Million km
Size (diameter):	4879 km
Number of Moons:	0
Length of a Year:	88 Earth days
Length of a Day:	1408 hours (58.6 Earth days)
Temperature (average):	167°C
Atmosphere:	
Hydrogen, Helium, Oxygen, Sodium, Potassium, Water Vapour	

Venus

Order from the Sun:	2nd
Distance from the Sun:	108 Million km
Size (diameter):	12,104 km
Number of Moons:	0
Length of a Year:	225 Earth days
Length of a Day:	5832 hours (243 Earth days)
Temperature (average):	464°C
Atmosphere:	
Carbon Dioxide, Sulfur Dioxide, Nitrogen	

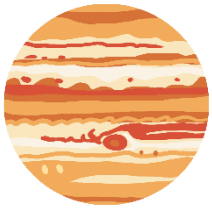
Earth

Order from the Sun:	3rd
Distance from the Sun:	150 Million km
Size (diameter):	12,742 km
Number of Moons:	1
Length of a Year:	365 Earth days
Length of a Day:	24 hours
Temperature (average):	15°C
Atmosphere:	
Nitrogen, Oxygen, Argon, Carbon Dioxide	

Mars

Order from the Sun:	4th
Distance from the Sun:	228 Million km
Size (diameter):	6779 km
Number of Moons:	2
Length of a Year:	687 Earth days
Length of a Day:	25 hours
Temperature (average):	-65°C
Atmosphere:	
Oxygen, Carbon Dioxide, Carbon Monoxide, Nitrogen, Argon	

Jupiter

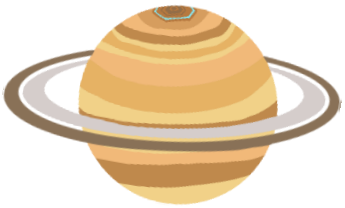


Order from the Sun:	5th
Distance from the Sun:	778 Million km
Size (diameter):	142,984 km
Number of Moons:	115
Length of a Year:	12 Earth years
Length of a Day:	10 hours
Temperature (average):	-110°C

Atmosphere:

Jupiter is mostly made up of gas, such as Hydrogen, Helium, Ammonia, Sulfur

Saturn



Order from the Sun:	6th
Distance from the Sun:	1.4 Billion km
Size (diameter):	116,460 km
Number of Moons:	292
Length of a Year:	29 Earth years
Length of a Day:	11 hours
Temperature (average):	-140°C

Atmosphere:

Saturn is mostly made up of gas, such as Hydrogen, Helium, Methane

Uranus

Order from the Sun:	7th
Distance from the Sun:	2.9 Billion km
Size (diameter):	50,724 km
Number of Moons:	28
Length of a Year:	84 Earth years
Length of a Day:	17 hours
Temperature (average):	-195°C

Atmosphere:

Uranus is mostly made up of gas, such as Hydrogen, Helium, Ammonia, Methane

Neptune

Order from the Sun:	8th
Distance from the Sun:	4.5 Billion km
Size (diameter):	49,244 km
Number of Moons:	16
Length of a Year:	165 Earth years
Length of a Day:	16 hours
Temperature (average):	-200°C

Atmosphere:

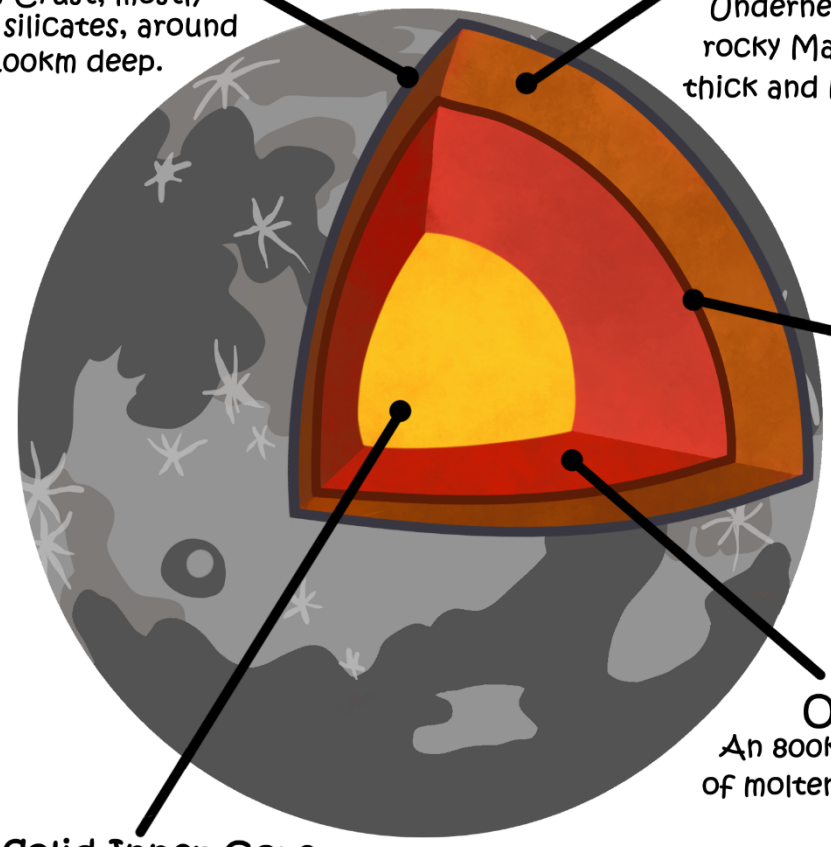
Neptune is mostly made up of gas, such as Hydrogen, Helium, Methane

Inside Mercury

Mercury is the closest planet to our Sun, at around 58 Million km away, and is the smallest planet in our Solar System - only slightly bigger than our Moon with a diameter of 4879km. Although it is closest to the Sun, it is only the 2nd hottest planet in our Solar System!

Mercury is tidally locked, meaning one side almost always faces the Sun, and the other side always faces away. The side closest to the Sun can reach temperatures up to 430°C, whilst the 'dark' side plunges down to -180°C! It has a very thin (almost non-existent) atmosphere, and its surface is covered in craters from meteoroid impacts.

Mercury is named after the Roman God of travel and messages!



Solid Crust

A thin Crust, mostly made of silicates, around 100km deep.

Mantle

Underneath the crust, is the rocky Mantle, which is 600km thick and made of silicates and sulfur.

Solid Anticrust

Next is a solid layer of iron-sulfide, that ranges from 50-200km in thickness.

Molten Outer Core

An 800km outer Core made of molten iron, sulfur and some silicates.

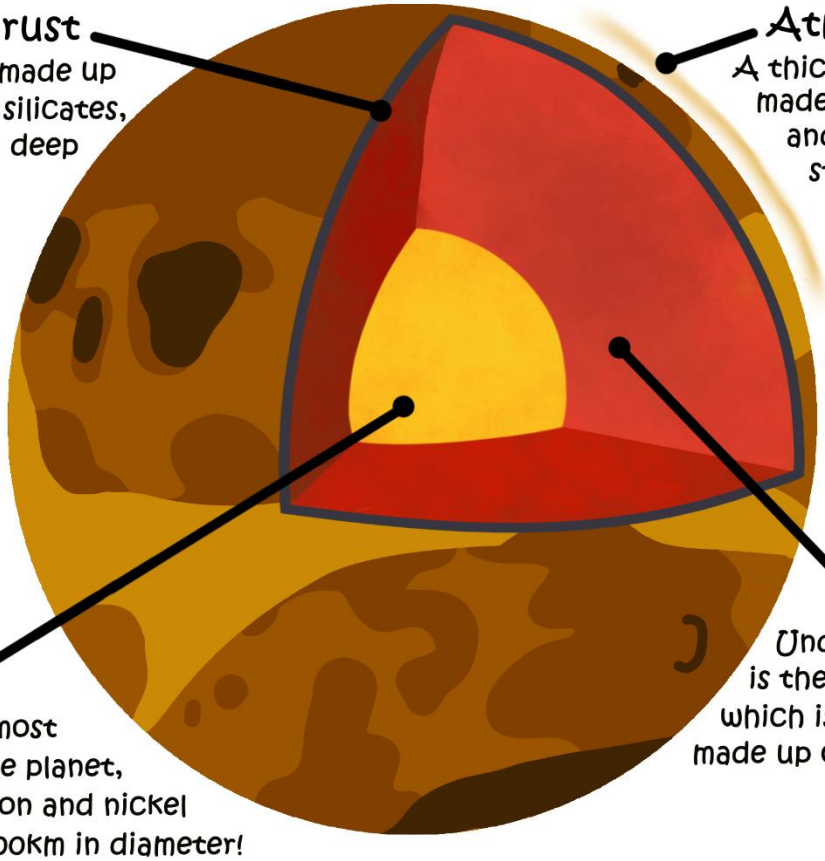
Solid Inner Core

Finally, at the centre of the planet, is a solid Core made of iron and nickel, making it very dense compared to other planet's Cores.
The solid Core is around 2000km in diameter!
It generates a magnetic field, like the Earth's, but much weaker

Did you know: The craters on Mercury are famous!
Over 400 of the craters on Mercury are named after famous people, including Walt Disney, Beethoven, JRR Tolkien and more!

Inside Venus

Venus is the 2nd closest planet to the Sun, at 108 Million km away, and it is often referred to as "Earth's evil twin" because it has a very similar size to the Earth, with a diameter of 12,104km, and a thick atmosphere.
However, unlike the Earth, the atmosphere on Venus is made up of 96% Carbon Dioxide, and it rains Sulfuric Acid! These are very dense gases and blanket the planet - trapping in heat. Although Mercury is closer to the Sun, the thick atmosphere means that Venus is actually the hottest planet in our Solar System, with temperatures around 475°C!
Venus is named after the Roman Goddess of beauty, because it shines so brightly in our night sky!



Solid Crust
A thin Crust, made up of basalt and silicates, around 50km deep

Atmosphere
A thick Atmosphere, mostly made of carbon dioxide and a pressure 90 times stronger than Earth's!

Mantle
Underneath the crust, is the rocky Mantle, which is 3000km thick and made up of silicates

Core
The innermost layer of the planet, made of iron and nickel around 3000km in diameter!
It is unknown if Venus' Core is completely solid or partially molten like the Earth's.
It also generates a magnetic field around the planet, but even though Venus is a similar size to us, it has a much weaker field.

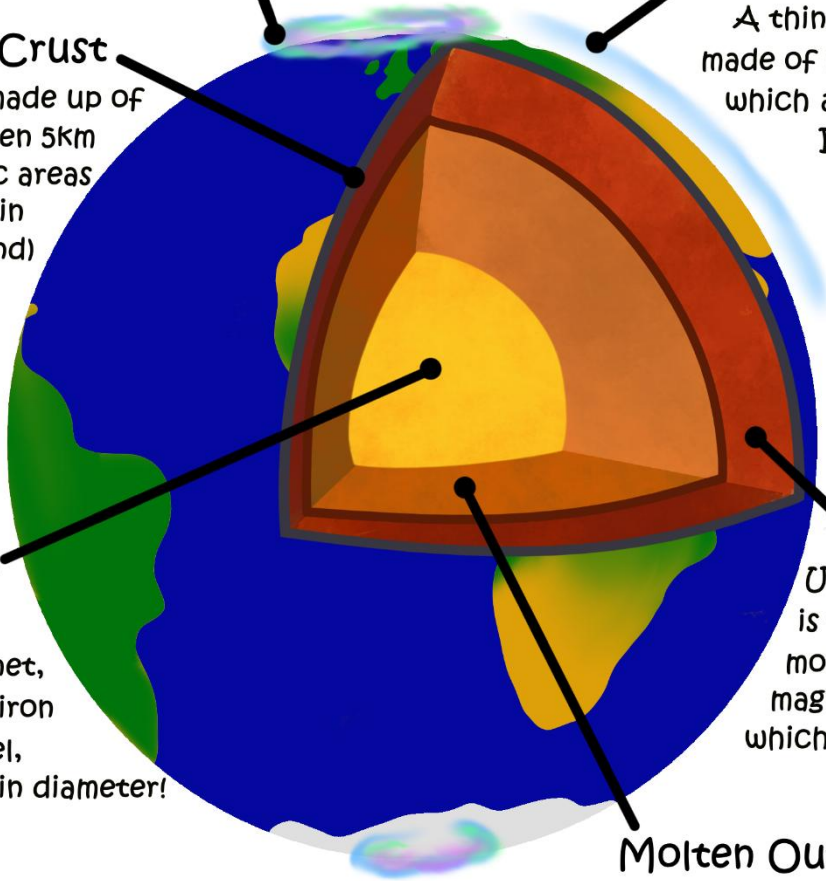
Did you know: A day on Venus is longer than a year!
Venus takes 243 Earth days to spin on it's Axis once, but only 225 Earth days to Orbit the Sun

Inside Earth

The Earth is our home and is the 3rd planet from the Sun, at a distance of 150 Million km. It is the only planet that is known to support life! We live in an area around the Sun called the Habitable Zone (also known as the Goldilocks Zone), where it's not too hot, not too cold, it's just right.

Earth has a strong magnetic field that protects us from the harsh Solar Winds, and causes the beautiful Auroras at the North and South Poles. We are the only planet in the Solar System with liquid water on its surface - over 70% of the Earth is covered in water, but only 3% of this is actually fresh water we can drink, the rest is salted.

Earth is also known as Terra, after the Roman Goddess of nature and the world itself!



Aurora

Atmosphere

A thin Atmosphere, mostly made of nitrogen and oxygen, which allows us to breathe! It helps protect the Earth from harmful radiation from the Sun, and meteors which burn up as shooting stars.

Solid Crust

A thin Crust, made up of silicates, between 5km deep in Oceanic areas and 50km deep in Continental (land) areas.

Solid Inner Core

The innermost layer of the planet, mostly made of iron with some nickel, around 2500km in diameter!

Mantle

Underneath the crust, is the Mantle, made of molten silicates, magnesium and iron, which is 2,900km thick.

Molten Outer Core

A 2,300km thick outer Core made of molten iron and nickel. This core generates a strong magnetic field around the planet, it is the reason compasses point North, and helps protect us from most of the Sun's radiation.

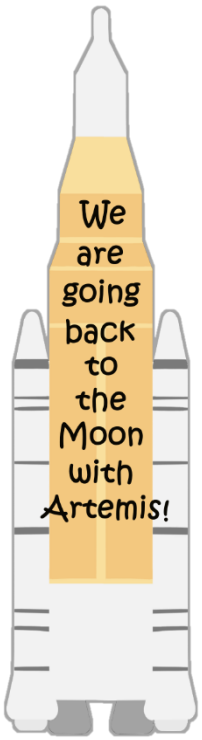
Did you know: Wood is the rarest resource!
So far, Earth is the only planet we have found to have trees, which makes our forests even more precious

Inside the Moon

The Earth has 1 Moon, and is around 384,400km away from us. If you lined up all the planets in our Solar System right next to each other, they would fit in the space between the Earth and the Moon (not including Saturn's rings)! We are tied together by gravity - the Earth is so big that it stops the Moon from floating away into Space. But the Moon also affects us! As it Orbits around the planet, the Moon pulls at the Earth, which causes the tides in the Seas!

It doesn't have a protective atmosphere, so meteors and comets hit the surface fairly often. Like Mercury, the Moon is tidally locked, but with the Earth instead of the Sun - which means that one side always faces us and one side always faces away!

The Moon is also known as Luna, after the Roman Goddess of the Moon!



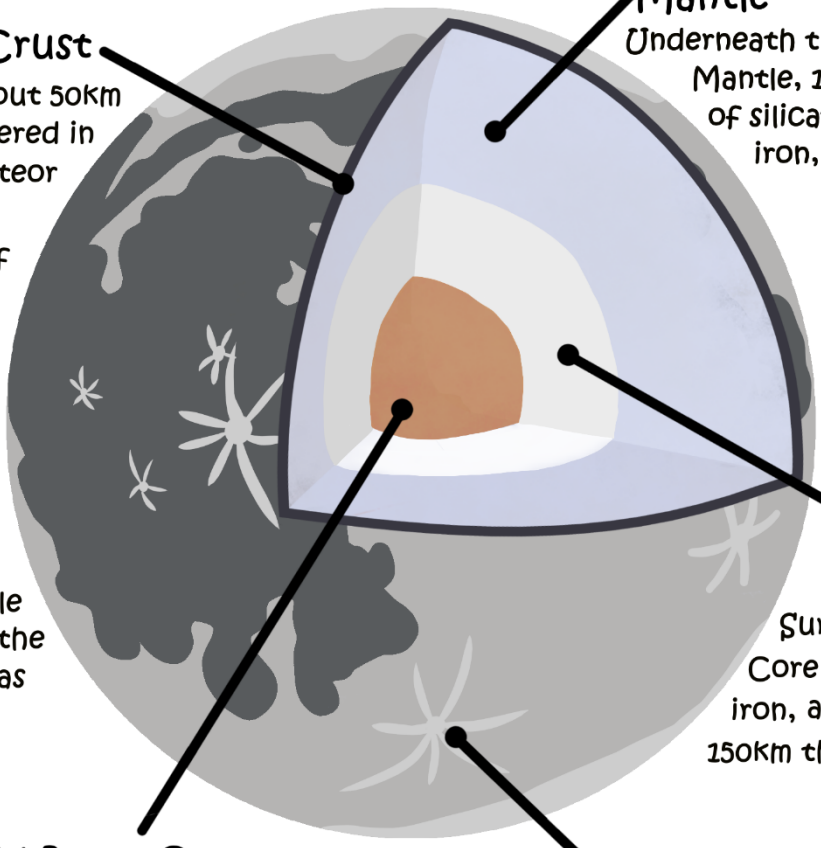
Solid Crust

A thin Crust, about 50km deep, that is covered in craters from meteor impacts!

It is made up of basalt and other igneous and metamorphic rocks, which are formed as lava cools down. Scientists think there may have once been a whole ocean of lava on the Moon when it was very young!

Mantle

Underneath the Crust, is a rocky Mantle, 1000km thick, made of silicates, magnesium and iron, just like the Earth.



Molten Outer Core

Surrounding the Solid Core is a molten layer of iron, and sulfur, around 150km thick.

Solid Inner Core

At the centre of the planet is a solid Core, made of iron.
It is about 480km in diameter!

Craters

Did you know: Humans have been to the Moon! 31 people have flown to the Moon, and the 1st person set foot on its surface in 1969. Since then 12 people have walked on and done experiements up there!

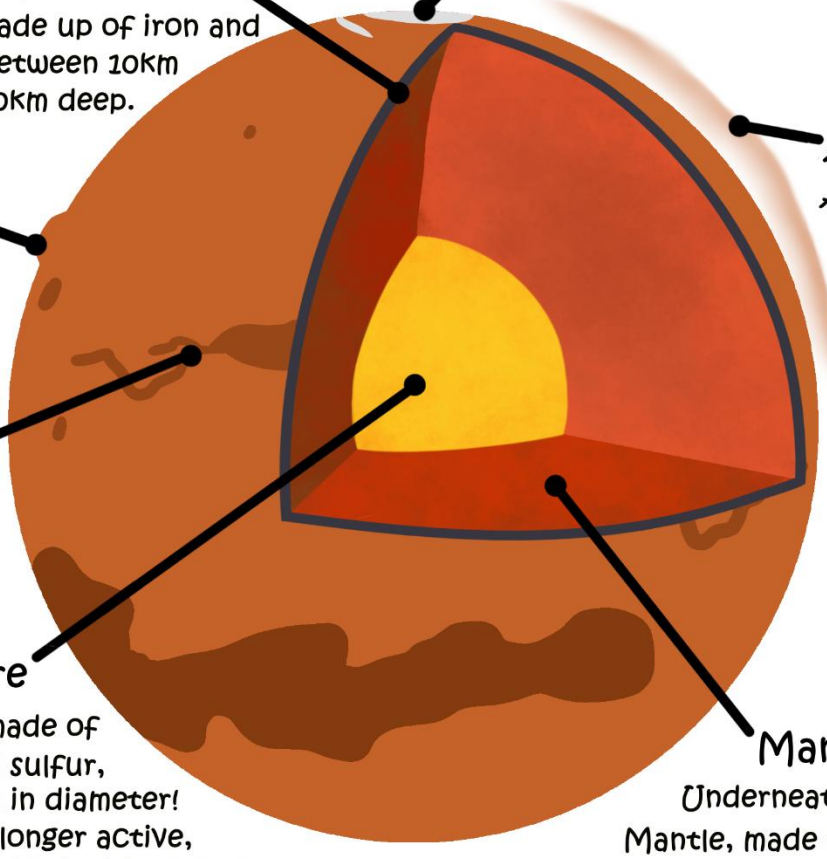
Inside Mars

Mars is the 4th planet from the Sun, at 228 Million km away, and is about half the size of the Earth! It is known as the Red Planet due to its distinctive red appearance caused by the Iron Oxide (that's rust) in its soil.

It is entirely populated by robots! Since 1960 scientists have sent over 68 probes to Mars - 21 have landed on its surface to study the planet and search for evidence of life.

Scientists believe that Mars may have had water on its surface a long time ago, due to the large canyons like the Valles Marineris, which likely would have been carved out by huge rivers and lakes. They have found ice around the North Pole, but because Mars has such a thin atmosphere, any liquid water evaporates very quickly.

Mars is named after the Roman God of war!



Ice Caps

Solid Crust
A thin Crust, made up of iron and other metals, between 10km to 50km deep.

Atmosphere
A thin Atmosphere, mostly made of carbon dioxide and nitrogen.
It appears red because of all the iron oxide dust that is thrown into the air during it's many storms.

Olympus Mons

Valles Marineris

Solid Core
A dense Core made of iron, nickel and sulfur, around 2,100km in diameter!
The Core is no longer active, so Mars' magnetic field is long gone, which leaves it exposed to the Sun's harmful winds and radiation.

Mantle
Underneath the crust, is the Mantle, made of molten silicates, which is between 1,240km and 1,880km thick.

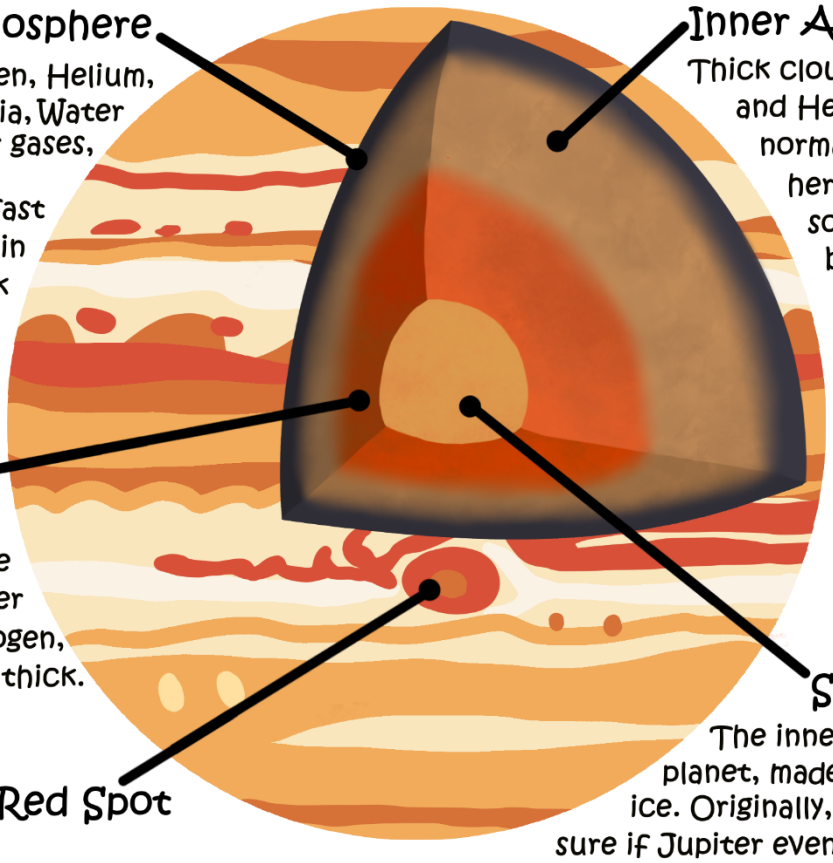
Did you know: Mars has the bigggest mountain in the Solar System!
Olympus Mons is a Shield Volcano, 21km high and 600km wide
That's 2.5 times taller than Everest, and about the size of France!
It might even still be active!

Inside Jupiter

Jupiter is the largest planet in our Solar System and the 5th planet from the Sun, at 778 Million km away! It is a Gas Giant, which means it has no surface, and is made up of layers and layers of different clouds of gas, with violent storms raging at all times. The most famous storm is known as the 'Great Red Spot' that is larger than the Earth and has been raging for over 350 years!

Scientists are constantly finding new moons orbiting Jupiter, with at least 115 being identified as of April 2026. The 4 largest moons (Io, Europa, Ganymede and Callisto) are known as the Galilean Moons, after the famous Astronomer, Galileo Galilei, who discovered them in 1610.

Jupiter is named after the Roman God of storms!



Outer Atmosphere

Layers or Hydrogen, Helium, Methane, Ammonia, Water vapour, and other gases, 50km deep.

These form fast moving clouds in distinctive dark and light bands.

Inner Atmosphere

Thick clouds of Hydrogen and Helium, which are normally gases, but here the pressure is so strong they become a liquid ocean.

It rains Helium!

Metallic Hydrogen

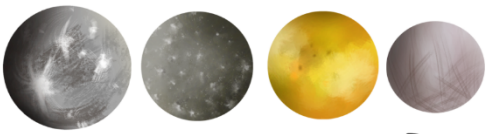
Surrounding the core is a thick layer of Metallic Hydrogen, around 57,200km thick.

The Great Red Spot

Solid Core

The innermost layer of the planet, made of iron, rock and ice. Originally, scientists weren't sure if Jupiter even had a Core, but information from the JUNO mission showed that actually it does! It's hard to tell just how big the Core is, because it blends with the Metallic Hydrogen layer.

Galilean Moons



Ganymede Callisto Io Europa

Did you know: Jupiter is more than 2.5 times the mass of all of the other planets in our Solar System, combined!

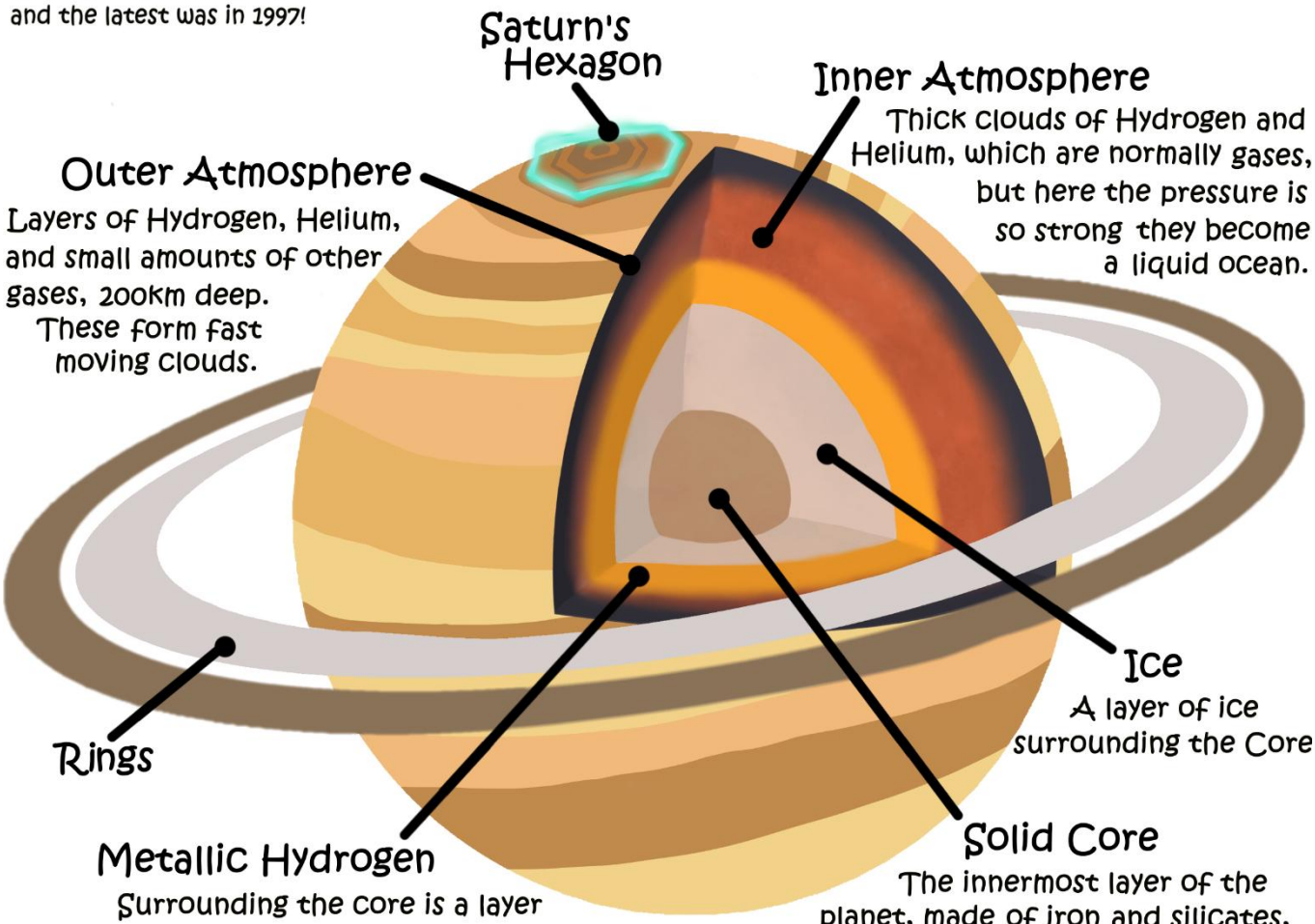
Inside Saturn

Saturn is the 6th planet from the Sun, at 1.4 Billion km away. Like Jupiter, it is also a Gas Giant, with no surface and bizarre hexagonal-shaped clouds at its North Pole. It is one of the most unique planets in our Solar System, with gigantic rings made of ice and rock! Some other planets have rings too, but none as spectacular as Saturn's - they stretch out to over 120,700km away from the planet, but are only 20m thick. Some of its moons actually live within the rings and cause ripples as they travel.

Scientists are constantly finding new moons orbiting Saturn, with at least 292 being identified as of April 2026 (there are so many, scientists stopped being able to come up with new names for them all!)

Saturn is named after the Roman God of farming!

The further away we travel from the Sun, the less information we know about the planets and their moons, so missions are sent to study them. But it can take a long time for the satellites to travel out there. Only 4 have ever made it out to Saturn, and the latest was in 1997!



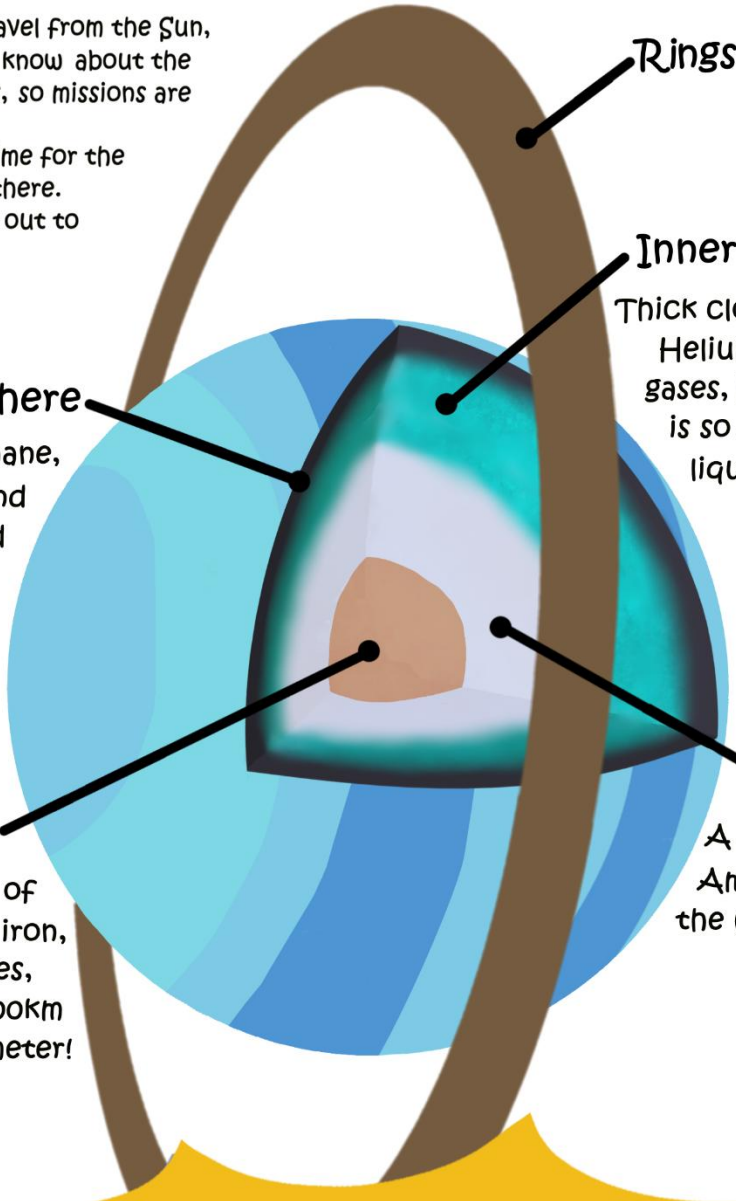
Did you know: Saturn could float in a bath (if you can find one that big)! It is mostly made up of Hydrogen and Helium, which are very light elements, so Saturn is actually 30% less dense than water

Inside Uranus

Uranus is the 7th planet from the Sun, at 2.9 Billion km away. Its Axis is tilted 98° so it rolls around the Sun on its side. Like Jupiter and Saturn, it is a Giant planet, with no surface, but it is classed as an Ice Giant because the gases that make up its clouds have very low freezing points. It also has spectacular rings, but not as big or complex as Saturn's - stretching out to around 98,000km away from the planet, and are up to 150m thick. Whilst Neptune is the coldest planet on average, Uranus reaches the lowest temperatures in the Solar System of -224°C.

Most planets have their moons named after different Gods, but Uranus' moons are named after characters from William Shakespeare and Alexander Pope's stories! Uranus is named after the Greek God of the sky!

The further away we travel from the Sun, the less information we know about the planets and their moons, so missions are sent to study them.
But it can take a long time for the satellites to travel out there.
Only 1 has ever made it out to Uranus, sent in 1977!



Rings

Inner Atmosphere

Thick clouds of Hydrogen and Helium, which are normally gases, but here the pressure is so strong they become a liquid ocean.

Outer Atmosphere

Layers of icy Methane, Ammonia, Water, and other gases, around 300km deep.

These form fast moving clouds.

Mantle

A sea of icy Water and Ammonia surrounding the Core.

Solid Core

The innermost layer of the planet, made of iron, nickel and silicates, around 10,000km in diameter!

Did you know: Uranus was originally going to be named 'George'! The planet was discovered in 1781 by Astronomer William Herschel. As a 'thank-you' for supporting his work, he wanted to name it 'Georgium Sidus' (George's Star) after King George III

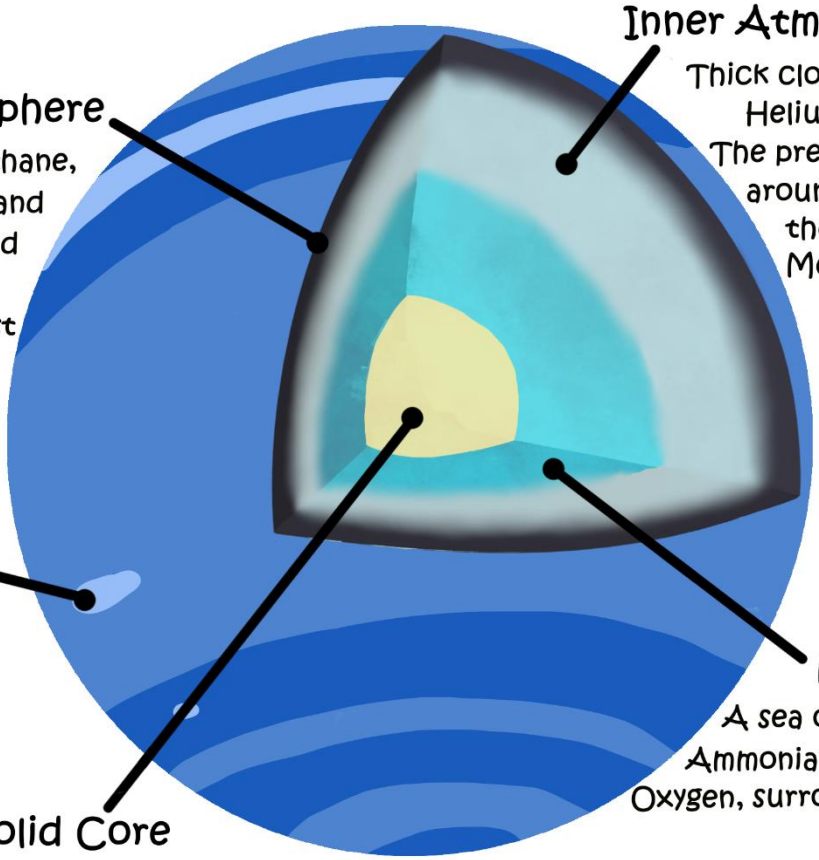
Inside Neptune

Neptune is the 8th and farthest planet from the Sun, at 4.5 Billion km away! Like Uranus, it is also an Ice Giant, with no surface, and like Jupiter, it is very stormy with winds of over 2,000km/hr. The most powerful winds we have recorded on Earth only reach up to 400 km/hr. The largest storm on Uranus was the 'Great Dark Spot', spotted in 1989 and lasted 5 years, but new ones appear regularly. Scientists think that there may even be a water ocean below its clouds!

It is the only planet you can't see on Earth with the naked eye, and takes 165 Earth years to complete 1 Orbit around the Sun, which means if aliens lived on Neptune, they would have only recently celebrated one birthday since it was discovered in 1846.

Neptune is named after the Roman God of the sea!

The further away we travel from the Sun, the less information we know about the planets and their moons, so missions are sent to study them. But it can take a long time for the satellites to travel out there. Only 1 has ever made it out to Neptune, sent in 1977!



Outer Atmosphere

Layers of icy Methane, Ammonia, Water, and other gases, around 400km deep.

These form very fast moving clouds and storms.

Inner Atmosphere

Thick clouds of Hydrogen, Helium, and Methane. The pressure is so strong around 7,000km below the clouds that the Methane is crushed and rains downs as diamonds!

Massive Storms

Mantle

A sea of icy Water, Ammonia, Hydrogen and Oxygen, surrounding the Core.

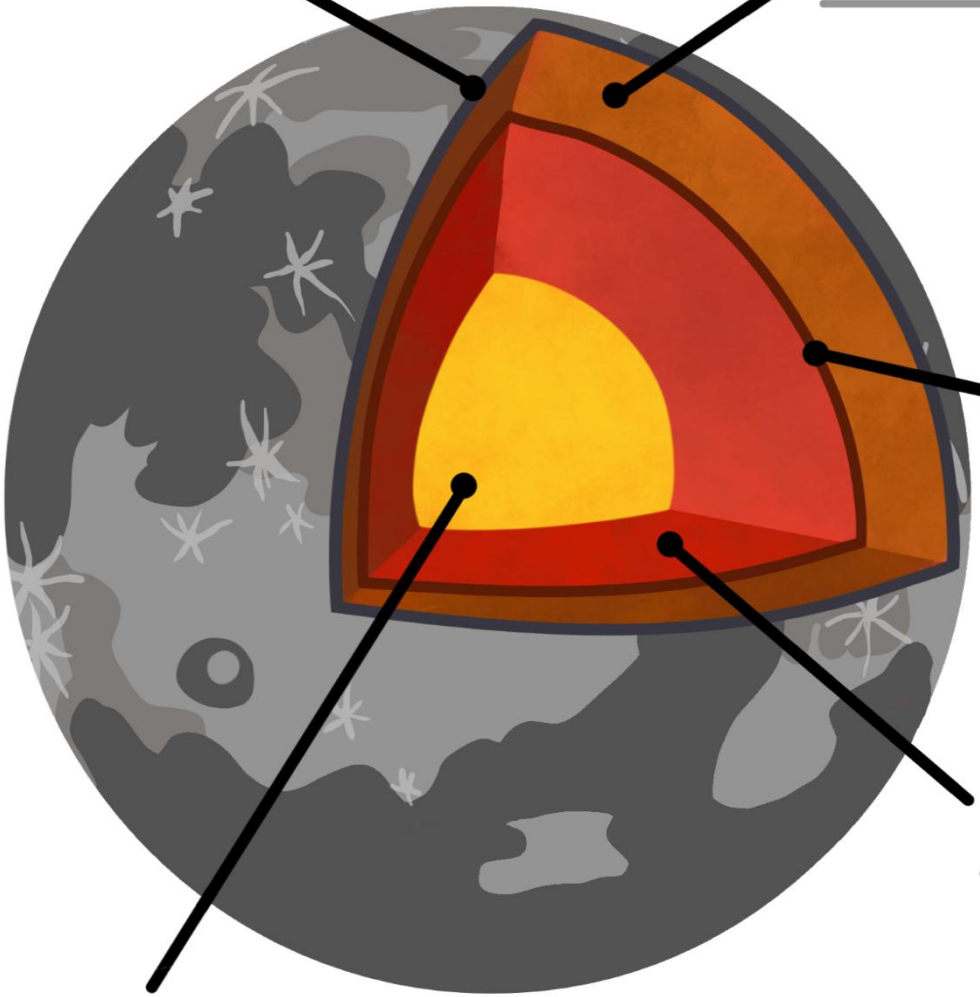
Solid Core

The innermost layer of the planet, likely made of iron and silicates.

Did you know: Neptune was discovered using Maths!
It is the only planet in our Solar System to have been found by predicting where it would be, based on how Uranus' orbit seemed to shift, instead of simply spotting it in the night sky

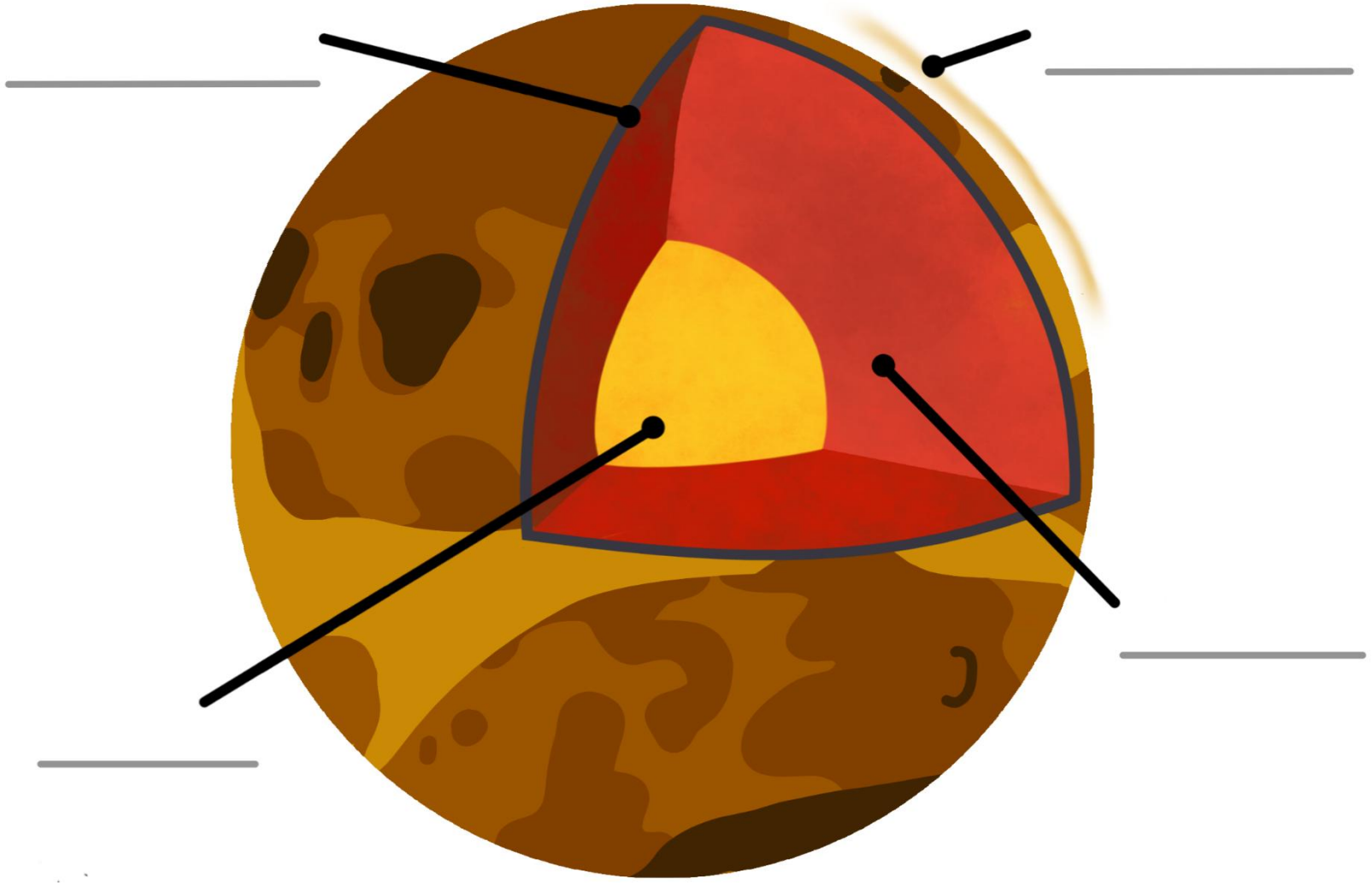
Inside Mercury

Label the layers of the planet!



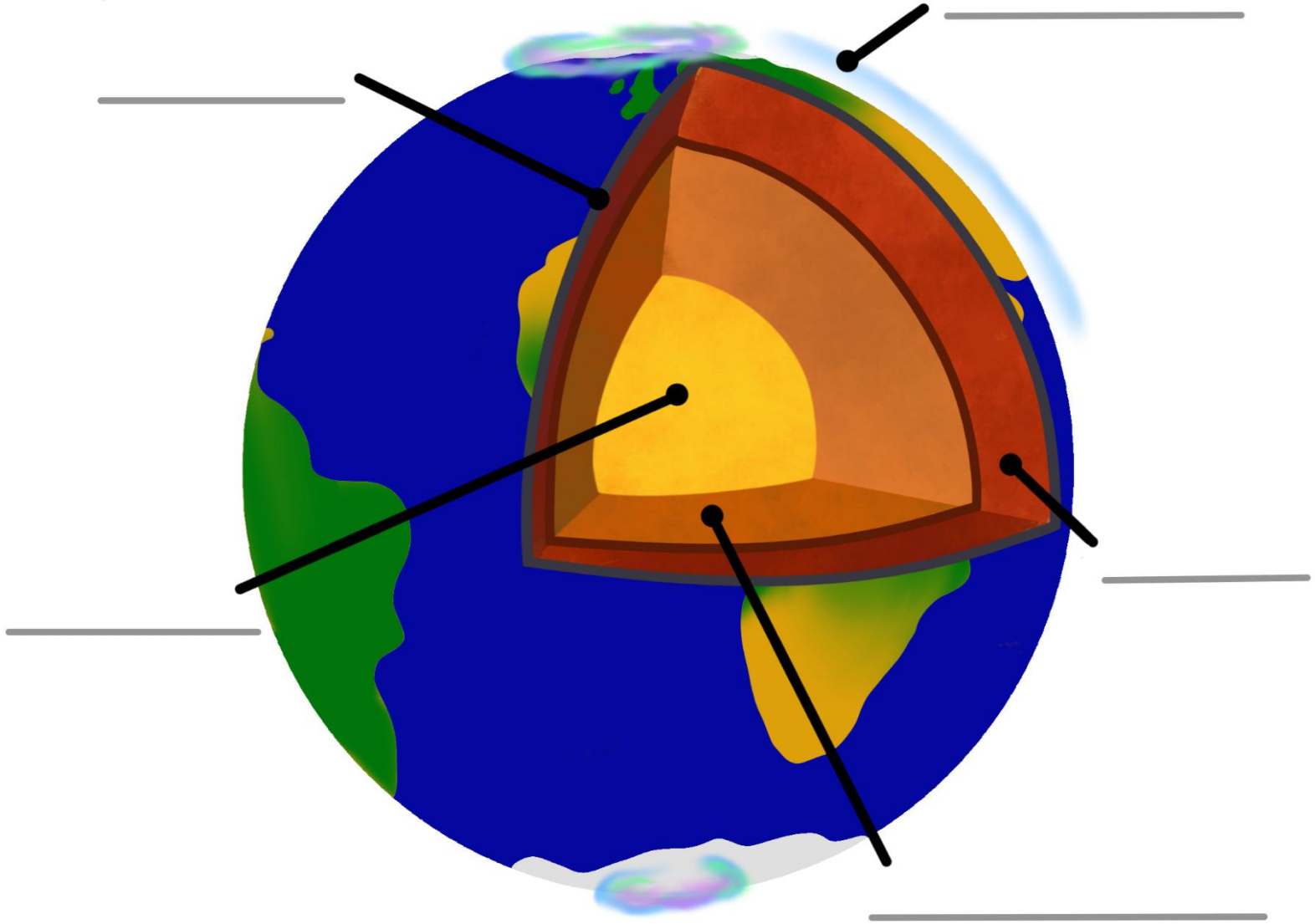
Inside Venus

Label the layers of the planet!



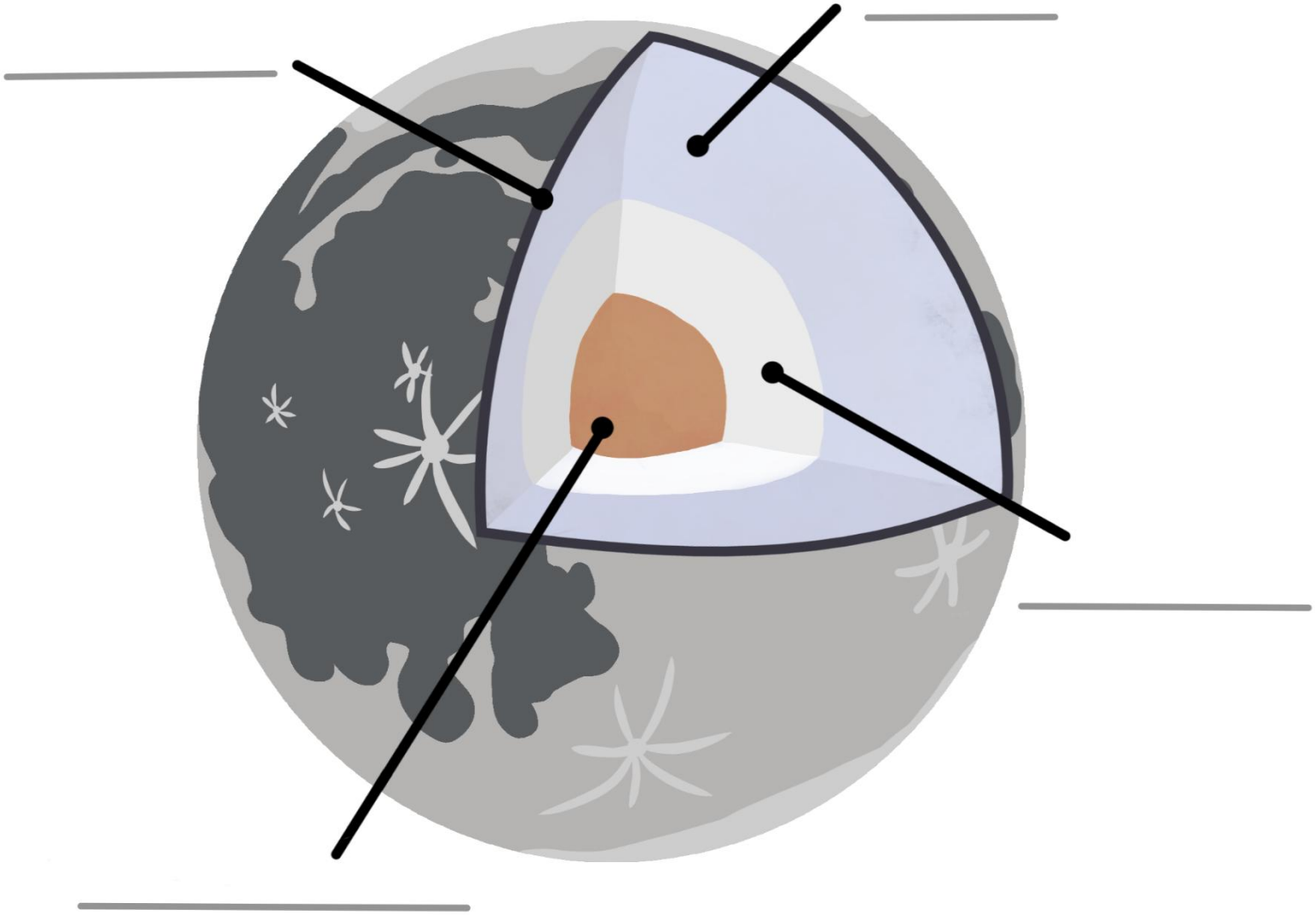
Inside Earth

Label the layers of the planet!



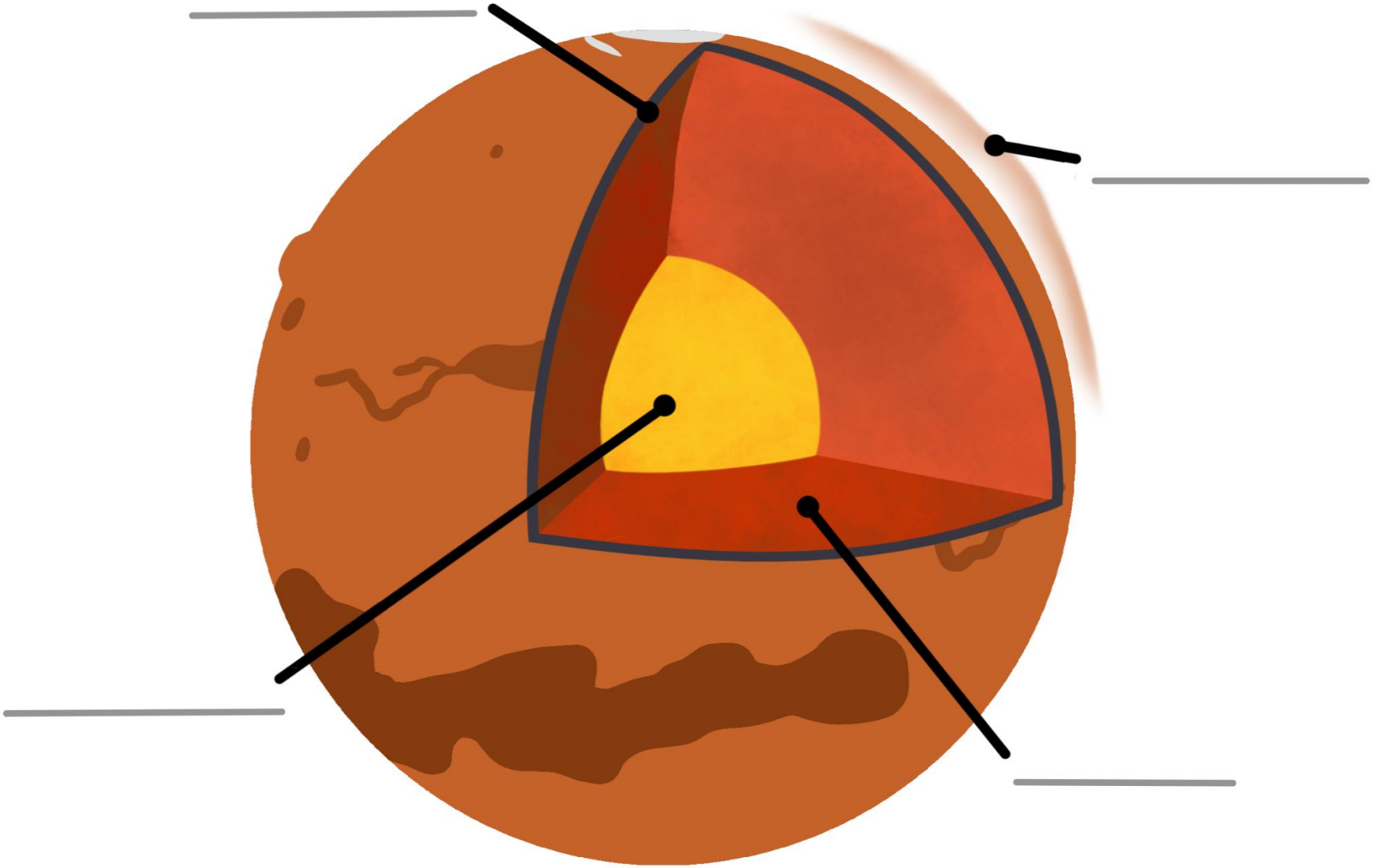
Inside the Moon

Label the layers of the Moon!



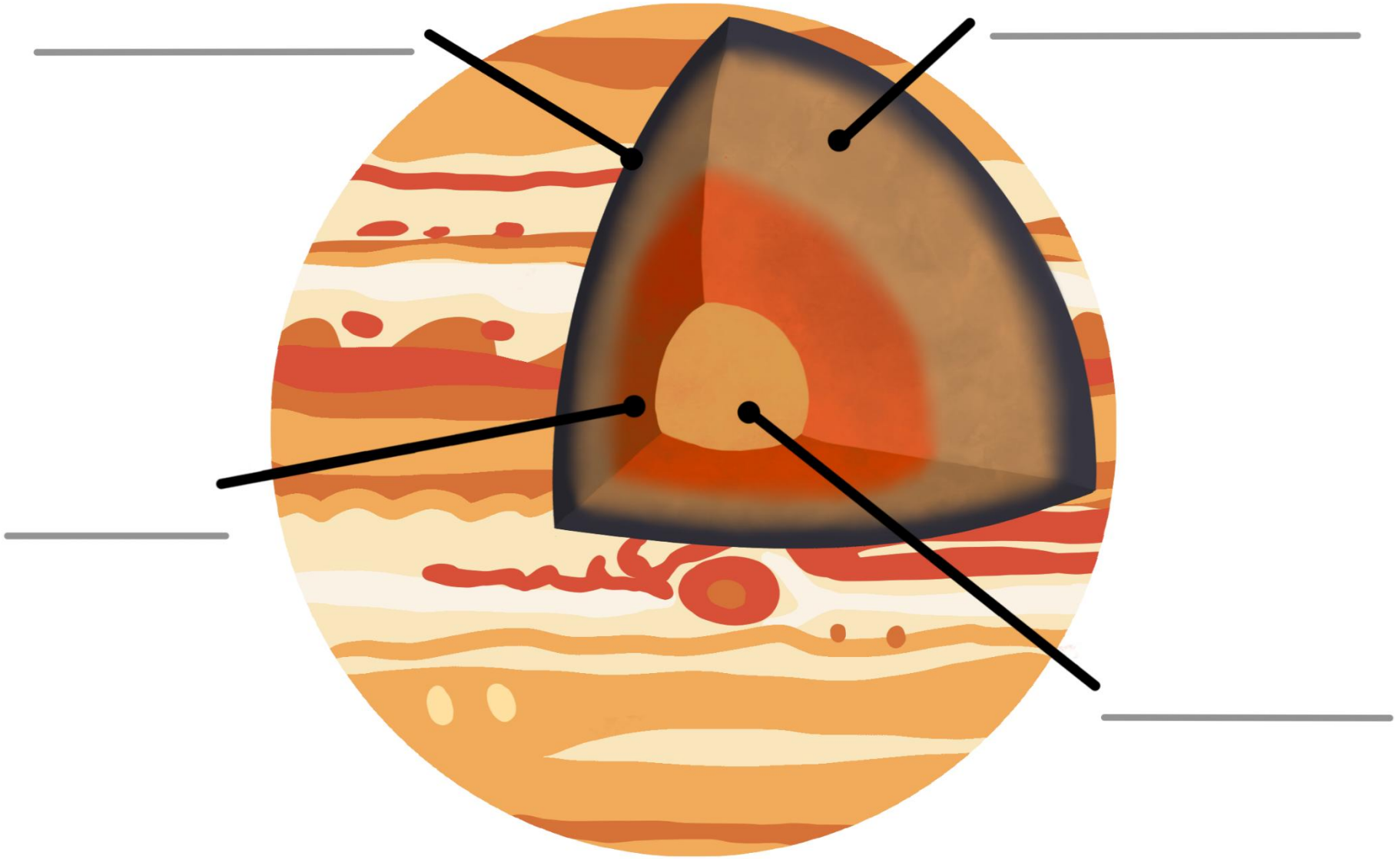
Inside Mars

Label the layers of the planet!



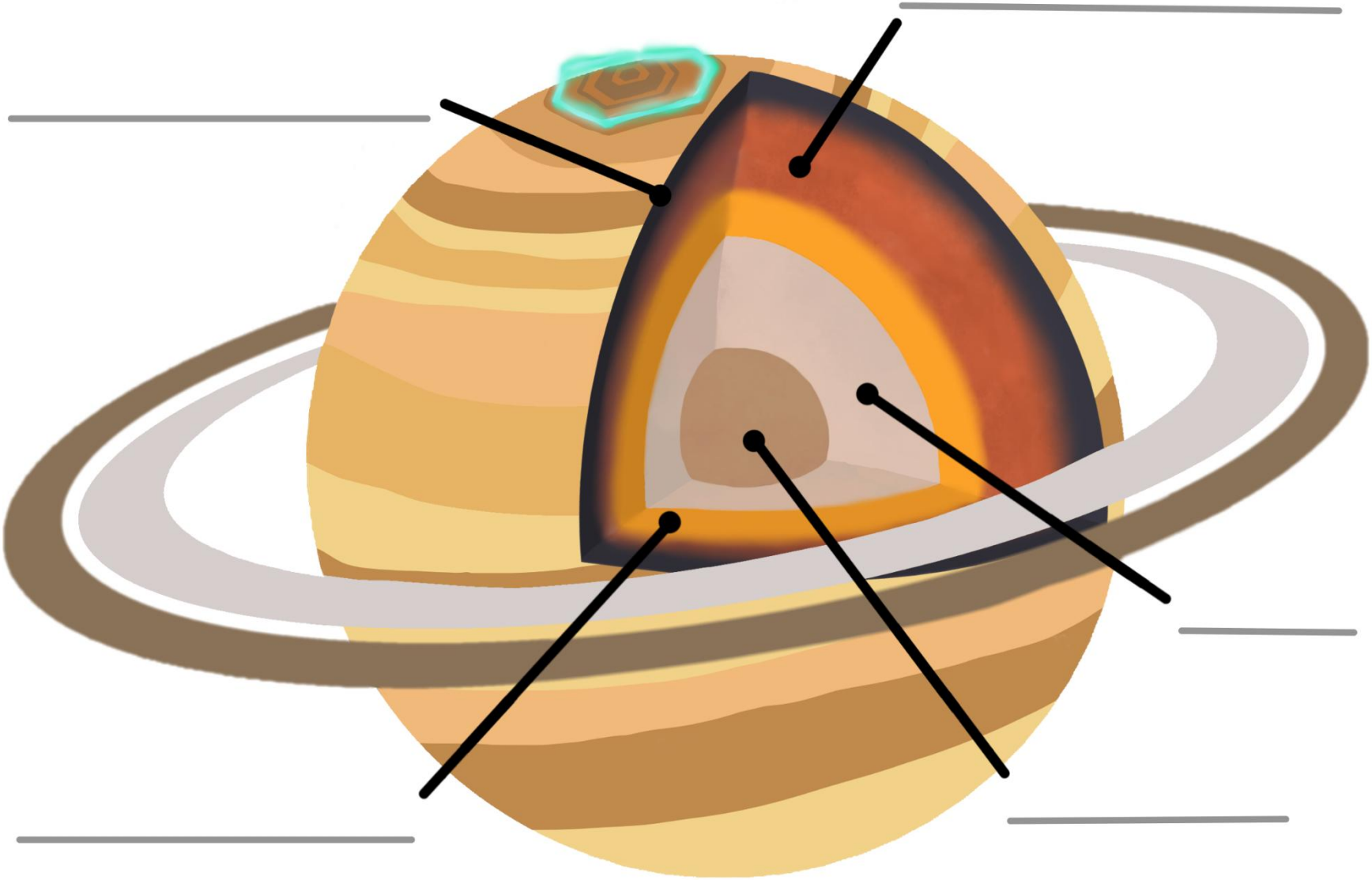
Inside Jupiter

Label the layers of the planet!



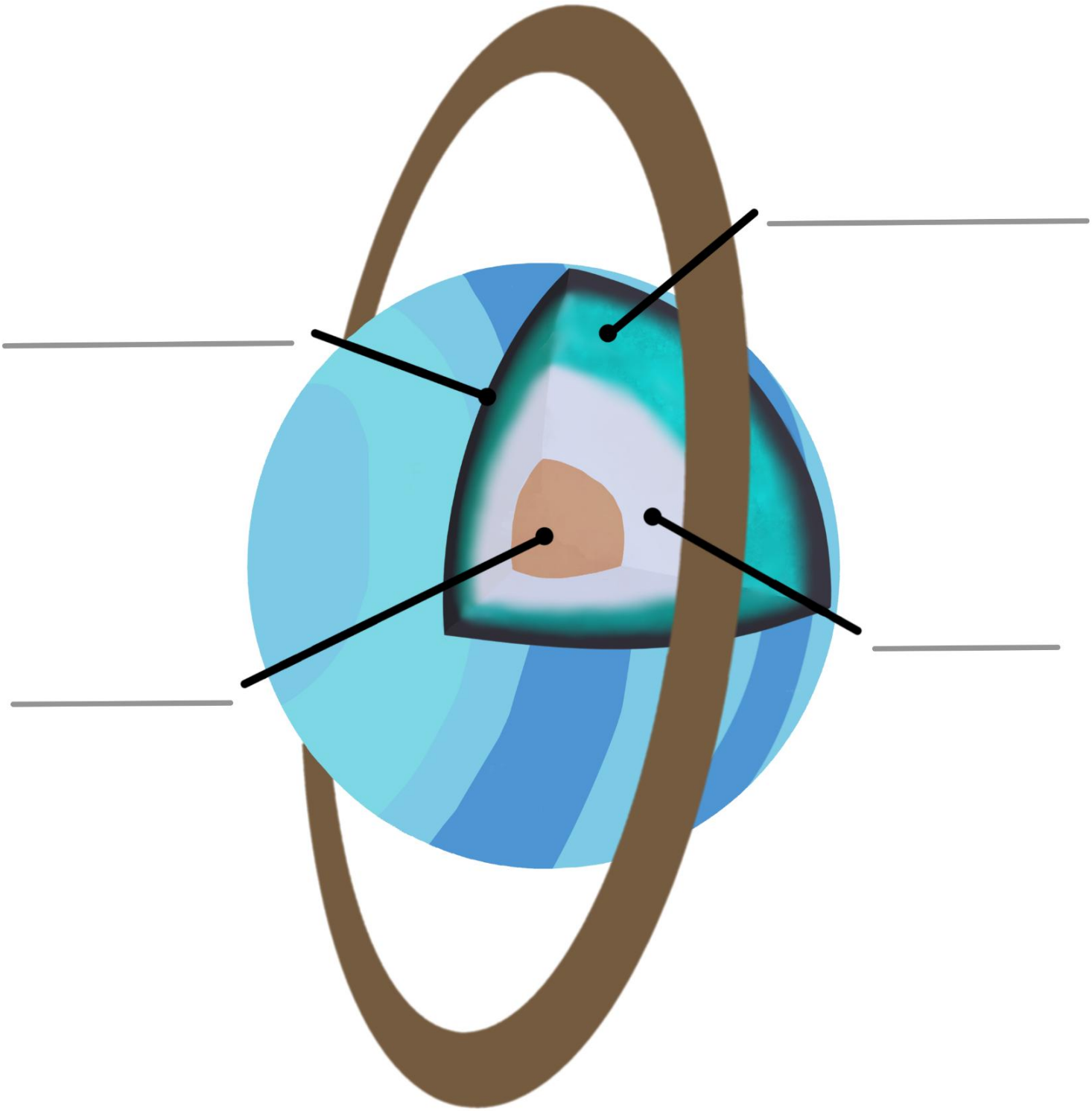
Inside Saturn

Label the layers of the planet!



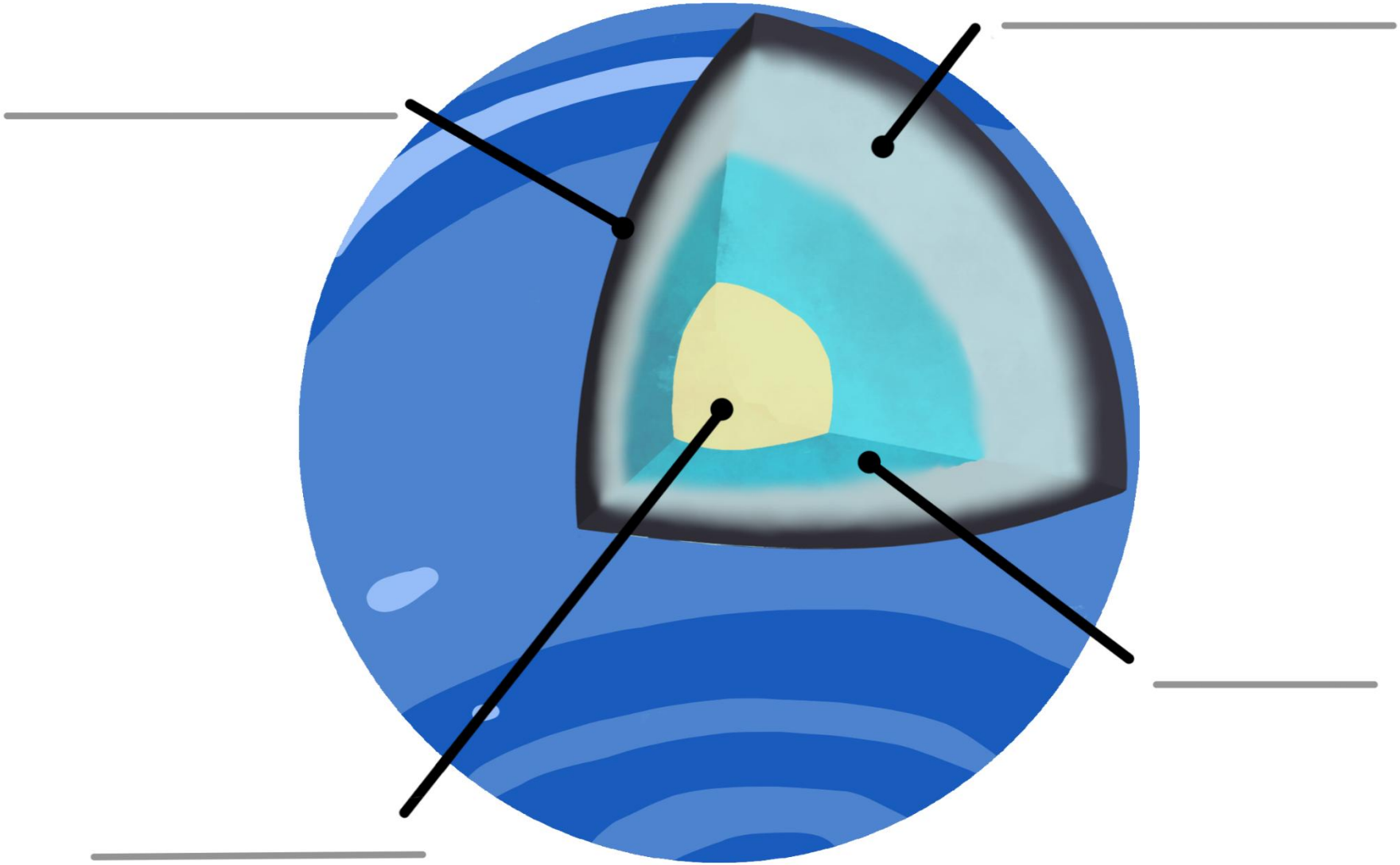
Inside Uranus

Label the layers of the planet!



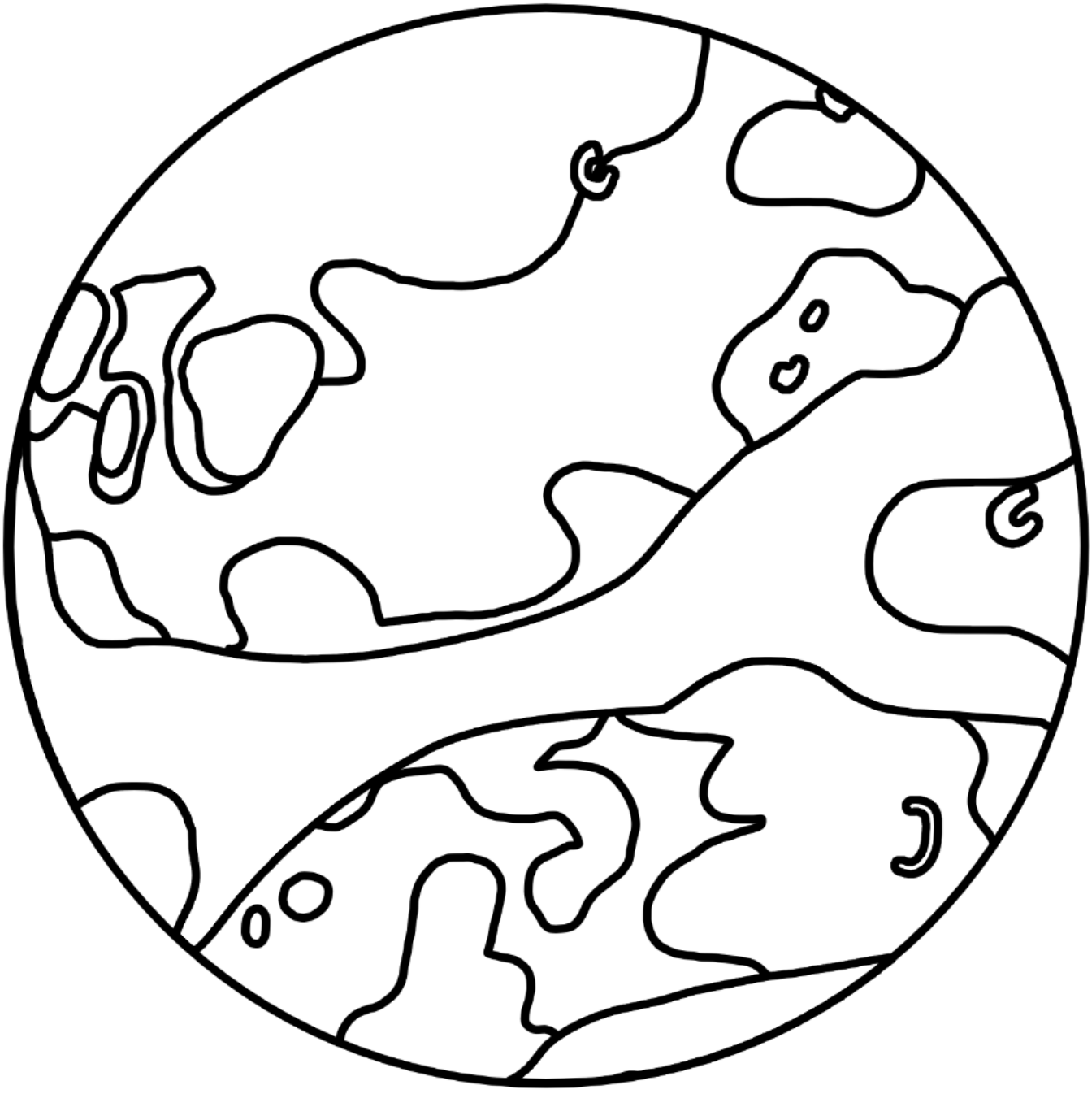
Inside Neptune

Label the layers of the planet!



Colour in Mercury

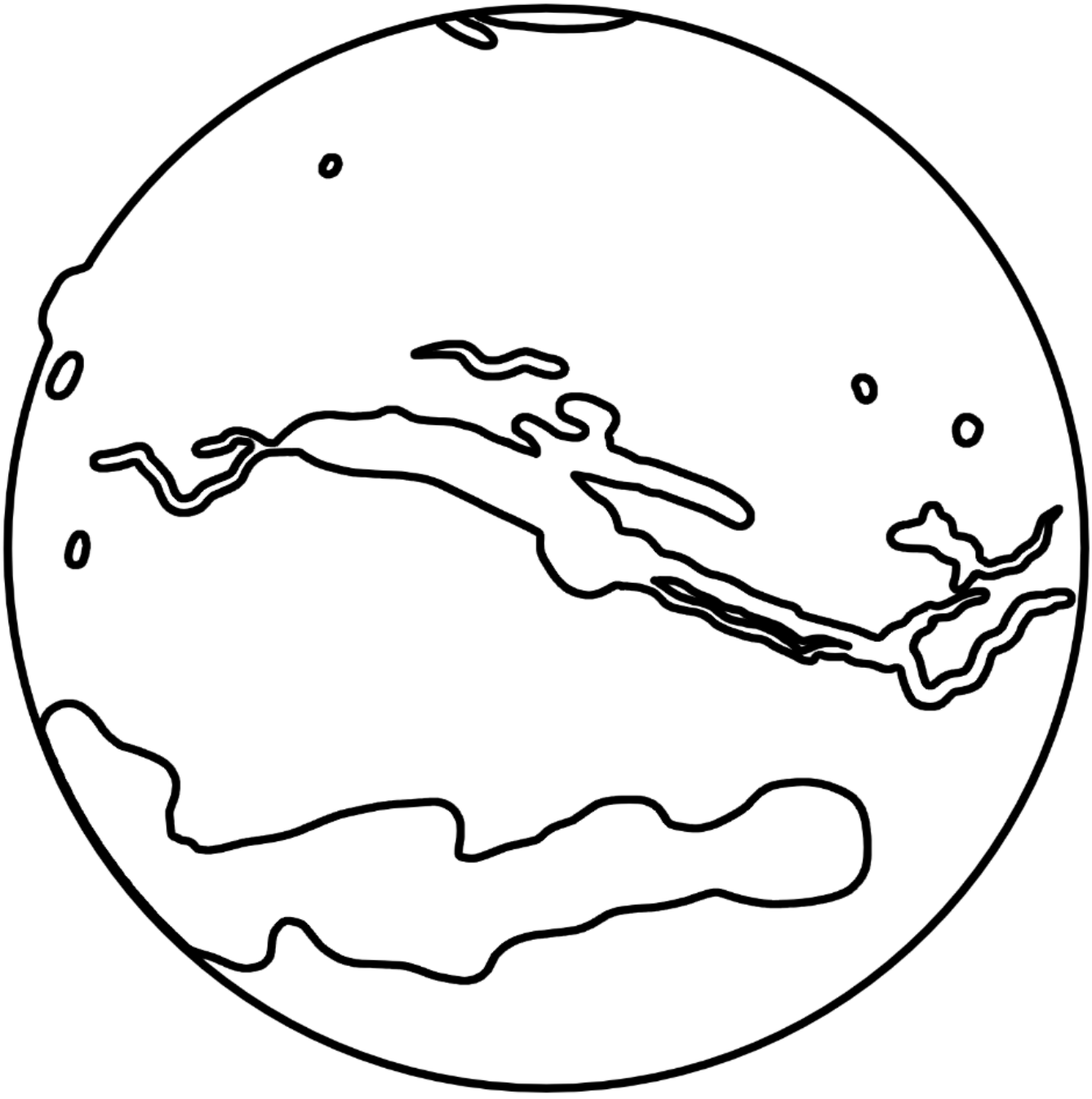
Colour in Venus



Colour in Earth

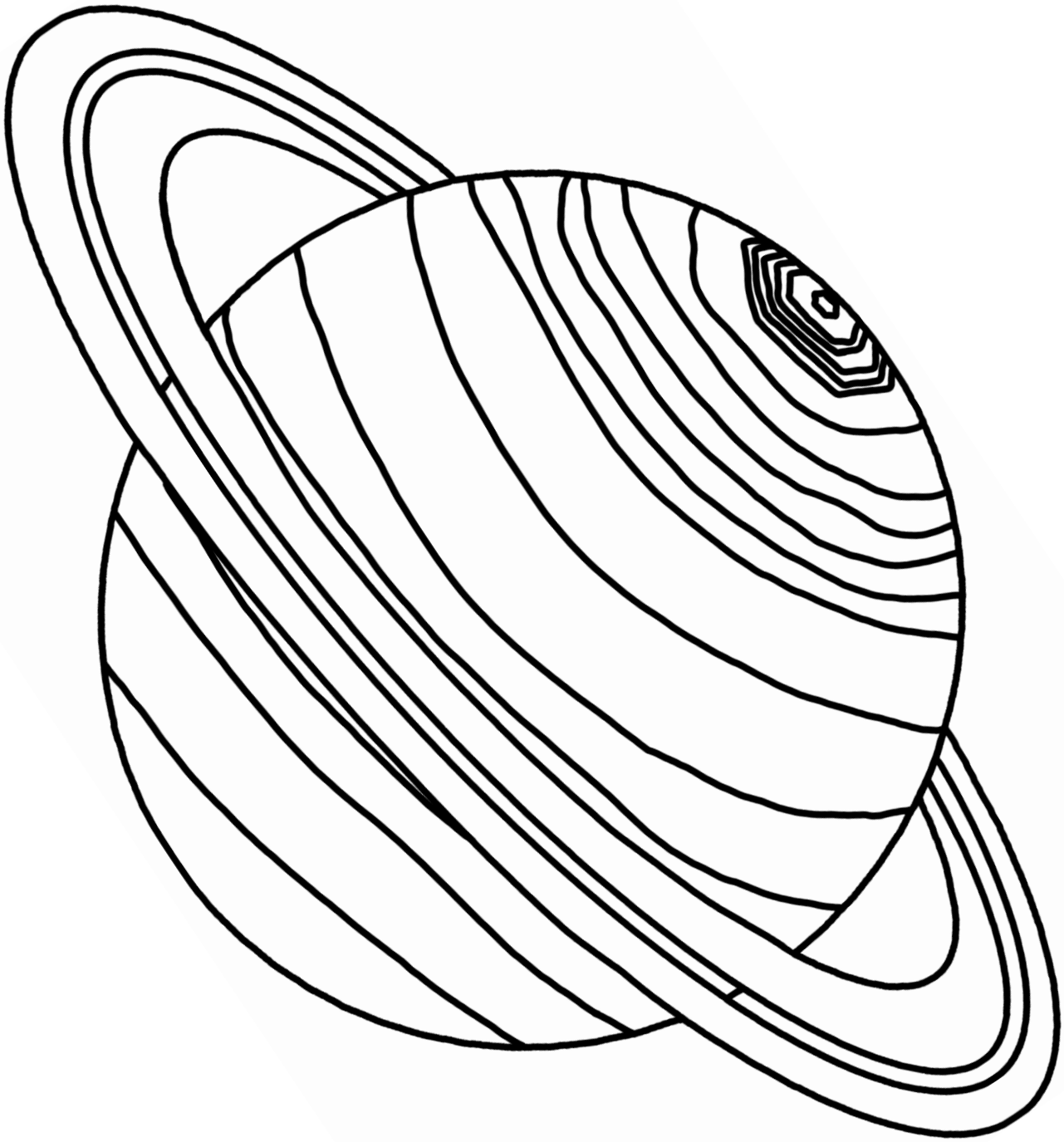
Colour in the Moon

Colour in Mars

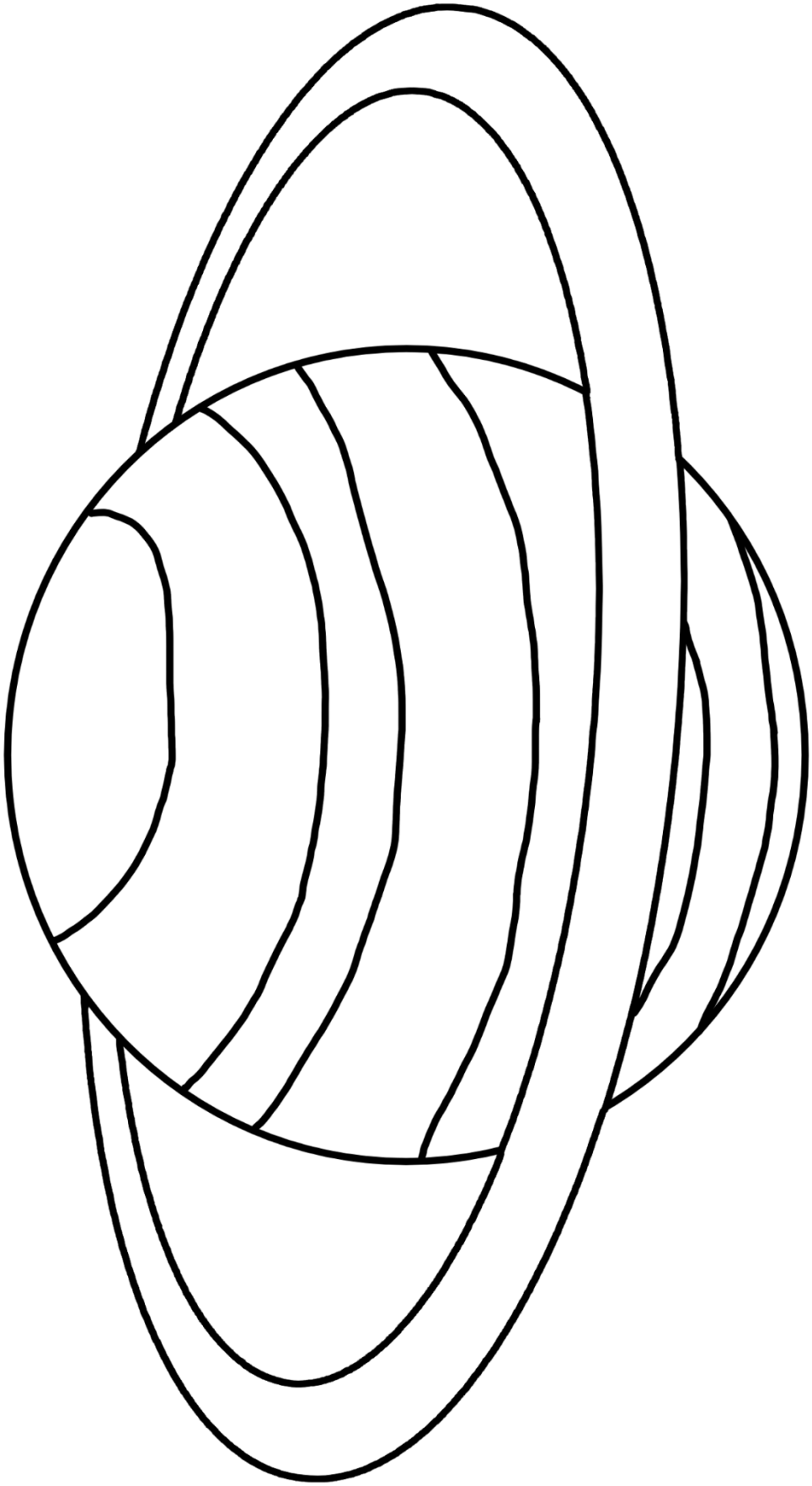


Colour in Jupiter

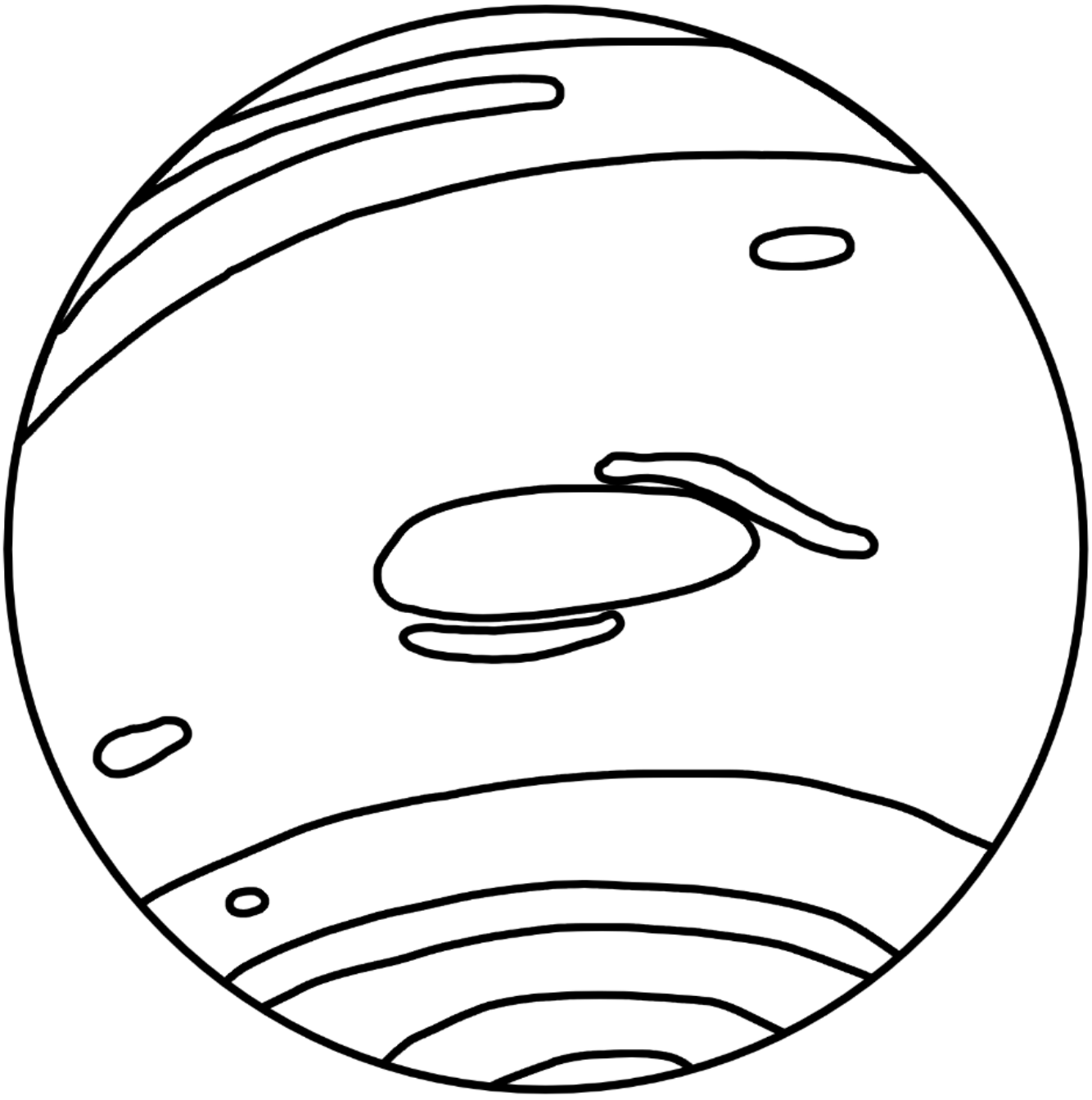
Colour in Saturn



Colour in Uranus



Colour in Neptune



You will need:

Scissors

Memory Game

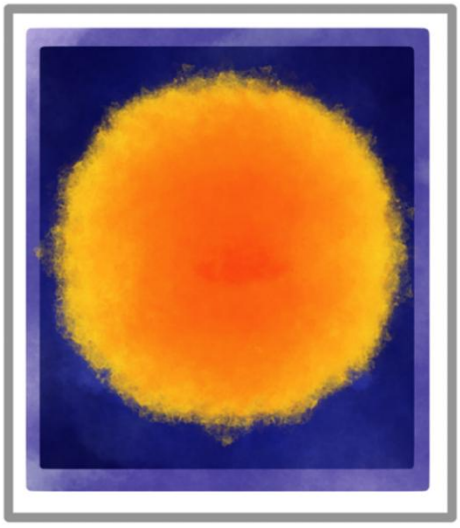
How to Play:

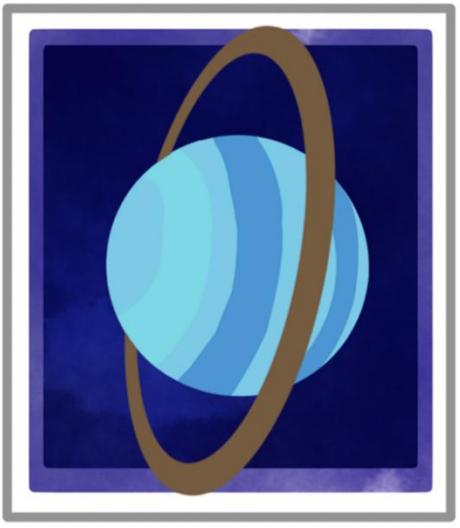
Print this page twice

Cut out each card and turn them upside down.

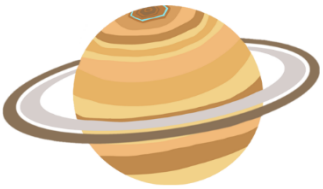
Flip over two cards, if they do not match, turn them back over.

Try and remember where the matching cards are and collect all pairs!





Name the Planets



Name Scramble

Unscramble the name of the planet!

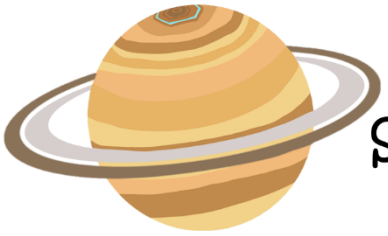
YCERURM

NSVUE

RHETA

RASM

URPTEIJ



SRNTAU

ANSUUR

ETENUPN

Out-of-this-world Search

U O E T R R N I P N E R P R R
V T E L U T C N E P T U N E S
E E O M I Y O P N V T U A L E
T R R O S U R C O M E T S B A
E E R O R R E A R T H P T S T
O H I N R U T A S R A M E A L
M N T A T I B R O E S R R T U
I K L E L R R A R A T S O E P
N U N R P L A N E T N R I L N
O I O P M A N T L E M N D L E
R P E N U S N M O R E C U I T
I E E S U N E V S K A R U T E
U R A N U S O A R E K H B E T
E T E C D N U I R E T I P U J
A T E U M E R C U R Y U N U A

PLANET
MARS
NEPTUNE
MOON
CORE

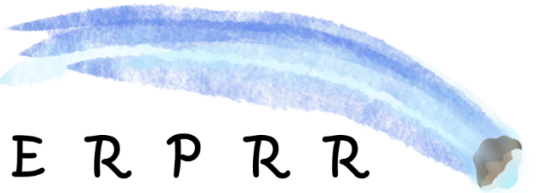
MERCURY
JUPITER
KUIPER
ORBIT
MANTLE

VENUS
SATURN
COMET
STAR
SATELLITE

EARTH
URANUS
SUN
ASTEROID

Out-of-this-world Search

Solution



U O E T R R N I P N E R P R R
V T E L U T C N E P T U N E S
E E O M I Y O P N V T U A L E
T R R O S U R C O M E T S B A
E E R O R R E A R T H P T S T
O H I N R U T A S R A M E A L
M N T A T I B R O E S R R T U
I K L E L R R A R A T S O E P
N U N R P L A N E T N R I L N
O I O P M A N T L E M N D L E
R P E N U S N M O R E C U I T
I E E S U N E V S K A R U T E
U R A N U S O A R E K H B E T
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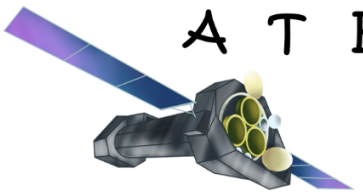
A T E U M E R C U R Y U N U A



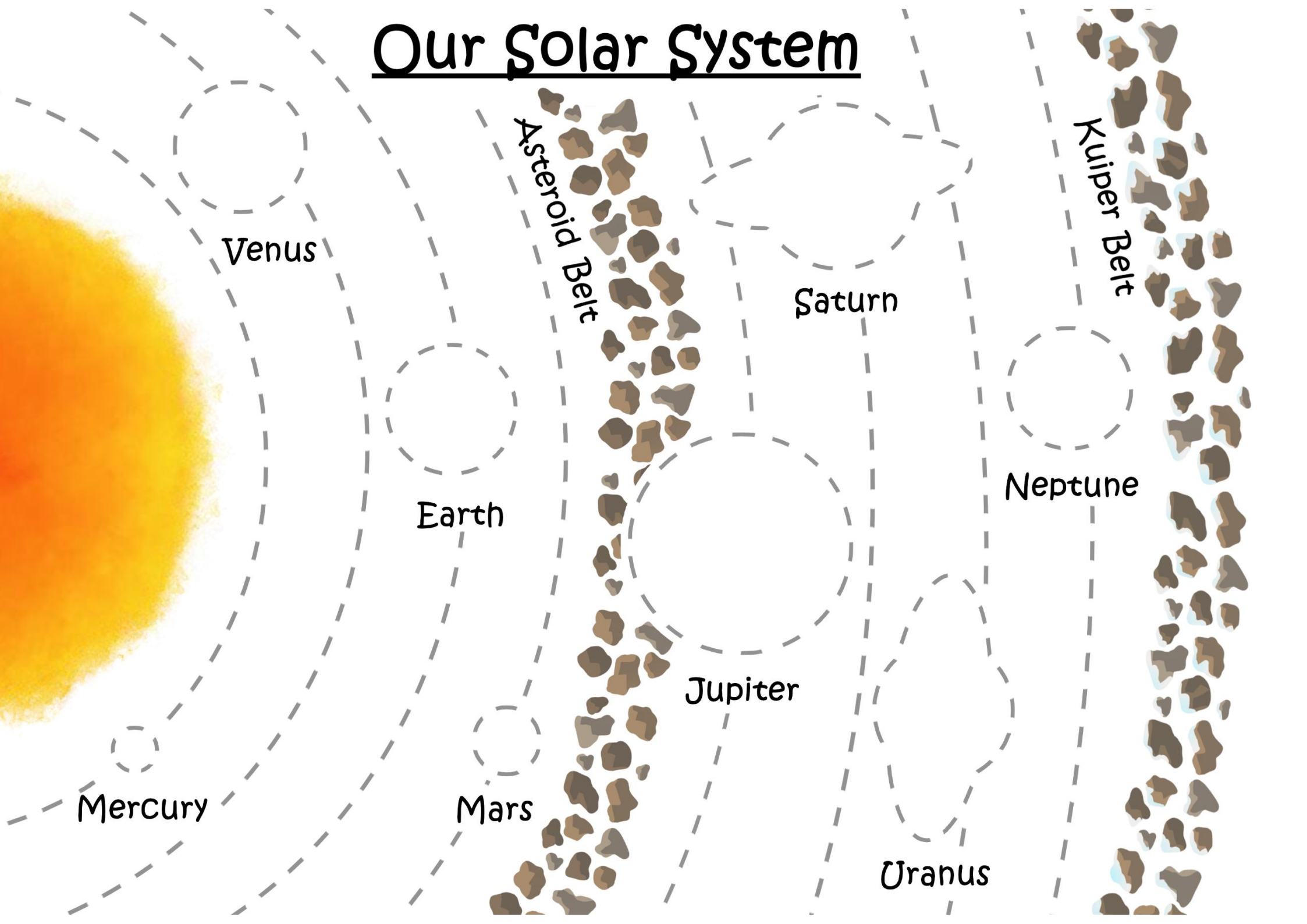
PLANET
MARS
NEPTUNE
MOON
CORE

MERCURY
JUPITER
KUIPER
ORBIT
MANTLE

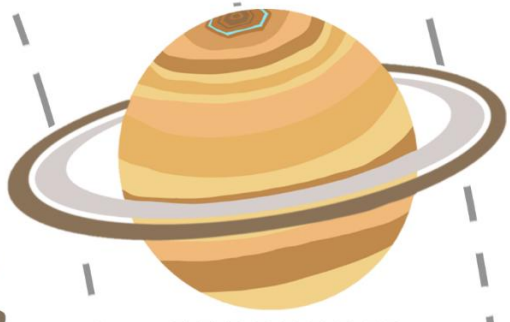
VENUS
SATURN
COMET
STAR
SATELLITE

EARTH
URANUS
SUN
ASTEROID

Our Solar System



Our Solar System



Asteroid Belt

Kuiper Belt

Our Solar System

Mercury

Venus

Earth

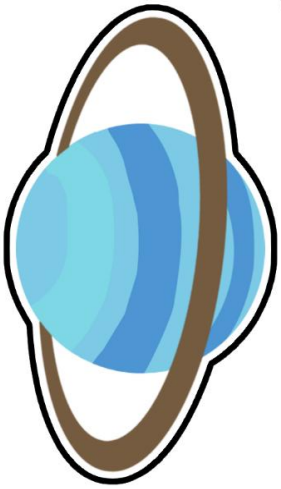
Mars

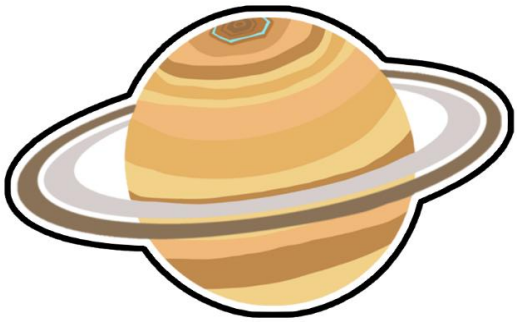
Jupiter

Saturn

Uranus

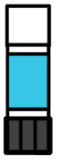
Neptune





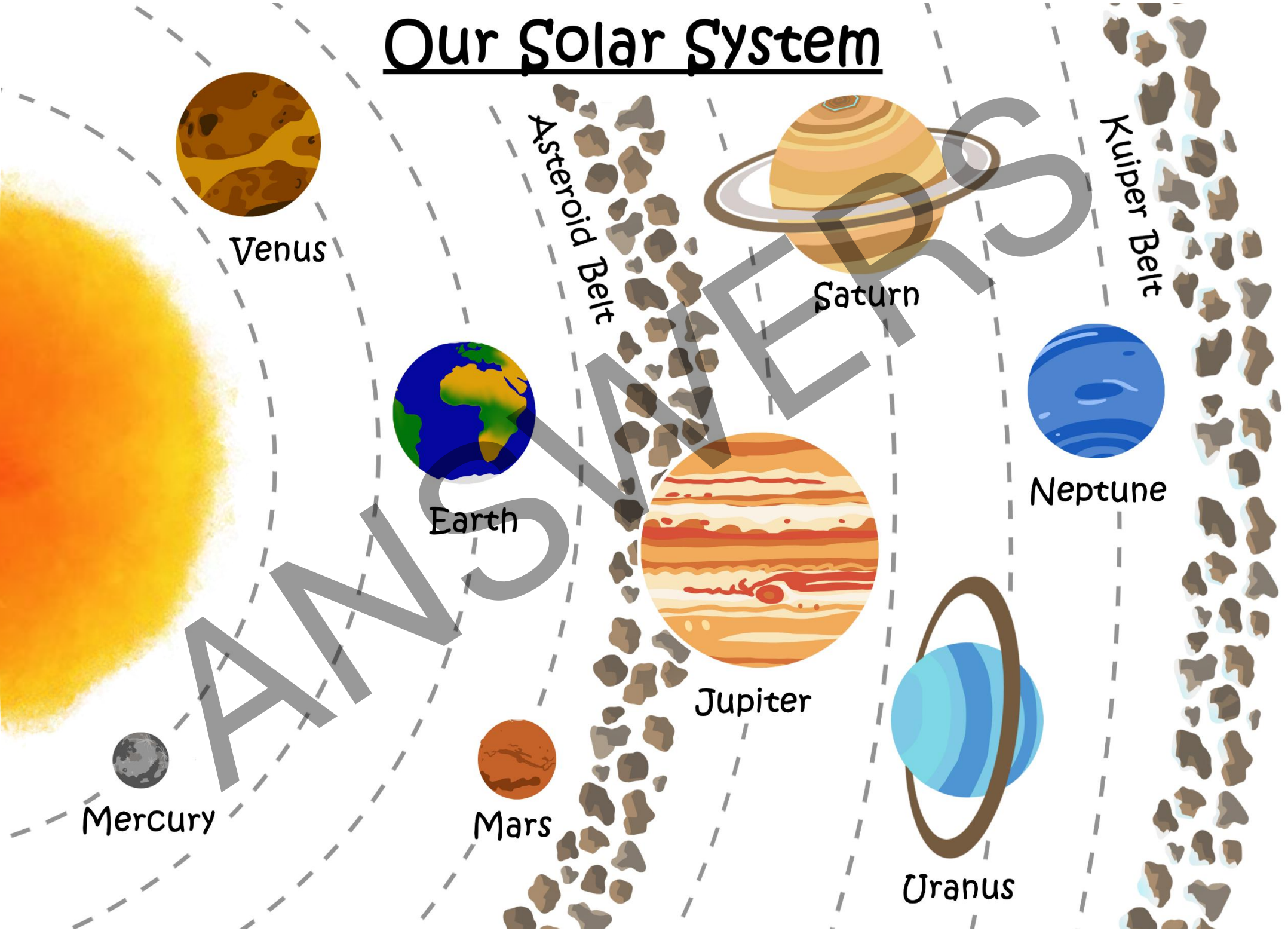
You will need:

Scissors



Glue Stick

Our Solar System



Solar System Model

Solar System Model

Uranus

Distance from the Sun:
2.8 billion km

7

6

Distance from the Sun:
1,430 million km
Saturn

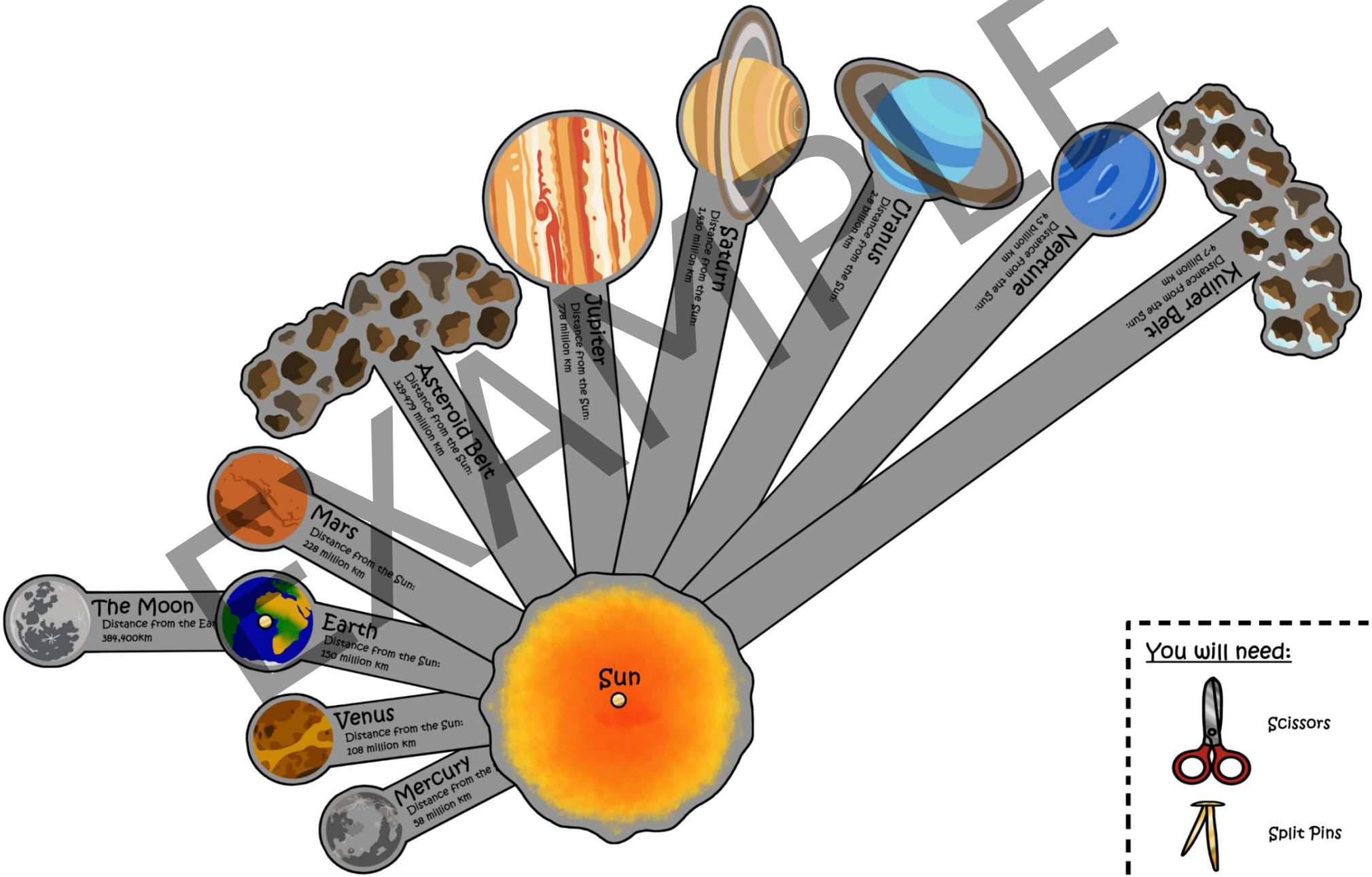
Neptune

Distance from the Sun:
4.5 billion km

8

Distance from the Sun:
4-7 billion km
Kuiper Belt

Solar System Model

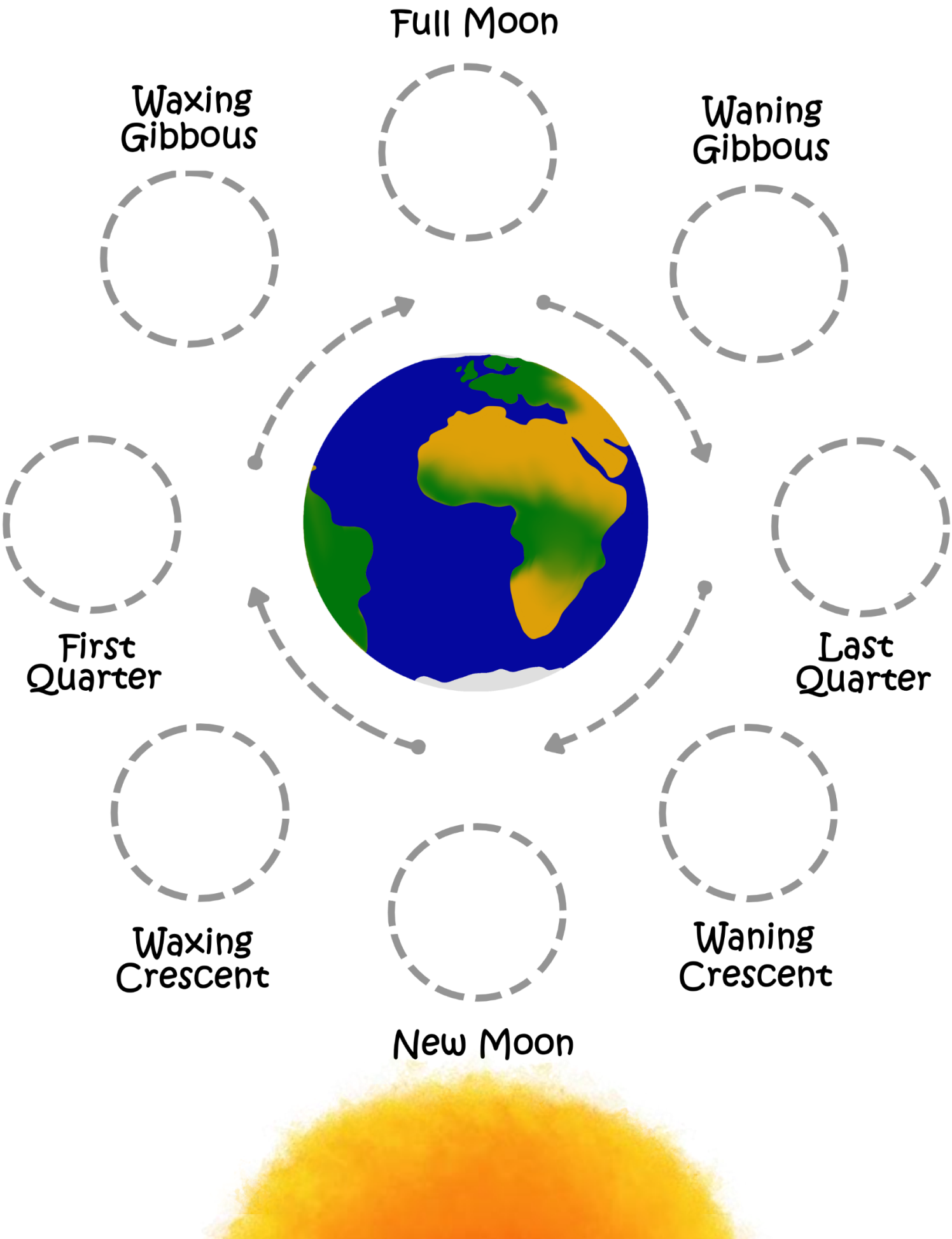


You will need:

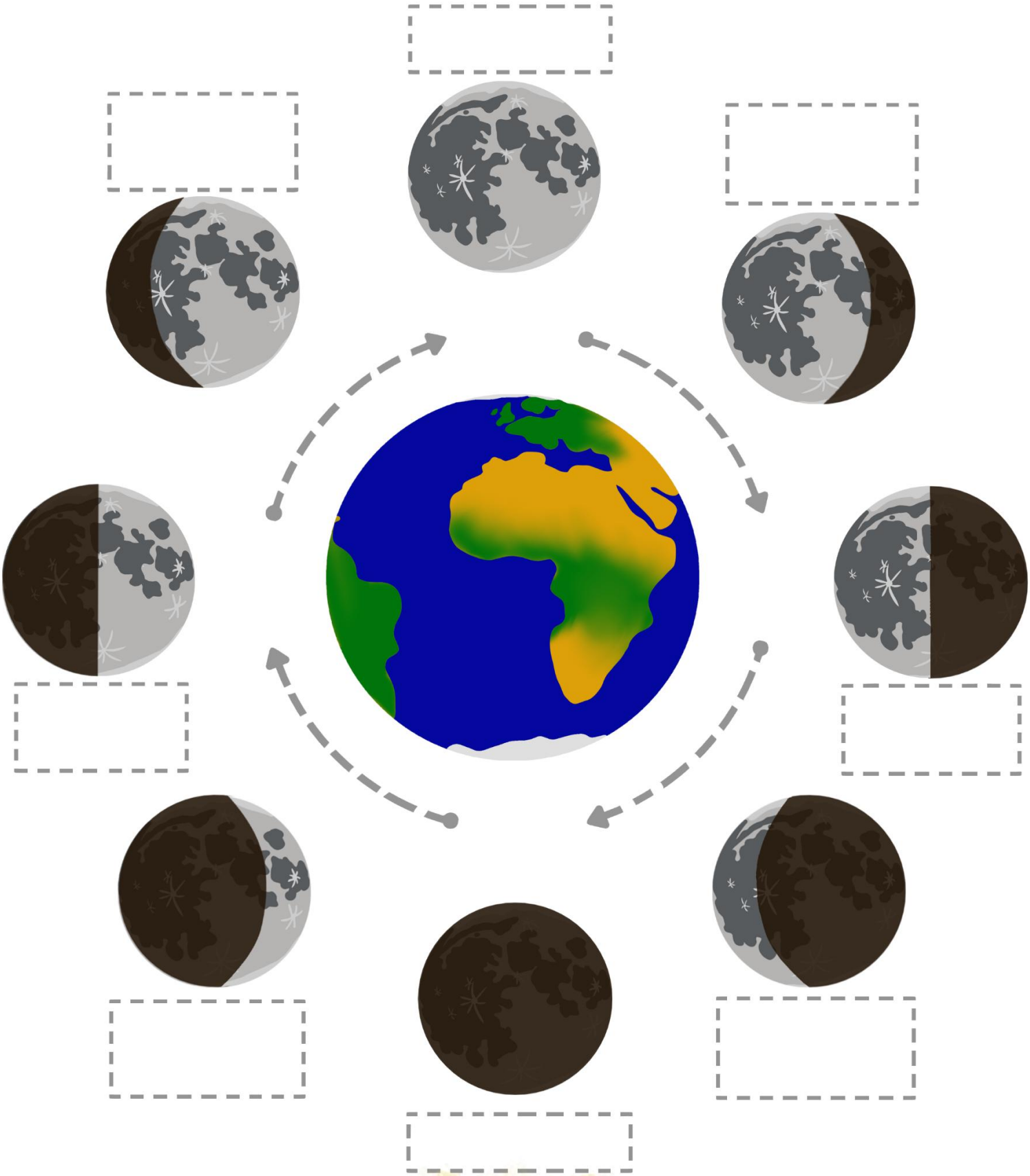
Scissors

Split Pins

Phases of the Moon



Phases of the Moon



Phases of the Moon

Full Moon

Waning Gibbous

Last Quarter

Waning Crescent

New Moon

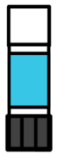
Waxing Crescent

First Quarter

Waxing Gibbous

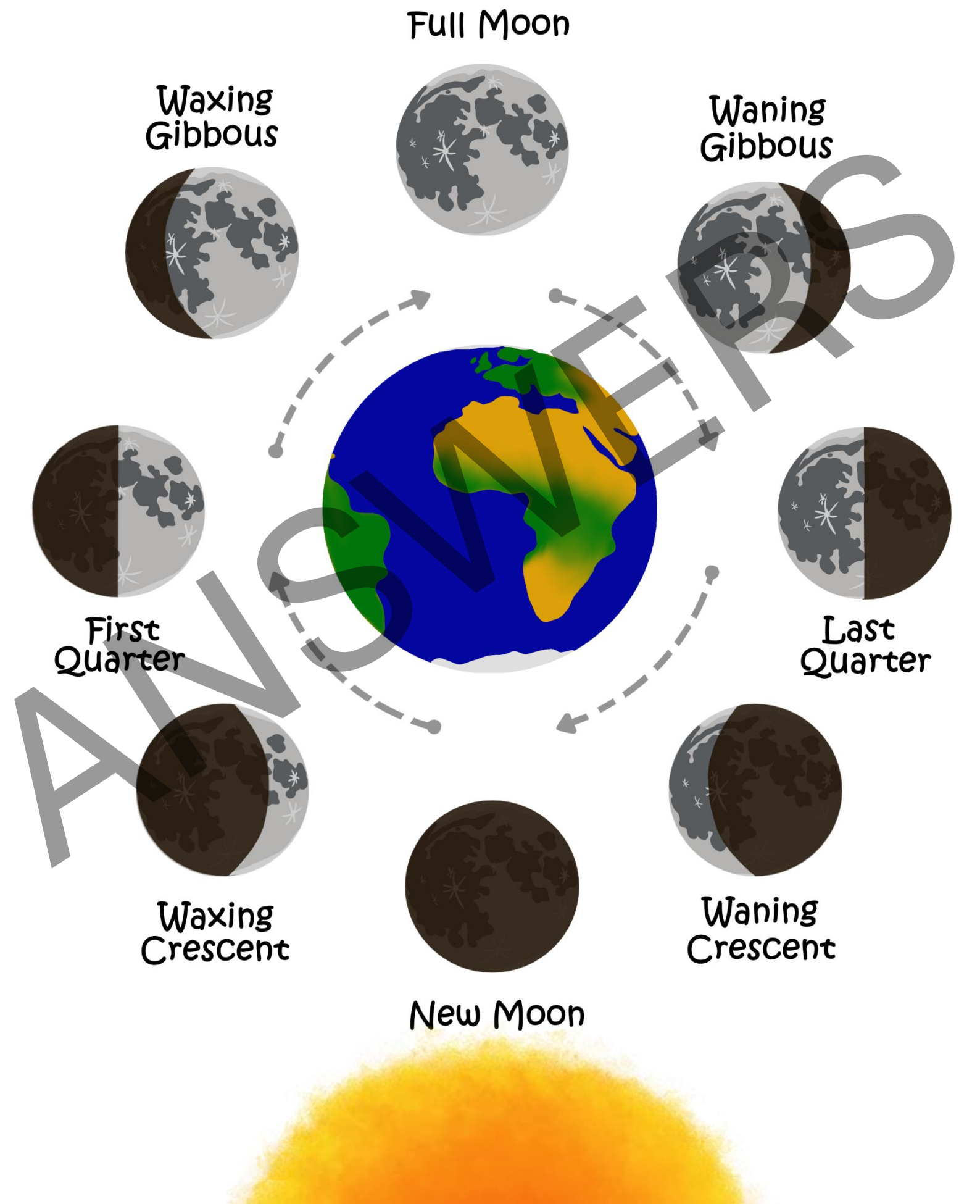
You will need:

Scissors



Glue Stick

Phases of the Moon



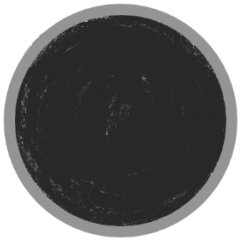
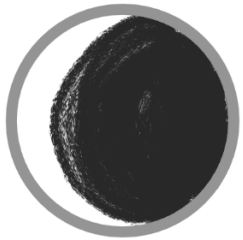
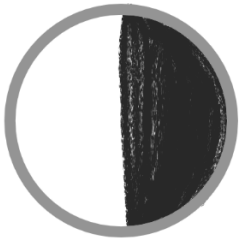
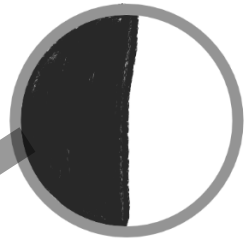
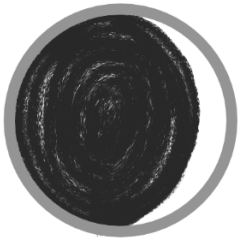
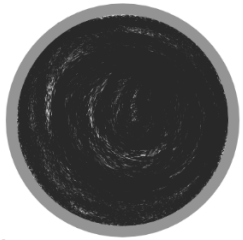
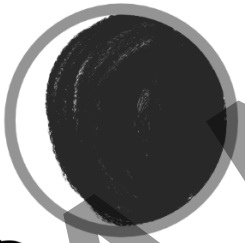
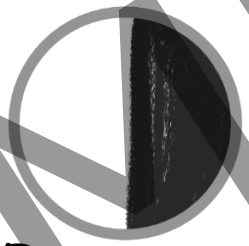
My Moon Diary

Record the phases of the Moon throughout the month!

Date:______	Date:______	Date:______	Date:______	Date:______	Date:______	Date:______
Date:______	Date:______	Date:______	Date:______	Date:______	Date:______	Date:______
Date:______	Date:______	Date:______	Date:______	Date:______	Date:______	Date:______
Date:______	Date:______	Date:______	Date:______	Date:______	Date:______	Date:______

My Moon Diary

Record the phases of the Moon throughout the month!

 Date:_____	 Date:_____	 Date:_____	 Date:_____	Date:_____	 Date:_____	 Date:_____
 Date:_____	 Date:_____	 Date:_____	 Date:_____	 Date:_____	Date:_____	 Date:_____
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Stellar Lifecycle

Learn all about the evolution of stars - from how they are born, to how they end their lives!
A star's life depends on how big it is. The bigger the star, the faster it burns up all its fuel. But these massive stars can also end in the biggest explosions in the Universe - a Supernova!
Stars, like our Sun, do more than keep us warm and look pretty in the night sky...
They are cosmic factories!

Stars burn very very hot, with the 'coldest' being around 2000°C, and the hottest reaching temperatures of over 33,000°C!
In fact, they are so hot, they can bond atoms together in a process called Fusion, which is responsible for making all the elements in the Period Table, up to Iron!
Supernova explosions are so powerful they can make even heavier elements, like copper and oxygen.

This means the Iron in our blood, the Oxygen in our lungs, and everything in between, all comes from stars!
As the famous Astronomer, Carl Sagan, once said,
"We are all made of stardust"

Nebula

Stars begin their life as clouds of gas and dust, called Nebulae, which eventually collapse under their own gravity. The areas where the Nebula collapses become very dense, and attract more gas and dust, which all clump together. These 'clumps' grow bigger and bigger, as they do they also become hotter.

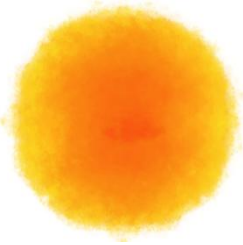
Protostar

Eventually the 'clumps' of gas and dust in the Nebula becomes so big and so hot, that a star begins to form. It takes around 100 Thousand Years for enough gas and dust to gather (at least 10% the mass of our Sun) for this Protostar to reach 10 Million °C. Once it reaches this temperature, a star is born!

Low-Intermediate Mass Star

Once a star is born, it takes its place on the Main Sequence. This is where stars will spend most of their lives, and it is where they are most stable.
Stars are grouped by how big they are. Our Sun is actually fairly small!
Stars that are up to 4 times the size of our Sun are called Low-Intermediate Mass Stars.
They can live for Billions of Years until they burn out.
Stars are like factories, and as they burn, they form new elements.
Low-Intermediate Mass Stars turn Hydrogen into Helium.

High Mass Star

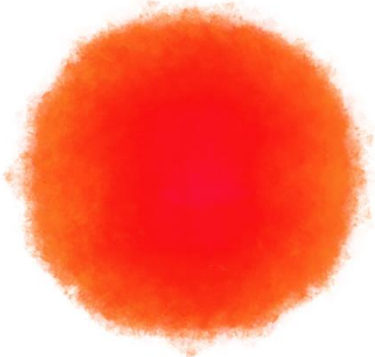


Once a star is born, it takes its place on the Main Sequence. This is where stars will spend most of their lives, and it is where they are most stable. Stars are grouped by how big they are. Stars that are over 5 times the size of our Sun are called High Mass Stars. Some can be as big as 250 times the size of our Sun!
These are very hot and burn through their fuel in only a few Million Years.
Stars are like factories, and as they burn, they form new elements.
High Mass stars can make Carbon, Neon and Magnesium.

Red Giant Star

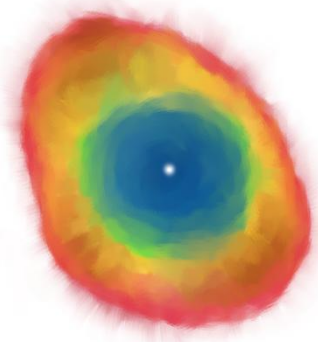
Eventually the stars run out of fuel. As this happens, the star cools down and expands.
Low-Intermediate Mass Stars expand to become Red Giants. These stars can swell up to 200 times the size of the Sun!
Red Giants are very common in the Universe and even appear red to the naked eye!
One well-known Red Giant Star is Arcturus, which can be found at the bottom of the Boötes Constellation.

Red Supergiant Star



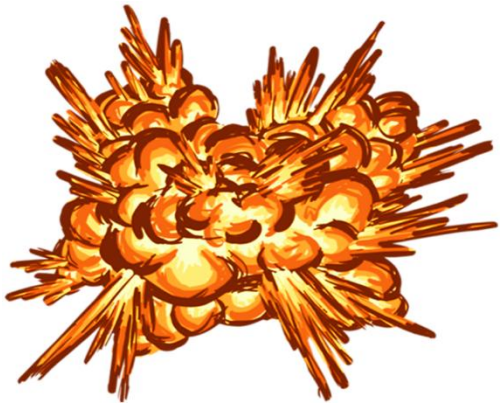
Eventually the stars run out of fuel. As this happens, the star cools down and expands.
High Mass Stars expand to become Red Supergiants.
One well-known Red Supergiant is Betelgeuse. It is the 10th brightest star in the sky and forms the left shoulder of the Orion Constellation.
If Betelgeuse were in the same place as our Sun, it would extend all the way out to Jupiter!

White Dwarf
(with Planetary Nebula)



For Low-Intermediate Mass stars, as their fuel completely stops, the outer layers of the star shed, leaving only the core of the star, which is now very small and very hot, called a White Dwarf.
The White Dwarf Star is surrounded by the shed outer layers of the old Red Giant Star, in what is known as a Planetary Nebula (which actually have nothing to do with planets).

Supernova



For High Mass Stars, as their fuel completely stops, the core becomes unstable and rapidly collapses, in a matter of seconds!
In fact, it collapses so quickly that huge shockwaves are made, which violently throw off all the outer layers of the star in the most powerful explosion in the Universe - a Supernova!

Neutron Star

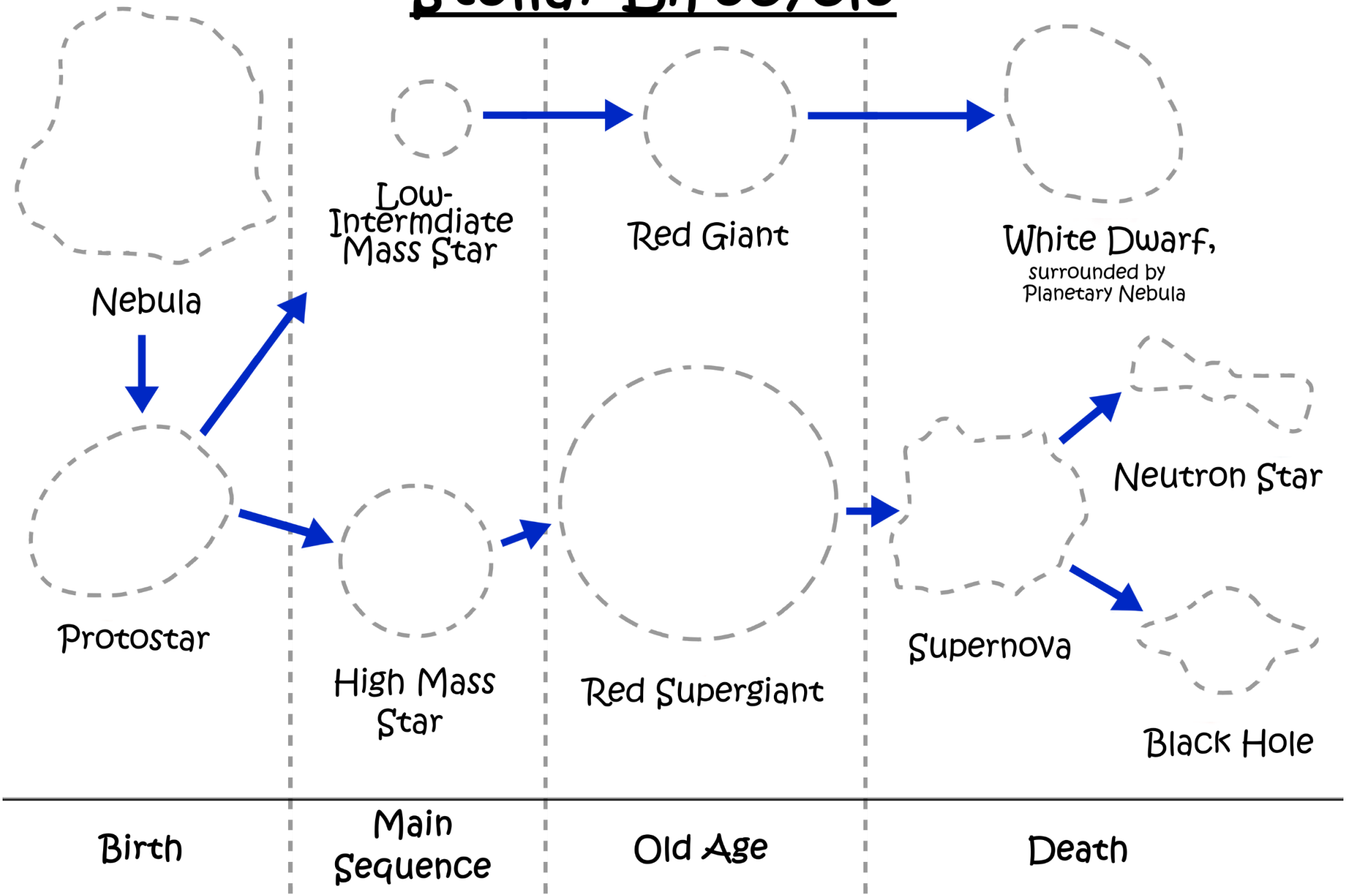
After High Mass Stars explode in a Supernova, the left-over core of the star collapses again to form a very dense object. What the core becomes depends on its size.
If the core is less than 3 times the size of our Sun, it becomes a Neutron Star.
These are normally only 20km across (that's smaller than London!) - an entire star squeezed down to a size smaller than a city!
Neutron Stars are the densest and heaviest objects in the Universe!

Black Hole

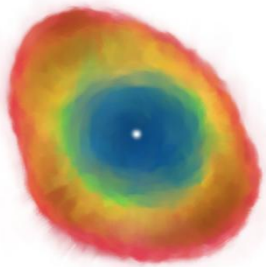
After High Mass Stars explode in a Supernova, the left-over core of the star collapses again to form a very dense object. What the core becomes depends on its size.
If the core is more than 3 times the size of our Sun, it becomes a Black Hole.
They can grow bigger as more gas and dust falls in.

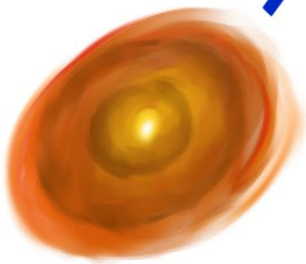
Inside a Black Hole, the force of gravity is so strong that not even light can escape!

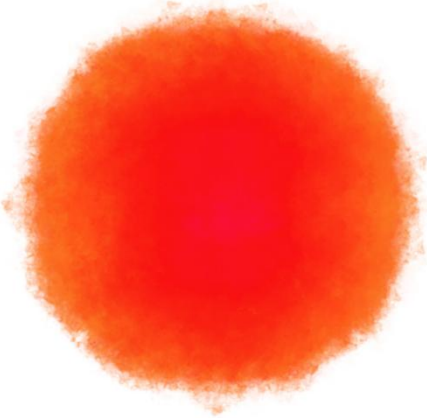
Stellar Lifecycle

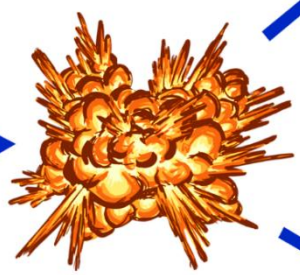


Stellar Lifecycle









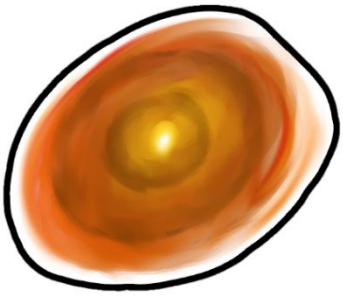
Birth

Main Sequence

Old Age

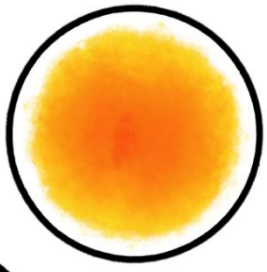
Death

Stellar Lifecycle

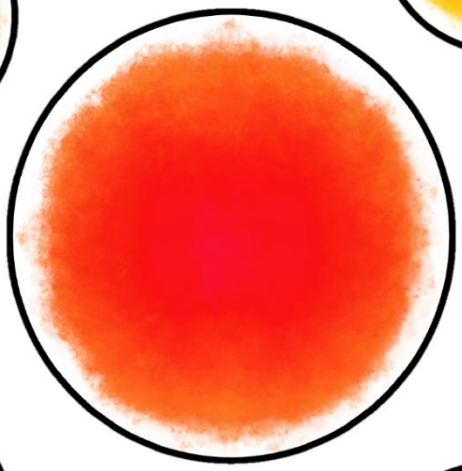


Nebula

Protostar

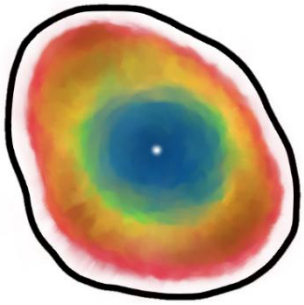


Low-Intermdiate Mass Star



High Mass Star

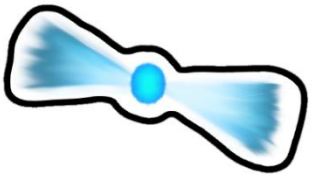
Red Giant



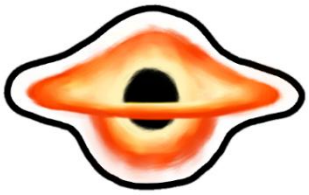
Red Supergiant

White Dwarf, surrounded by Planetary Nebula

Supernova



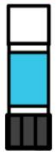
Neutron Star



Black Hole

You will need:

Scissors



Glue Stick

Stellar Lifecycle

Nebula

Protostar

Low-Intermdiate Mass Star

Red Giant

White Dwarf,
surrounded by Planetary Nebula

High Mass Star

Red Supergiant

Supernova

Neutron Star

Black Hole

Birth

Main Sequence

Old Age

Death

Stargazing Journal

Print out this sheet and record what you see at night!

Date:

Time:

Location:

Temperature:

Moon Phase:

Cloud Cover:

- ☐ Clear
- ☐ <25%
- ☐ 25-50%
- ☐ 50-75%
- ☐ >75%

Sketch

Equipment Used:

- ☐ Telescope
- ☐ Binoculars
- ☐ Other

Notes:

Make Your Own Planisphere

A planisphere is a simple map of the night sky that shows the stars visible in your area. Rotating the wheel shows how the stars move across the sky throughout the night, and which constellations are visible at different times of the year.
In the UK, we are (more or less) at a latitude of 52°N.

Step 1.

Print the pages below and stick them onto pieces of card.

Step 2.

Carefully cut out the Star Wheel, Planisphere body and other indicated areas.

Step 3.

Fold along the indicator line on the Planisphere body.

Step 4.

Use a hole punch, or ask an adult to carefully cut holes in the Star Wheel and Planisphere body, where shown (red dot)

Step 5.

Line up the small holes, with the Star Wheel sandwiched between the folded Planisphere body, and fasten them together with a split pin

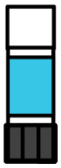
You can add a dot of glue in the corners of the Planisphere Body to fix it together

Congratulations! You how have a working Planisphere!

Turn the Star Wheel until you find today's date and time. Then go outside and happy stargazing!

You will need:

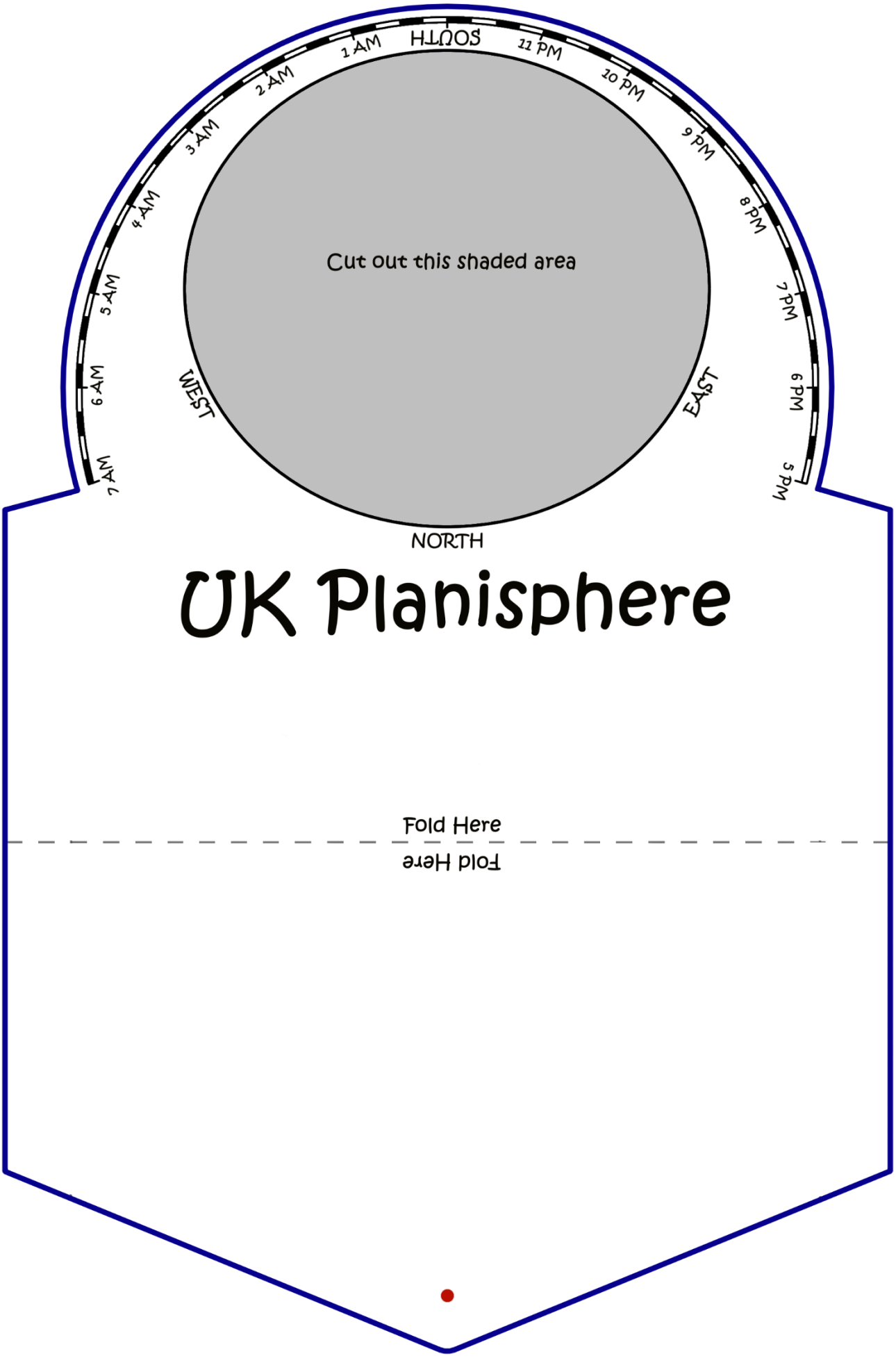
Scissors



Glue Stick

Split Pins

Planisphere Body

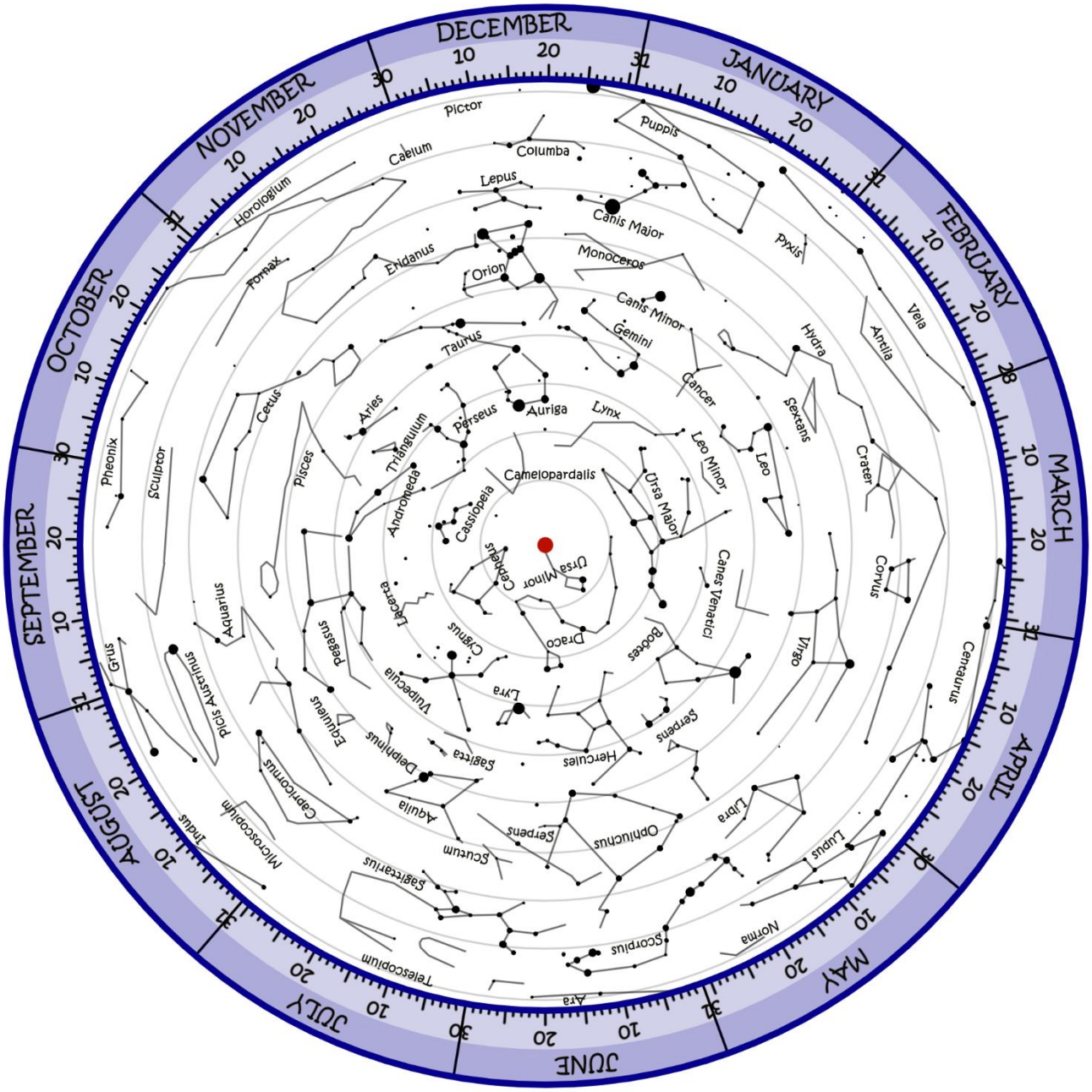


UK Planisphere

Fold Here

Fold Here

Star Wheel


DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
Pictor
Puppis
Columba
Caelum
Lepus
Canis Major
Horologium
Monoceros
Pyxis
Fornax
Eridanus
Orion
Canis Minor
Vela
Antlia
Gemini
Taurus
Hydra
Cancer
Aries
Auriga
Lynx
Sextans
Cetus
Perseus
Triangulum
Leo Minor
Leo
Crater
Pisces
Camelopardalis
Ursa Major
Andromeda
Cassiopeia
Pheonix
Sculptor
Ursa Minor
Cepheus
Canes Venatici
Corvus
Lacerta
Draco
Bootes
Aquarius
Cygnus
Virgo
Pegasus
Vulpecula
Lyra
Centaurus
Grus
Equuleus
Hercules
Serpens
Delphinus
Sagitta
Libra
Aquila
Ophiuchus
Lupus
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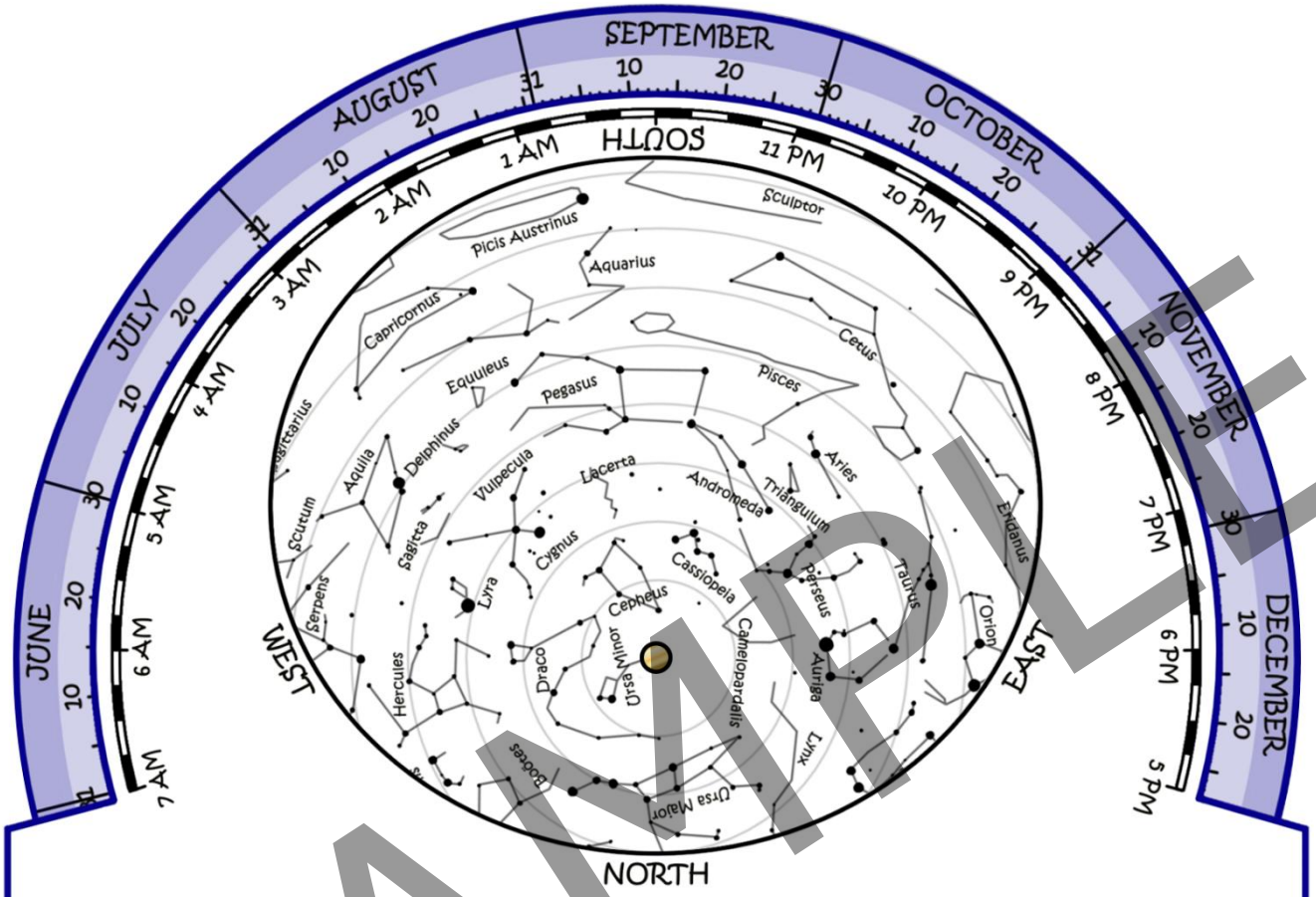
Scutum
Serpens
Microscopium
Sagittarius
Norma
Indus
Scorpius
Telescopium
Ara



UK Planisphere

Fold Here

Activity Ideas

Watch a Meteor Shower!

Look up dates for the next meteor shower in your area, and spend the night spotting as many shooting stars as you can.

Visit a Planetarium!

Find out where the closest Planetarium to you is, and plan a fun day out! You may learn more about the planets and stars and where to spot them.

Go Stargazing!

Go out at night, bring a book on Constellations and try to name all the ones you can find.

Design a Spacecraft!

Do you want to go to the Moon? Or Mars? Maybe you want to build a satellite to answer all the questions of the Universe? Look into what makes missions possible and design your own! Think about how your rocket or satellite will get into space, how will it land safely, how will it communicate with Earth, what equipment it will need to study space, what equipment it might need to keep it safe.

Make a Sundial

Stick a straw or a skewer into the middle of a paper plate and track the Sun's movement across the sky as the shadow moves

Watch Rocket Launches!

Visit https://www.nasa.gov/live/ or https://next2space.com/esa/ to keep up to date with missions and even tune in see them launch into space!

Attend a Lecture!

The Royal Institute, the Institute of Physics, the National Space Centre, and plenty of Universities regularly put on lectures for all ages and abilities. Learn more about exciting research and topics!