

8+

2h

PRIMARY SCHOOL



# Design Your Alien



EN



## BRIEF DESCRIPTION

*Review the environmental factors that make Earth habitable and compare them to another world within our Solar System. Use creative thinking to design an alien life form suited for specific environmental conditions on an extra-terrestrial world within our Solar System.*



## KEYWORDS

- Habitable
- Life
- Extra-terrestrial
- Alien
- Environment
- Solar System
- Earth
- Art
- Creative



## MATERIALS


- Design your own Alien script
- Crayons
- Paper
- Solar System fact sheets
- Design your own Alien presentation (with laptop and projector) or print-friendly Design your own Alien presentation slides



## LEARNING OBJECTIVE

- Use the idea of extra-terrestrial life to inspire children and encourage them to take an interest in science,
- Identify which conditions make Earth habitable for life,
- Understand how the conditions on Earth affect life,
- Develop an in-depth knowledge of the environments on






Earth and on at least one other world within the Solar System,


- Create an alien life form suited for specific environmental conditions on an extra-terrestrial world.
- Promote respect for the environment,
- Improve creative thinking.

## BACKGROUND INFORMATION



The following information is included in the resources attached to this activity; the Design your own Alien script and related presentation, the Solar System fact sheets and the Mars alien example.

Life is can be found almost anywhere on Earth; from the poles to the equator, from the bottom of the sea to miles high, from dry valleys to groundwater miles below the Earth's surface. Over the last 3.7 billion years or so, life on the Earth has adapted to almost every environment imaginable. What is it about Earth that makes it so perfectly suited to harbour life?

- Distance from the Sun: Earth lies in our solar system's "Habitable Zone". The narrow band within which liquid water can exist. If the Earth lay much closer to the Sun the oceans would vaporize, preventing the existence of life as we know it. If our planet orbited much farther from the Sun, the oceans would freeze and the water cycle that enables life would be nonexistent.
  - Gravity: gravity hold things to the Earth's surface and keeps it from flying off into space, including life and our atmosphere, too. Many worlds in the Solar System are smaller than Earth, meaning they have weaker gravity. This makes things lighter on these worlds. Others planets are bigger than Earth and have much stronger gravity. On one of the gas giants, for example, the pressure at the surface would be so intense life would be crushed in seconds.
  - Atmosphere: Earth's has one of the thickest atmospheres within our Solar System, without it we couldn't breathe. Space is an airless vacuum in which life would quickly suffocate. The blanket of our atmos-
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phere is useful for a couple of other reasons too, it regulates the surface temperature, keeping out the freezing cold of space at night and the furious heat of the sun during the day. The atmosphere also acts as a protective barrier, absorbing harmful rays from the Sun and other cosmic bodies before they reach the surface.

There's nothing to say that extra-terrestrial life is confined by the same environmental conditions as life on Earth. They may not need water or oxygen or even a solid surface to thrive but, like life on Earth, they will need to have adapted to their environment to survive.



## FULL ACTIVITY DESCRIPTION

The search for extra-terrestrial life is undoubtedly one of the most attractive topics in science, particularly to children. With increasing evidence to suggest that the majority of Sun-like stars play host to planetary systems, the idea of alien life is becoming ever more real. This activity utilises the topic of alien life to demonstrate that science can be an exciting, cutting-edge subject and that, like the universe, the chance for further discovery in Astronomy is almost infinite.

The following activity deals with both extra-terrestrial worlds and our home planet, Earth. By educating children about the life-essential conditions here on Earth and comparing it to other worlds they learn that this the only place in the universe suitable for life as we know it, thus promoting respect for the environment and a sense of global community.



### Advanced Preparation:

Print off Solar System fact sheets (Earth, Mars, Mercury, Jupiter, Io and Titan)

Prepare computer, projector and script for 'Invent an Alien' presentation.

**Mars**

- Type:** Planet
- Size:** 6,794 km  
Just over half the size of Earth
- Distance from the sun:** 227,900,000 km  
Approximately one and a half times as far as the Earth  
One of the outer Solar System's habitable zone
- Orbit:** (Yearly) Week  
Just over a week one complete orbit around the sun. If you were on Mars you'd only stay on night!
- Atmosphere:** Quite thin  
The atmosphere is only about 1/100 the thickness of Earth's atmosphere
- Temperature:** Minimum: -150 °C  
Maximum: 35 °C

*Mars' surface is a dry, barren wasteland covered in old craters and impact craters. It is home to the 'red planet', which is due to a layer of iron oxide. Despite being an 'Earth-like' planet, Mars experiences 6000 °Celsius which can cause the entire planet and above the surface from heat for days!  
For the first time, NASA used the Mars Reconnaissance Orbiter (MRO) to take a close-up image of the surface of Mars. It has been taken from a distance of 100 km.*

## STEP 1

Split the group into pairs or teams of up to 4 children. Distribute the fact sheets, paper and crayons. Make sure each group has at least one of each fact sheet.

## STEP 2

Give a 10-minute presentation to the group about habitability on Earth and the environmental conditions within the Solar System (using the 'Invent an Alien' presentation and script - optional). During the presentation ask students what life needs to exist. Discuss:

- a way to breathe
- a food source
- protection from heat and/or cold
- protection from cosmic radiation
- a way to sense their environment
- a way to move (based on strong/ weak gravity)

## STEP 3

Discuss Mars as an example to generate ideas. (use fact sheet and alien provided - optional)



## STEP 4

Ask students to select one world per group, either Mercury, Jupiter, Io or Titan. They must then design an alien based on the environmental factors provided on the fact sheet for that world.

## STEP 5

Students must present their alien to group and explain the different characteristics of their life form and how they would be beneficial in the chosen environment.



## For Individuals or Group

### Indoors

*Similar activity: Schatz, D. & Cooper, D. (2004) Invent an Alien: Astro Adventures: The Pacific Science Center*

### Attachments:

- *Solar System fact files (Earth, Mars, Mercury, Jupiter, Io, Titan):*

*Each fact file includes the following information: type, size, distance from Sun, temperature, gravity. Each child or group will receive one of each fact file for comparison purposes and design an alien for just one of the worlds.*

- *Martian example sheet:*

*An example alien based on Martian conditions. Provided to aid and inspire the children when creating their own creature.*

- *Design your own Alien presentation (Prezi presentation):*

*The presentation provides background information about the life-essential conditions on the Earth. Designed to teach children how planetary conditions affect life on Earth and how comparable conditions on an extra-terrestrial world would affect life there. To be presented at the start of the activity.*

- *Design your own Alien presentation slides (print friendly): see above.*

- *Design your own Alien presentation script: see above.*



[www.eu-unawe.org](http://www.eu-unawe.org)



# Earth

Type:

Planet

Gravity:

Strong enough to hold us here

Weak enough we don't get crushed

Atmosphere

Thick enough to breathe

Thin enough to see through

Temperature:

Minimum:  
-89.2 °C

(Vostok Station, Antarctica)

Maximum:  
70°C

(LuT desert, Iran)

Size:

12.756 km

Distance from the sun:

149,597,890 km



# IO

Type:

Moon

Gravity:

Very Weak

If you weighed 100 kg on Earth, you'd weigh 18.3 kg

Size:

3,643 km

Atmosphere:

Very thin

One million times thinner than Earth's atmosphere!

Temperature:

Maximum: 927 °C

Distance from the sun:

778,500,000 km

Orbits Jupiter in the Outer Solar System



*LOKI* - One of Io's volcanoes, Loki, is more powerful than all of Earth's volcanoes combined! Io is in a tug of war between Jupiter, Europa and Ganymede (two of the other large moons of Jupiter) and that is what heats it up and causes the explosive volcanic eruptions. If Io wasn't in this strange tug-of-war situation, it would have cooled off a long time ago.

Io is the most volcanically active world in the Solar System, with over 400 active volcanoes! Even though the moon is so far from the Sun, the hot molten lava flowing over the surface make it a very hot place to be!

# Jupiter

Planet

Type:

Size:

142.984 km

Jupiter is the largest planet in Solar System. Over 1,000 Earth's could fit into it! The planet is mainly gas, like all planets in the Outer Solar System, but we think it has an Earth-sized solid core hidden at its centre.

Distance from the sun:

778.500.000 km

(more than 5 times as far as the Earth)

Jupiter lies in the outer Solar system.

Gravity:

very, very strong

Jupiter is massive, so the gravity here is immensely strong. Also, the deeper you travel into Jupiter's thick atmosphere the stronger the pressure becomes, it is unimaginably strong near the centre of the planet.

Atmosphere:

Extremely thick

Jupiter is largely gas, almost entirely atmosphere. The gas is mostly hydrogen and helium, like the Sun. In fact if Jupiter was a few times bigger, enough that the core was just a few times hotter, it would probably have turned into a Sun!

Temperature:

Maximum: 36.000°C

The temperature rises steadily higher the deeper you travel into Jupiter's gassy atmosphere. No probe we could create (never mind person) could stand the heat and pressure even a third of the way down. At the core the astronomers estimate that the temperature is around 36,000°C!

*INTENSE STORMS rage in Jupiter's atmosphere. The Great Red Spot on Jupiter is a giant spinning storm has been observed since the 1600s.*





# Mars

Type:

Planet

Gravity:

Weak

Just over a third the strength of Earth's gravity. So if you weighed 100kg on Earth, you'd only weigh 38kg on Mars!

Atmosphere:

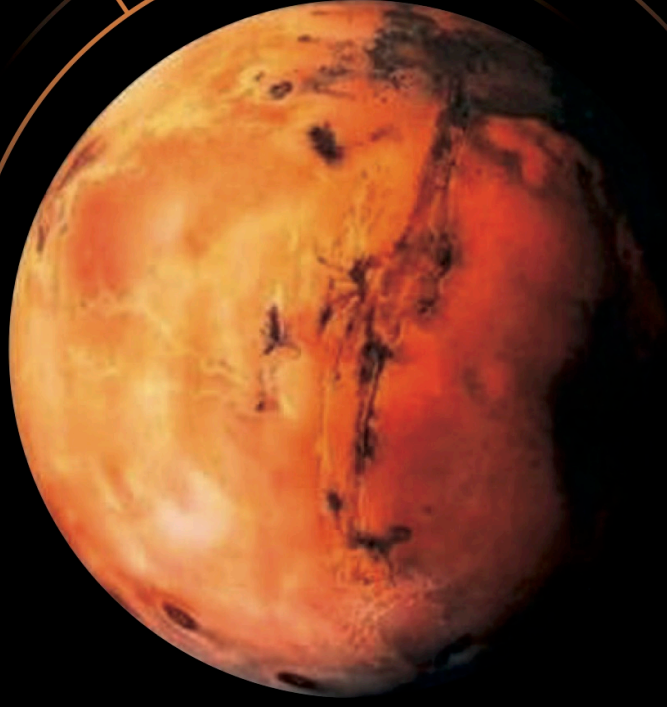
Quite thin

The atmosphere is less than 1/100 the thickness of Earth's atmosphere!

Temperature:

Minimum:  $-150^{\circ}\text{C}$

Maximum:  $35^{\circ}\text{C}$



Size:

6,794 km

Just over half the size of Earth

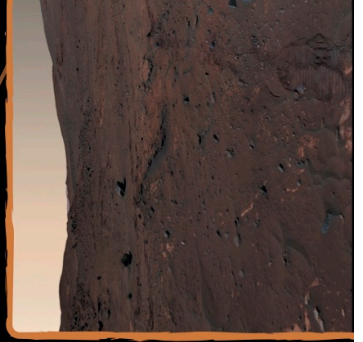
Distance from the sun:

227,900,000 km

(Approximately one and a half times as far as the Earth)

Still in our Solar System's habitable zone!

Mars' surface is a dry, barren wasteland covered in old volcanoes and impact craters. It is famous for its red colour, which is due to a layer of iron oxide (better known as RUST). Mars experiences SAND STORMS which can scour the entire planet and block the surface from view for days! We also know Mars used to have liquid WATER, rivers of it that might have been around for millions of years.



# Mercury

Planet

Type:

Gravity:

Weak

Mercury is very small for a planet, so the gravity is very weak. It's just over 1/3 the strength of Earth's. So if you weighed 100kg on Earth, you'd only weigh 38kg on Mercury.

Size:

4,879 km

Mercury is the smallest planet in the Solar System, even the moon Titan is bigger!

Atmosphere:

No

Gravity is weak so it cannot hold the atmosphere in place and it blows into space

Temperature:

Maximum: 380°C

Minimum: -180°C

Mercury experiences very varied temperatures between day and night-time. It is very close to the Sun, so in daylight the planet becomes very hot. The planet has a very weak atmosphere holds no heat in (nor does it block heat out during the day) so at night it becomes freezing, or way below freezing, in fact!

Mercury's surface resembles that of Earth's Moon, scarred by many IMPACT CRATERS resulting from collisions with meteoroids and comets. An atmosphere acts like a protective cushion around a planet, helping to break up any meteors or asteroids before impact.



Distance from the sun:

57,900,000 km

It lies thus 3 times as close to the sun as Earth does!

Nearest planet to the Sun!

# Titan

Moon

Type:

very weak

Gravity:

Size:

5.150 km

Titan is the second biggest moon in the Solar System (after Ganymede, one of Jupiter's moons) it's bigger than our own Moon and even the planet Mercury!

Atmosphere:

Thick hazy atmosphere

The atmosphere on Titan is 5 times thicker than on Earth and stretches 10 times higher into space

Distance from the sun:

1.427.000.000 km

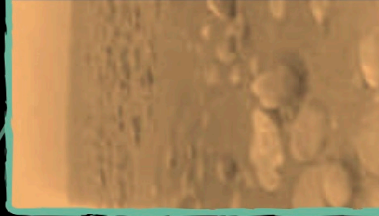
Titan orbits Saturn in the Outer Solar System

Temperature:

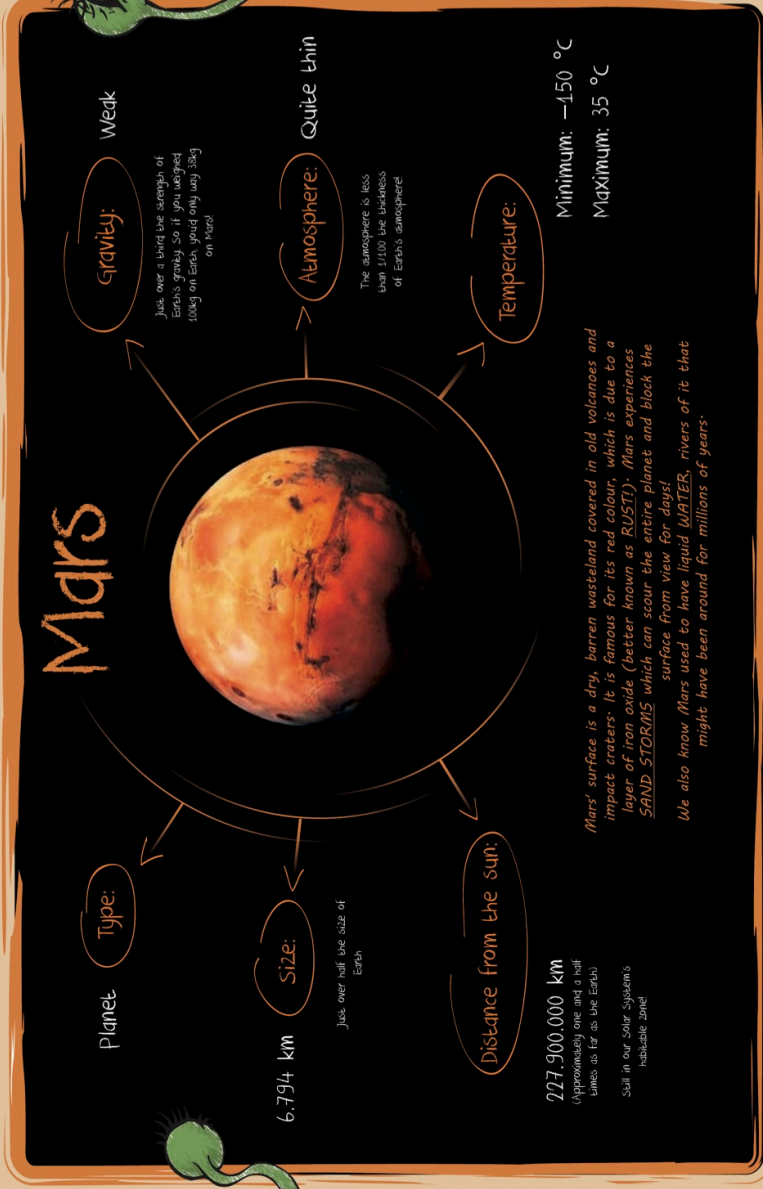
-180 °C

Titan lies very far from the Sun which is why it is so cold and to make things worse Saturn often sits between the moon and the Sun, blocking all the sunlight! So the moon gets very cold and has ice on much of its surface. However, its thick atmosphere holds in some heat, so things aren't as bad there as they could be!

Titan has a special climate: there are many THICK CLOUDS on Titan, from which it often rains. But unlike on earth, it's not water that falls down, but LIQUID METHANE AND ETHANE!



# DESIGN YOUR ALIEN



**Thick shield**  
Protect against sand  
Protect against cosmic radiation  
Heat reflecting shield



Alien can crawl up in his own shield to protect itself from the storms and radiations

Long extendable eyes to see through sand storms



Weak gravity  
Feet like sucker knobs to stick the ground



Sand storms  
Strong paws with nails to be able to dig wholes in the ground in times of heavy persistent storms

Thin atmosphere  
Big nostrils to suck in more air at one time



The temperature on Mars is very cold  
Fur to keep warmish

Shield to protect eyes from UV rays

Sand storms  
Long eyelashes to keep the sand from coming in the eyes

Mars used to have liquid water  
The alien may have developed fins to swim

