



# Space – Ideas Web

Age range: 5-7 years

## Nutrition – eating the right foods

Living in space in a low gravity environment is bad for astronauts' bones and muscles and they need to eat food with lots of calcium and vitamin D to stay healthy.

- ② How can we sort a variety of foods into different groups? ② Which foods should we eat more of and which ones should only be 'treats'?
- ② Can we make a lunch box for an astronaut?
- ② Which foods would be most suitable in space and how best can they be stored? ② What makes eating food difficult in space?

## Conditions for growing plants

There are no supermarkets in space – growing plants in space for food is important if we want to go on longer space journeys. Scientists on board the International Space Station grow plants to see which conditions help plants to grow the best. They also help tell us more about growing plants back on Earth.

- ② How can we investigate what plants need to grow? ② What is different about growing plants in space compared with on Earth? ② How might this affect plant growth? ② Can you find out what plants astronauts have grown on board the ISS? ② Which have they been unable to grow?

## Uses and properties of materials

When fixing things on the outside of a spacecraft, astronauts wear a space suit. The fabric used in an astronaut's suit needs to be strong, easy to move in, comfortable and hard-wearing, as well as being both air and water tight.

- ② How can we investigate how stretchy different fabrics are? ② Can we sort the fabrics into those that are waterproof and those that aren't? ② Can we create a scale for how hard-wearing they are? ② What fabric would not be suitable for an astronaut's suit? Why not?

## Mixtures of materials

Some scientists believe that collisions of comets with Earth long ago may have resulted in water and organic materials being deposited on our planet. A comet is a mixture of different materials, such as rock, dust, ice and frozen gases – a bit like a dirty snowball.

- ② Can we create our own comet models? ② What could we use to represent the different materials in the comet? ② What changes have you noticed when you mix the different parts together? ② Can we make a drawing to record our observations?

## Harmful effects of microorganisms

Before going into space, astronauts must stay in quarantine. This is to prevent them from carrying any illnesses into space and infecting other astronauts they will be living with.

- ② How can we find out which illnesses we have had in the last school term? ② Can we create a pictogram to show our findings? ② In what ways can we prevent illnesses from spreading in our class?

## Pushes and pulls

Things and people in space aren't affected by gravity the same way they are on Earth. Gravity is still present in space, but the feeling of weightlessness is due to the fact that they are in orbit so effectively in freefall around the Earth. Astronauts on board the ISS can't walk around, so they move by pushing themselves off from different surfaces.

- ② What do we feel when sitting still on a seesaw, swing, or at the top of a slide? ② How can we get the equipment to move? ② What kind of movement do we need to do for which kind of equipment? ② Are there any other ways of getting the equipment to move? ② How can we get the movement to stop?

## BIOLOGY

## SPACE

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## Seasonal Change

From space, satellites record the change of seasons around the world. They send images showing snowfall, temperature and rainfall at different times of the year.

- ② In which seasons can we play in the park after school? ② Can we count the number of leaves found in the playground on one day in each month and create a pictograph to show the results? ② Do the seasons change in the same way in other places around the world?

## Light sources

The sun is our nearest star and our greatest source of light. During the night the part of the Earth that we are on is facing away from the sun, which means it is dark outside and we rely on other sources of light to be able to see.

- ② Which light sources can we identify? ② Can we order them from dimmest to brightest? ② Which sources of light help us to see at night? ② How can we show that we need light in order to see?

## Comparing and grouping rocks

When rocks from space fall through the Earth's atmosphere, the air around them gets so hot that it glows. This is the streak of light we see as a shooting star. Smaller rocks completely break apart while falling, but larger ones can land on the ground. These 'space rocks' are called meteorites.

- ② What other rocks do we know? ② Can we observe and then describe them? ② How can we sort them into different groups? ② What different kinds of rocks can we find in and around the school? ② How can we find out more about meteorites?

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## Basic needs of animals and humans

Without gravity, fluids inside astronauts' bodies don't move around in the same way they do on Earth. This fools the body into thinking it is carrying too much water, so astronauts have to pee a lot. If they don't drink enough water to make up for this, they become dehydrated quickly. Bodies cannot function properly without water.

- ② How could we find out the amount of water we drink each day?
- ② Could we do this survey over a week?
- ② What colour urine means that you are well hydrated?
- ② What colour means that you are dehydrated?
- ② Can you record your hydration levels over 12 hours to see how hydrated you are?

## Habitats and environment

Satellites orbiting Earth allow us to see different habitats, from the polar regions to tropical rainforests. Photographs of the Earth taken from space over the past thirty years help scientists identify how environments have changed and how this may sometimes pose a threat to plants and animals.

- ② Can we list of different habitats in the world? How many animals do we know that live in one of these habitats?
- ② How many different ways can we sort these animals into groups?
- ② Why have you sorted them in this way?
- ② Which animals are threatened or endangered species?
- ② Can we research why a species has become endangered?

## Separating mixtures

Astronauts living on the International Space Station need water for many things including washing and drinking. Fresh water is in short supply in space, so waste water is recycled on the space station by separating the fresh water from the dirty water.

- ② What can you use to separate large solid particles from a liquid?
- ② How can we separate smaller solids from a liquid?
- ② Can you separate a mixture of sand, marbles and water?
- ② How could we separate dissolved substances (such as salt) from water?
- ② Can you find out how waste water is recycled on the ISS?

## Changes of state

As Mars is too far away for people to go there, Nasa scientists have sent robots to investigate the planet. It is very cold on Mars, so there is no liquid water but the robots have found ice. Scientists think that it was a lot warmer on Mars thousands of years ago and there might have once been large seas.

- ② How can we observe and record the changes when ice melts?
- ② Does temperature affect the rate at which ice melts?
- ② How could we investigate this?
- ② Can we find out if different frozen substances melt faster or slower?
- ② Which other liquids could we freeze and observe the resulting solids?
- ② Do they have a different freezing point?

## Healthy life choices

On Earth, all our muscles and bones are working against gravity and keep us fit (even if we might not exercise as much as we should). Because astronauts are weightless in space, they need to exercise regularly to keep their muscles and bones healthy.

- ② How can we investigate the effect of different kinds of exercise on the body?
- ② Can we keep an exercise diary for a week to see the kinds of activity we perform regularly?
- ② Can we carry out activities that help to build strength and co-ordination?
- ② What do astronauts do to keep fit and healthy on the ISS?

## Light and shadows

The spacesuits astronauts wear when outside their space craft have a specially designed gold-lined visor, which they can see through but which reflects too bright sunlight to protect their eyes.

- ② How can we find out which materials are good at reflecting light?
- ② Can we create a table to show this?
- ② Are some shinier than others?
- ② What equipment would we use to measure this?

## Air resistance

The descent module which brings astronauts back to Earth from the ISS has a specially designed parachute that opens after the module has entered the atmosphere. The parachute helps the module to land safely.

- ② How can we investigate how the size of a parachute affects the descent of an object?
- ② Which other factors could we investigate?
- ② Could we represent our findings as a graph?
- ② Why do spacecraft need to land as slowly as possible?

## The Earth, sun and moon

The International Space Station orbits the Earth very quickly, completing a circle every 90 minutes or so. During this orbit it passes through the shadow produced by the Earth blocking the sun's light. Astronauts see sixteen and sunsets and sunrises each day as they pass into and out of the Earth's shadow.

- ② Can we show how shadows are formed?
- ② How can we observe shadows changing over the course of a day?
- ② What is the best way to represent our findings?
- ② Can we create a model to explain why we have day and night?

## Uses and properties of materials

Satellites need to be made of materials that are able to withstand very high temperatures. They need to be good at transferring heat, via thermal conduction, from the hot side pointing towards the Sun, to the cold side facing out into space.

- ② Can we create a table to see which materials heat up and cool down quickly and which don't?
- ② What other properties of materials do you would be important on a satellite?
- ② Why do you think satellites aren't made of very heavy materials?
- ② How would you investigate this theory?



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## Human circulatory system

When rockets launch, astronauts' bodies experience a lot of high forces, which makes it harder for their heart to pump blood to their brain. Astronauts sit inside the rocket in a reclined position so they are less likely to faint as they begin their ascent.

- ② Can we measure our heart rate before and after exercise?
- ② How could we measure heart rate recovery after exercise?
- ② What would be a good way to present our results?

## Harmful effects of microorganisms

Microbial growth was found on the Mir Station as a result of increase in temperature and poor ventilation during a period when the electrical power failed. Astronauts must clean spacecraft routinely to prevent the harmful bacteria and moulds growing and spoiling their food.

- ② How can we compare how different foods decay over time?
- ② How can we see which conditions affect the growth of mould on food?
- ② Can we find out if other materials are affected by micro-organisms?
- ② What conditions promote their growth?
- ② How do you think astronauts prevent the growth of micro-organisms such as mould on a spacecraft?
- ② Can you think of all the ways in which this would affect the spacecraft and the crew?

## Effects of gravity

When Neil Armstrong walked on the moon, he bounced along as the gravity moon is a lot weaker than the gravity on Earth. This means that his weight was less on the moon than on Earth, though his mass was the same.

- ② Can you find out which planet of the solar system you weight least on?
- ② Would your weight be more or less on Mars?
- ② Can you record your findings in a table?
- ② What would your weight be on Comet 67P?

## Habitats and environment/ Adaptation and evolution

Astrobiologists investigate life deep below the surface of the Earth, looking at organisms that live in extreme conditions such as high temperatures, highly acidic or salty environments. This helps them judge whether life might be possible on other planets.

- ② Can we list animals found in various habitats in our local area?
- ② Do they have features which help them to survive in a particular habitat?
- ② Looking at images of animals found in eg desert or polar regions, can we create a list of features of these animals?
- ② In what way do specific features help animals survive in a particular habitat?
- ② What features would we expect life on Mars to have?

## Global UV experiment

It is important to wear sunscreen when you go out in the sun because the UV rays in sunlight can damage your DNA and cause sunburn and skin cancer. In space, astronauts have to be even more careful to protect themselves from UV light, as they are not protected by the Earth's atmosphere.

- ② How can we investigate the best sunscreen at blocking UV light?
- ② Can we order them from worst to best?
- ② How do your results compare to the manufacturers' rating?

## Changes in materials

Satellites orbiting the Earth have large solar panels, which create electricity from the sun's light. When launching a satellite the solar panels are still folded up. Once in orbit, the panels are unfolded by heating a material on the back of the panel, which expands and moves when heated.

- ② How can we use thermochromic paper to investigate which materials have good thermal conductivity?
- ② Can you think of any applications for thermochromic materials in everyday life?

## Reversible and irreversible changes

Mars is known as the red planet as it appears red when viewed through a telescope. The robots Nasa sent to Mars found iron oxide or rust causes the red colour.

- ② Can we find out which materials rust?
- ② What factors cause rusting?
- ② How can we investigate this?
- ② How could we compare the length of time different objects containing iron take to rust?
- ② What could we do to prevent materials from rusting?
- ② Can we investigate if liquids other than water cause rusting?

## BIOLOGY



## CHEMISTRY

## PHYSICS

## Contact forces

Mars has many craters that have been formed by meteorites. The larger, heavier and faster the meteorite, the bigger the crater it creates when it crashes into the planet.

- ② Can we investigate how the size of different objects affects the size of a crater?
- ② How can we measure the size of the craters?
- ② How can we find out if the surface a meteorite lands on affects the size of the crater?
- ② Can we present our findings as a graph?

## Prisms and the spectrum

Satellites use prisms to split the light of far away stars into their components, to find out which colours of the spectrum they contain. This helps scientists to find out what these stars are made of.

- ② Can we investigate what happens to light when it passes through a prism?
- ② What happens if we pass it through a second prism? Why is this?
- ② Does the same thing happen when we pass light through a glass of water?
- ② Can we create a rainbow-coloured spinning top and see what happens when we spin it? Why do you think this happens?

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