Our Diverse World

Year 6/7 Summer Science Challenge

This summer, we are taking the opportunity to celebrate the amazing diversity we see across the world. From biodiversity to cultural and societal diversity, from the diversity of knowledge to STEM careers and subjects. These activities are designed to help you explore this theme at home safely with friends and family

The activities provided in this pack are all optional – you may have a go at as many or as few as you would like to. Just make sure you take pictures of what you do to show your new form tutors and science teachers in September!

The most important thing is that you take the opportunity to explore the outdoors in the community or local cultural spots, visit different places to find out about our diverse world around us and get your parents/carers or wider family to think about how their own jobs might link to science and technology subjects.

Some of the activities require a few resources – have a look and see what you might have already around the house or just see if you can keep back some items from the recycling bin!

Good luck and Have fun!

The Science Team @ Samuel Ward

ABOUT THIS ACTIVITY

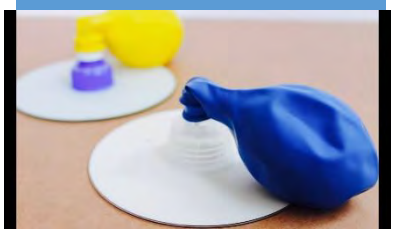
In March 2020 a cargo resupply mission was sent to the International Space Station (ISS). The ISS was built by space agencies from countries around the world.

In this activity you'll look at some of the experiments that UK European Space Agency (ESA) astronaut Tim Peake completed onboard the ISS, before you have a go yourself!

Kit list

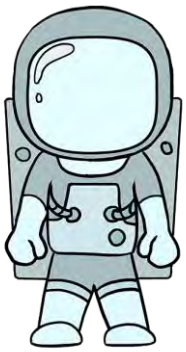
- 1 x CD
- 1 x pull-up bottle lid (such as on a sports drink)
- 1 x balloon
- 1 x blob of Blu Tack
- Stopwatch or camera (optional)
- Tape measure

Time: 1 hour



Diverse jobs

Astronaut hovercraft experiments



Instructions

First, head to astroacademy.org.uk/ resources/collisions to watch Tim Peake's demonstrations of elastic and inelastic collisions between objects of different masses

Now it's your turn

1. Roll the Blu Tack into a sausage shape and press it around the edge of the bottom of the bottle lid.
2. Push the bottle top down onto the middle of the CD so that it sticks to the CD with no gaps for the air to escape, except through the hole in the CD.
3. Blow up the balloon reasonably full, but not completely, and then twist the bottom round several times (so the air doesn't come out while you're attaching it to your hovercraft base!)
4. Stretch the balloon over the top of the bottle top with the bottle top closed. Untwist the balloon.
5. When you want your hovercraft to go, pull the bottle lid into the open position. Push your hovercraft gently and watch how far it glides!
6. Just like Tim did in the video, try (gently!) colliding two hovercrafts. What happens and why?

Next steps

- What happens if you increase the mass or velocity of your hovercraft? Can you think of a way to record data from your experiment to show what is happening?
- Download the CAPCOM GO! app by NSC Creative in the app store to see an augmented reality rocket launch
- Visit spotthestation.nasa.gov to see when the ISS will be visible in your area.

Share your experiments

Twitter UKSpaceAcademy Instagram spaceacademyuk

To find out more visit nationalspaceacademy.org

Diverse jobs

Conservation matter(s)

ABOUT THIS ACTIVITY

Can you protect your favourite objects from the agents of deterioration?

The Prince Philip Maritime Collections Centre (PPMCC) at Royal Museums Greenwich has a diverse collection of historic objects, which need careful storage depending on the material they're made from. In this activity you will play the role of a conservator and use your creativity and knowledge of specific material types to design ways of preventing irreversible damage

Kit list

- List of agents of deterioration (see next page)
- Condition report, downloadable from rmg.co.uk/see-do/british-science-week
- A range of everyday items made from different characteristics, including natural and manmade. These could be wood, stone, paper, plastic or metal

Time: 1 hour

Instructions

1. Working as a pair, select three items from those provided. Make sure each item is made from a different material.

2. Investigate each object using the condition report via the link in the Kit List. Follow the questions of the report to identify the object's condition. Notice how the material of each item has different characteristics

3. As a conservator, your aim is to protect your items from deterioration. Read the list of common types of deterioration and discuss with your partner. List on your report the deteriorations you think your items are most susceptible to.

4. Now you have identified the agents of deterioration, you need to think about how you are going to prevent them damaging your objects. You will notice that some materials are more vulnerable to multiple types of deterioration than others. To prevent further damage, you must design a container for each object that will reduce any risk to the item - whether it's pests, temperature, light, humidity and/or humans

5. Put together a presentation about your design. When making the presentation, ensure that you back up your choices and designs with scientific knowledge. Present reasoned explanations, including explaining the data behind your predictions of how your object may be damaged when exposed to different types of deterioration.

For example: This comic book is susceptible to light damage. The evidence shows this because the exposed front page is lighter than the pages on the inside, which are usually hidden from light; therefore, my container will be made from U.V protective glass.

6. How are the needs of each of your three items different?

Supporting information

Agents of deterioration

OBJECTS CAN BE DAMAGED IN MANY WAYS. HERE ARE SOME EXAMPLES YOU MAY WISH TO CONSIDER WHEN THINKING OF HOW TO PROTECT YOUR OBJECTS. CAN YOU THINK OF ANY OTHER EXAMPLES?

Human action

Often objects become damaged through misuse or not being stored properly. Physical force can damage artefacts directly by causing stress, breakage and pressure. This could be due to stacking objects on top of each other or accidentally knocking into an item. Staff at Royal Museums Greenwich prevent physical force damage by storing artefacts in cases or in cabinets. The most common cause of damage by humans is overcleaning. Vandalism or theft are also a concern, especially for objects in public areas.

Light

Light damage can be caused by overexposure to either natural or artificial light. Light has the biggest effect on paper-based objects, and in the case of letters or manuscripts, can result in the object becoming unreadable. It's a shame if artefacts fade from exposure to excessive light, as it makes it harder to see what the artefact originally looked like. Staff at Royal Museums Greenwich try to minimise the amount of times light sensitive objects are exposed to light by rotating them from display and storing them in dark cabinets or containers.

Fire

Fire can cause smoke damage, or partial or total loss of the artefacts. As a result, it is important that fire prevention be given the highest priority possible. Staff at Royal Museums Greenwich use secondary housing to protect the objects from fires. Secondary housing means putting a container within another container to create an extra barrier.

Water

Water damage can result from natural occurrences, human intervention or plumbing failures. The museum stores its collection off the floor and inside cabinets, in anticipation of a leak or flood.

Pests

Pests such as insects and rodents can sometimes see the valuable collection as a nice snack rather than artefact. They are attracted to objects made from natural materials, such as plants and animals. Before adding new objects into the collection, staff at Royal Museums Greenwich place all our organic items into quarantine. In quarantine the new objects are frozen which eradicates any potential pests and their eggs. All objects from natural based materials are then stored in containers which prevent aces of pests

Pollutants

Pollutants can be natural or manmade gases, aerosols, liquids, dust or dirt that are known to accelerate decay of the objects. Aerosols and liquids that are commonly seen around artefacts are household cleaners, bug sprays, and detergents. The chemicals within these sprays can attach to the objects and slowly cause it to decay.

Temperature and humidity

Incorrect temperatures and humidity can damage the objects. Depending on the material of the object, it can react in different ways to extremes of temperature and humidity. Warm and damp conditions may result in mould.

Diverse jobs

Design an Antarctic research station

ABOUT THIS ACTIVITY

Antarctica was first sighted 200 years ago. The early explorers were looking for new sources of seals and whales to exploit for their pelts and oil. In the last 100 years, through international science programmes, we now understand that Antarctica is pivotal in the Earth's climate system and a sensitive barometer of environmental change. In this activity, you will investigate the geopolitics of Antarctica and design a science station suitable for scientific research in Antarctica.

Background

There are few places on Earth where there has never been war, where the environment is fully protected, and where scientific research has priority. In 1959, the governing Antarctic Treaty, which unites over 50 nations, made Antarctica a continent dedicated to scientific research with a common aim: to encourage international cooperation and protect the environment for future generations.

Kit list

Access to a computer or fact sheets on Antarctica Coloured pens A3 paper (for design)

Time: 2+ hours

Instructions

1. Start by doing some research on past and present buildings in Antarctica - what was their purpose and how were the stations are designed?
2. Think about the key scientific knowledge you will need for designing your station. For example:
   - What is the terrain like? Where would you locate it?
   - How cold can it get in Antarctica?
   - What temperature will it need to be inside the station? How will you heat the station? How will you maintain the temperature? Think about thermal energy and insulation.
   - What will the inhabitants be doing there? What equipment and rooms will the station need to accommodate them?
3. Consider what research will be completed in the station – look at the priorities of the countries involved in the Antarctic Treaty and the similarities/ differences between them. The station will need to be equipped for these kinds of research
4. Consider what other elements might need to be included:
   - How will you reach your station?
   - Will researchers live in the station or will they have a separate building to stay in?
   - How and where will they eat, sleep, exercise etc?
   - How will researchers travel around?
   - How can you make the research station representative of all the nations involved?
5. Make a design for the station, incorporating everything you have considered above. How will you communicate your ideas?
6. You may also wish to consider how materials will be transported to the Antarctic to build your station

Next steps

Use these links to research your survey station.

ukaht.org/discover/port-lockroy

ukaht.org/discover/other-historic-sites

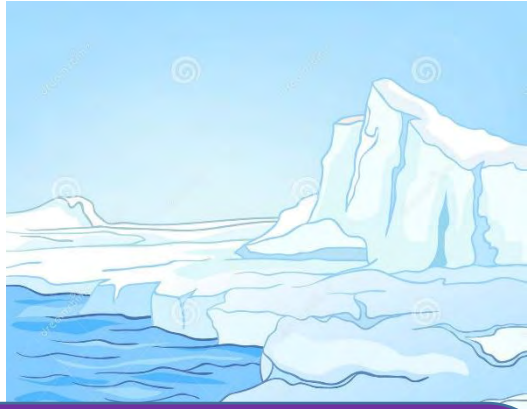
bas.ac.uk/polar-operations/sitesand-facilities/station

discoveringantarctica.org.uk/howis-antarctica-governed/geopolitics/geopolitics-of-antarctica/

Fact sheet

Antarctica facts

Since its discovery, Antarctica has had a chequered past. Once news of this new land was known, global exploitation of its abundant seal population began almost immediately; later it was whalers that would exploit the environment.



During the 20th century, the focus of human activity in Antarctica shifted to a new form of exploration, as scientists began to study the continent's environment and biodiversity and steps were taken to protect them. Today, scientific research in Antarctica shapes

The Antarctic Treaty was set up in 1959 by 12 nations. Now, more than 50 countries have signed up to this unique set of principles.

Legal protocols have since strengthened the protection of the environment, forbidding mineral and oil exploration, controlling human activity in Antarctica.

Whilst the treaty does not have an expiry date, in 2048 any country can call for a conference to renegotiate the terms of its environmental

Try it at home

Make your own bath bomb

ABOUT THIS ACTIVITY

In this activity you will investigate how to make your own bath bomb. We can all support the diversity of our planet by using less packaging including single-use materials. By designing your own bath bomb you could also find a way to cut down on the packaging required and encourage others to make their own bath bombs. The following recipe makes four small bath bombs.

Dry ingredients

- 100 grams baking soda
- 50 grams citric acid
- 25 grams cornflour

Wet ingredients

- 2 tbsp sunflower oil or olive oil
- 2 tsp water
- 1 tsp food colouring (optional)
- 12-15 drops essential oils of choice (be sure to check for allergies)

Kit list

- Two mixing bowls
- Whisk
- Flexible plastic moulds (clean empty yogurt pots, silicone ice cube tray or silicone cupcake cases)

Time: 2+ hours

Instructions

1. Mix the dry ingredients together in one bowl and the wet ingredients together in the other bowl.
2. Add the wet ingredients to the dry ingredients a few drops at a time while whisking, until the mixture just sticks together when pressed.
3. Press the mixture into the mould and leave to dry for at least 2 hours.
4. Make a few bath bombs with variations and record the differences in them, such as:
   - More or less baking soda
   - More or less citric acid
   - Different oils (citric or other)
   - Different colours
5. Remember to keep some elements the same, to make it a fair test.
6. Now it's time to test your bath bomb! Put the bath bomb in some water and record:
   - How long it takes to disperse.
   - How high the 'fizz' is.
   - What happens to the water
   - Anything else you think might be important in deciding if a bath bomb is effective or not.
7. Compare your different bath bombs, deciding which one makes it more effective as a bath bomb.
8. Re-write your favourite recipe as a step-by-step guide

ABOUT THIS ACTIVITY

In the future there may be human settlements on Mars. This will be a challenging process. How will the settlers be able to grow food, make products, heal illnesses and injuries? There will be limited capacity for bringing supplies from Earth. Decisions will have to be made about what can initially be brought from Earth in order to make the colonisation successful.

Should fungi be included in the initial colonisation?

Did you know?

Fungi have been on Earth for around 1 billion years. Homo sapiens have only been around for about 200, 000 years!

Challenge

Mars Mission

Instructions

Create a poster with your reasons for or against bringing fungi on a mission to Mars, identifying at least one species of fungi that could be useful to bring to Mars, and one that should stay on Earth.

Could fungi be a useful addition to a Mars mission? Are there any reasons not to bring fungi to Mars?

You will need to research:

- What are fungi?
- Would fungi survive on Mars?
- What useful properties do fungi have?
- Why would we bring fungi over other items?
- Are there any negative qualities of fungi?
- Mars colonisation – why might we need to colonise another planet in the future?

You will need to apply the skills of a **Space Biologist**; see below for the sorts of skills a space biologist needs:

What does a Space Biologist do?

A Space Biologist works to understand how spaceflight affects living things and helps to prepare for human space exploration missions in the future. They conduct experiments to see how living organisms grow, reproduce, develop and protect themselves from diseases in space conditions.

Skills:

- Observation - looking at things carefully
- Attentiveness - able to pay attention to detail
- Researching - finding relevant information
- Problem solving - able to find solutions to issues
- Classifying - arranging, ordering and grouping things
- Questioning - identifying areas that can be studied or tested
- Inferring - making informed guesses
- Communication - written and verbal

Challenge

Illustrating threats to plants

ABOUT THIS ACTIVITY

A worrying one in five of the world's plant species are threatened with extinction. However, education is a powerful tool in raising people's awareness of the scale of the problem and showing what they can do to help.

Are you up to the challenge of designing a comic strip to be used in schools to educate your peers about why temperate plants are threatened and why we should care?

Did you know?

Many plants could become extinct before we even know they're at risk, or sometimes, before they're even discovered.

Instructions

Produce a comic strip informing people of threats to temperate plants.

You can either:

Choose ONE temperate plant that is currently threatened and explain how and why that plant is threatened.

OR

Focus on the range of different ways a temperate plant could be threatened.
Note: Your comic strip may be hand-drawn or computer generated.

- Consider the tone of your comic; is it serious or light-hearted? Are you using comedy to engage people? Don't forget that the main purpose of your comic is to educate, not simply amuse.
- Use your imagination and be as creative as you like!

You will need to apply the skills of a **Comic Writer/Illustrator**; see below for the sorts of skills a comic writer/illustrator needs

What does a Comic Writer/Illustrator do?

Comic Writers write the scripts for a comic strip or book. Often working in teams, they outline scenes, describe the characters and action and detail what will happen. Illustrators then work on the drawings using a range of media - for example pencil, ink, paint or graphics – to bring the comic alive.

Skills

- Imagination and creativity - able to develop ideas
- Communication - able to present ideas through text and images
- Presentation - presenting information clearly and concisely
- Researching - finding relevant information
- Development - able to translate initial idea to finished product
- Design and illustration
- Collaboration - working with others

ABOUT THIS ACTIVITY

The world of science is full of people who have made incredible discoveries, developed amazing technologies or impacted our lives.

When you join Samuel Ward Academy you will be in a Science class named after one of these amazing people. This activity encourages you to find out a bit more about one of them, what they did and why they are so important to the world of Science.

Famous Scientists

Who am I?

Instructions

Choose one of the scientists listed below:

Research them, find out about their life, their work, the discoveries they made and the impact these discoveries had on the world.

Present your findings in whatever creative way you choose. Will you produce a poster, information leaflet, video diary, 3D model, animation?

We look forward to seeing your work!

Scientist:

Robert Bunsen

Rachel Carson

William Beaumont

Elsie Widdowson

Nikola Tesla

Marie Lavoisier

Stephen Hawking