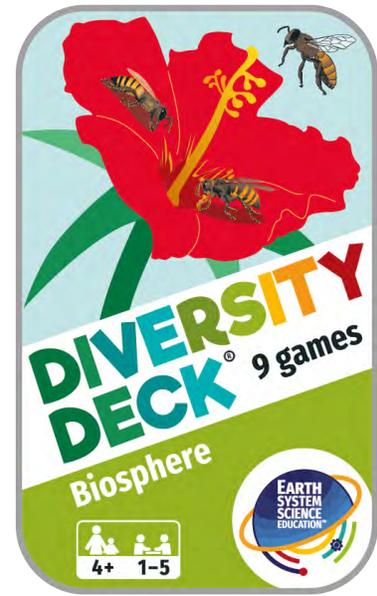


DIVERSITY DECK® Funbook



Biosphere



MAINTENANT
Sustaining Now
maintenant.org.uk

PLAY ● LEARN ● CHANGE THE WORLD



Earth System Science Education™

To understand how our planet works and our impact on it, we teach Earth System Science.

We divide the Earth into 7 different components called spheres.

Today, we will tell you the story of the Biosphere.

E12
∞

This symbol means there is further information available on our Educational Hub [MAINTENANT.org.uk](https://www.maintenant.org.uk). You can click on the weblink or type the reference, e.g. **E12**, into the search box.

1
E10

Hydrosphere

All the water on planet Earth

E10
1

2
E11

Cryosphere

All the ice on planet Earth

E11
2

3
E12

Biosphere

All living organisms on planet Earth

E12
3

4
E13

Atmosphere

The layers of gases surrounding planet Earth

E13
4

5
E14

Lithosphere

The solid outer part of planet Earth

E14
5

6
E15

Magnetosphere

The magnetic field protecting planet Earth

E15
6

1
E16

Technosphere

Human impact on planet Earth

E16
1

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Biosphere
EARTH SYSTEM SCIENCE EDUCATION™
4+ 1-5

1 B10 **First life**
Life developed in the deep oceans

2 B11 **Genetics & inheritance**
Life passes on information

3 B12 **Adaptation & evolution**
Life finds a way to survive

4 B13 **Ecosystems**
Life is interconnected

5 B14 **Food web**
Energy is moved through ecosystems

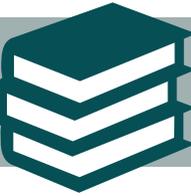
6 B15 **Seed dispersal**
Plants move in many different ways

1 B16 **Nutrient cycle**
The Earth is constantly recycling its resources

B17 **Insects**
Life would not exist without insects

B18 **Trees**
Trees breathe life

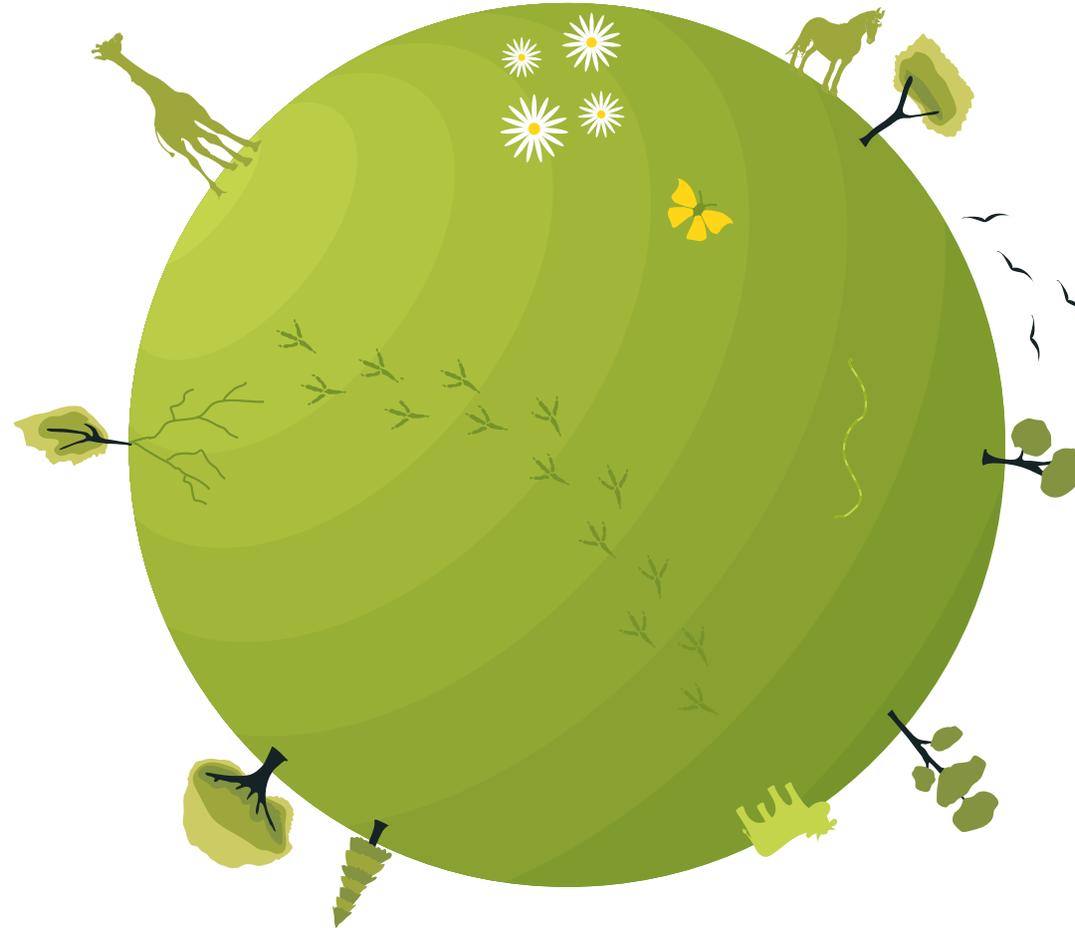
B19 **6th mass extinction**
Life is reaching a dangerous tipping point



The Biosphere

The biosphere contains all the living things on planet Earth.

As far as we know, we are the only planet to have a biosphere, making us extremely special.

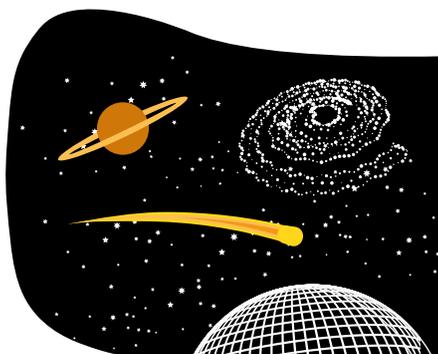


DID YOU KNOW?

Viruses are not living organisms but are parasitic and replicate themselves inside cells of other organisms.

FABULOUS FACT

The Biosphere extends **12 500 metres** below the surface of the Earth (lithosphere) and into the atmosphere to include birds, insects and bacteria.



Astrobiology

Astrobiology is the study of the origin and evolution of life in the universe. It is the search for other forms of life on other planets.



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Biosphere Wordsearch

Complete this wordsearch to familiarise yourself with some words about the biosphere. There is a glossary at the end of this book for you to use if you are not sure of their meaning. Some words are also linked to pages on our educational hub.

- BIOSPHERE
- UNIQUE
- ADAPTATION
- NUTRIENT
- EVOLVED
- ENVIRONMENT
- MUTATION
- INSECTS
- EXTINCTION
- WILDLIFE

K	W	J	R	A	M	Q	U	T	A	C	T
B	I	O	S	P	H	E	R	E	V	G	Y
E	V	Y	G	E	U	Q	I	N	U	E	F
F	S	Z	S	E	V	O	L	V	E	D	W
I	E	X	T	I	N	C	T	I	O	N	I
L	C	T	M	T	N	E	I	R	T	U	N
D	T	I	O	G	K	B	W	O	R	P	S
L	E	A	W	H	Z	J	N	N	F	H	E
I	N	O	I	T	A	T	U	M	D	A	C
W	T	V	K	M	X	E	X	E	V	O	T
B	I	O	S	F	E	R	Q	N	U	Z	S
U	T	A	D	A	P	T	A	T	I	O	N



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Our planet is unique

Our planet is unique and is the only one we know of that supports life.



1) Can you find the one planet Earth in the picture?

.....



2) How many planet Mars' are there?

.....



3) How many Suns are there?

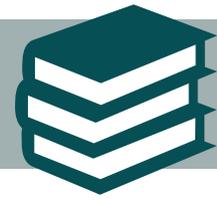
.....



4) How many Europa moons are there?

.....

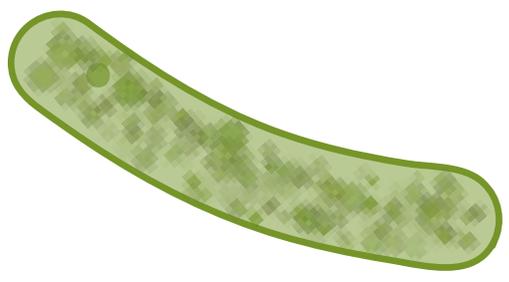




First life

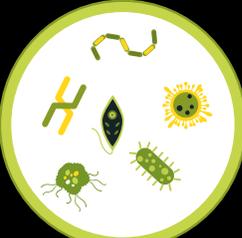
Life began in the deep oceans **3.5 billion years ago** from single celled organisms.

The biosphere was created at this point.



DID YOU KNOW?
Blue-green algae, or *Cyanobacteria*, are thought to be the first life forms on Earth. Fossils have been found in Western Australia dating back **3.5 billion** years.

FABULOUS FACT
Although not proven, some scientists claim to have discovered possible life as early as **4.2 billion** years ago in Quebec, Canada.



Microbiology

Microbiology is the study of microscopic organisms, invisible to the naked eye (bacteria, fungi and viruses). Microbiologists study their structure and interaction with their environment.



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Our Time and Place in the Universe

Draw a line from these events to the red arrows on the timeline to place them in the right order.



Earth was formed 4.5 billion years ago



Humans appeared on Earth 6 million years ago



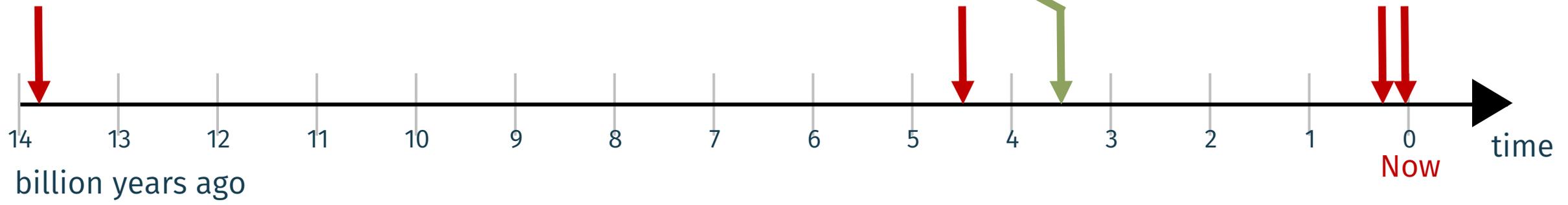
Life began 3.5 billion years ago

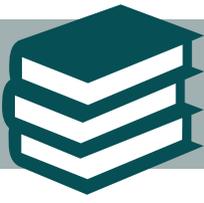


Big Bang 13.8 billion years ago



Dinosaurs appeared on the Earth 240 million years ago





Life is everywhere

The biosphere is a closed, self-regulating system containing all the ecosystems on the planet.

Every part of the planet holds some form of life; from the deepest depths of the ocean floor to the highest mountain peaks.

The biosphere is supported by the atmosphere, the hydrosphere and the lithosphere in important ways which keep the planet in balance.



Our STEAM ambassador



Marine Biologist

Marie-Anne
Cambon Bonavita

Marie-Anne is using deep sea submersibles to study the ocean bed and observe what living organisms she and her team can find in the deep ocean cracks of the Pacific Ocean's floor.

They aim to document organisms such as bacteria, to gene sequence their DNA, and compare them to other fauna in the vents of different oceanic locations.

This information will lead to a better understanding of the deep sea's ecosystems. Marie-Anne's research helps to decide if those ecosystems can be sustainably exploited for the rare minerals deposited there.



A balance of gases in the atmosphere allows life to flourish

Over billions of years, the **atmosphere** has developed the right balance of gases to sustain life.

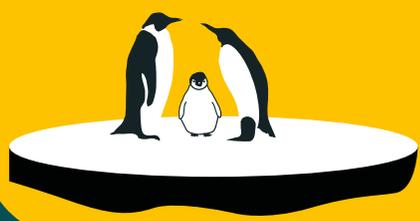
This balance was created in several different ways including the following biological processes:

- Plants carry out photosynthesis and produce **oxygen**.
- Animals and plants respire and produce **carbon dioxide**.



DID YOU KNOW?
Changes to the amount of oxygen in the atmosphere over time have guided the evolution of animal lungs and affected the size of land animals.

FABULOUS FACT
Photosynthetic bacteria produce oxygen through photosynthesis. *Prochlorococcus* is a tiny ocean living bacteria which produces around a fifth of the Earth's oxygen!



Bioclimatology
Bioclimatology is the analysis between climatic zones and ecosystems. Bioclimatologists study the global climate's impact on the development and evolution of all organisms.

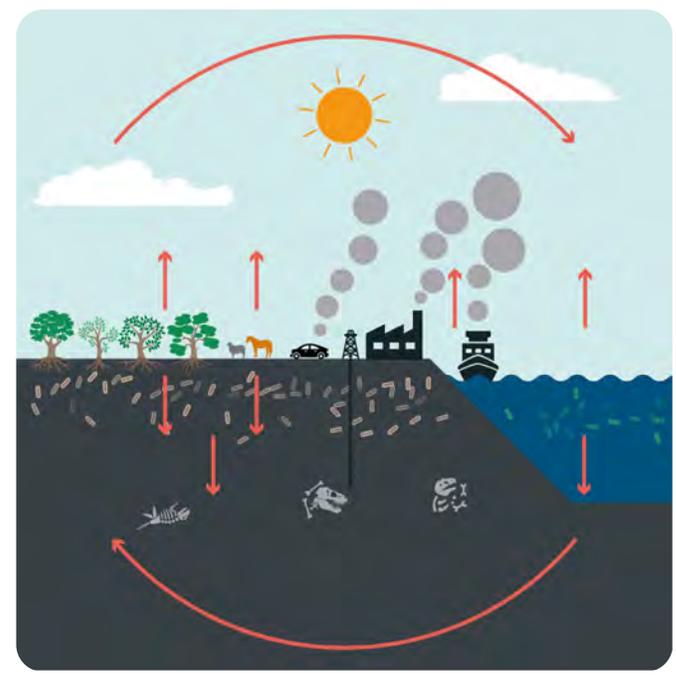


The lithosphere contains all the nutrients needed for life

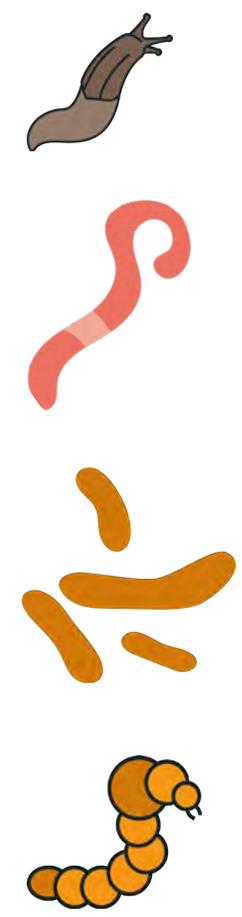
The **biosphere** interacts with the **lithosphere** where nutrients such as **carbon** and **nitrogen** are recycled in the soil.



Nitrogen cycle



Carbon Cycle



DID YOU KNOW?

Many bugs and beetles help to speed up this recycling process by breaking down dead animals and plants.

FABULOUS FACT

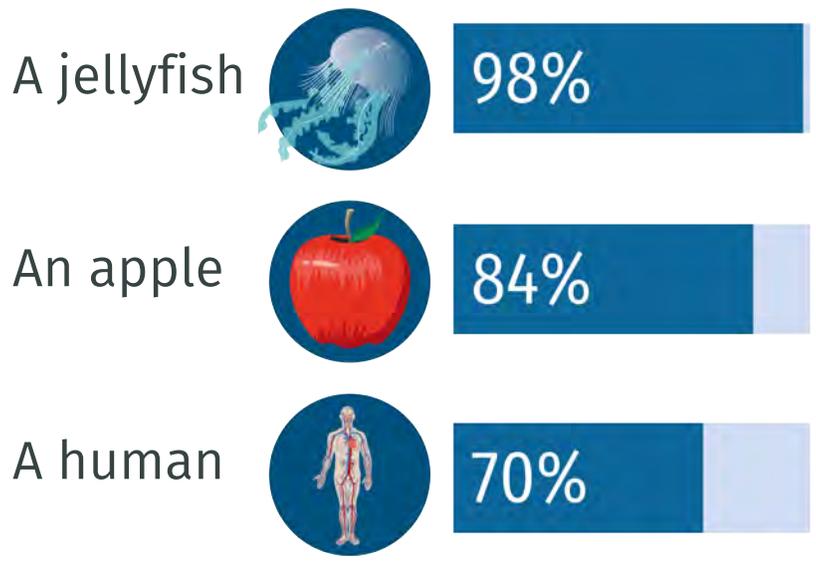
In North Carolina, USA, scientists estimated that there are **124 million** animals living in 1 acre of soil when dug just 13 cm deep!



The hydrosphere's water cycle makes life possible

The **hydrosphere** supports the **biosphere** by providing water for all living things.

Living things have a lot more water in them than you might expect!



There may be less rain without an amazing bacteria called *Pseudomonas syringae*

We make it rain



DID YOU KNOW?
Rainforests such as the Amazon create rain by releasing water vapour through transpiration on the undersides of their leaves.



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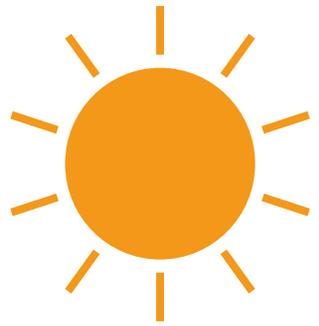


A Terrarium

A terrarium creates its own environment and atmosphere by recycling nutrients and gases around its closed system.

It can clearly show the interactions between the different spheres in miniature!

They can be tricky to look after successfully, just like our planet, but if cared for properly, they can last for a long time.



Small plants

Soil

Gravel

DID YOU KNOW?

A terrarium is a sealed transparent globe in which plants are grown. The heat and light which enter through the glass, start its very own water cycle!

FABULOUS FACT

The world's largest terrarium can be found in a shopping mall in Warsaw, Poland. This mini enclosed forest weighs more than a ton:
1018kg



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Let's make a terrarium!

Creating a terrarium gives a sense of how our world works and how it can self-regulate as long as it is not polluted and spoilt.

You will need

- 1) A large empty jar
- 2) Gravel for the base
- 3) Soil/compost
- 4) Small plants and moss
- 5) Water

How to do it

- 1) Place a small layer of gravel at the bottom of the jar, followed by a layer of soil.
- 2) Place in small plants and moss.
- 3) Spray with water.
- 4) Once sealed, place in a cool place out of direct sunlight.
- 5) You may need to adjust the balance of water at first by opening the lid; too little water and it will dry out, too much water and it will rot.

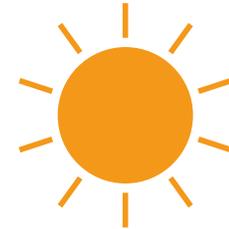




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Terrarium discussion



1) What will the plants need to survive?

.....

2) What gases are circulating around the terrarium which are essential for life?

.....

3) Do you know the names of the processes which create these gases?

.....

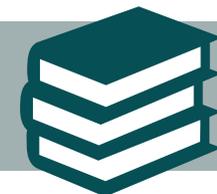
4) What will you need to support animal life in the biosphere terrarium?

.....

5) Add toy figures to represent humans - what impact would this have on the biosphere - how will it change?

.....

.....



Ecosystems

From the smallest bacteria to entire forests, everything in the biosphere is working to provide food, shelter, water and unique environments for animals and plants to live in.

It is really important that we value every species for the place that it holds in nature. There are big consequences when even small organisms disappear from ecosystems. When individual species go extinct, it will mean that important processes may not be carried out anymore.

Some examples of these would be:

- When an organism disappears from a food chain, it changes the energy flow through an ecosystem. Some animals have less to eat and decrease in numbers and if predators disappear, then some animals may increase in numbers.
- Seed dispersal of certain plants might not occur.
- Pollination of plants might stop and the plant may not be able to reproduce.
- The breakdown of dead material may be slowed leaving plants without the nutrients that they need to grow.

DID YOU KNOW?

Coral reefs, rainforest, Arctic tundra, wetlands and deserts are all types of ecosystems.

Can you think of any others?



Zoology

Zoology is the study of the animal kingdom. This includes the study of embryology, evolution, classification, habitats, and the distribution of all animals, both living and extinct, and how they interact with their ecosystems.





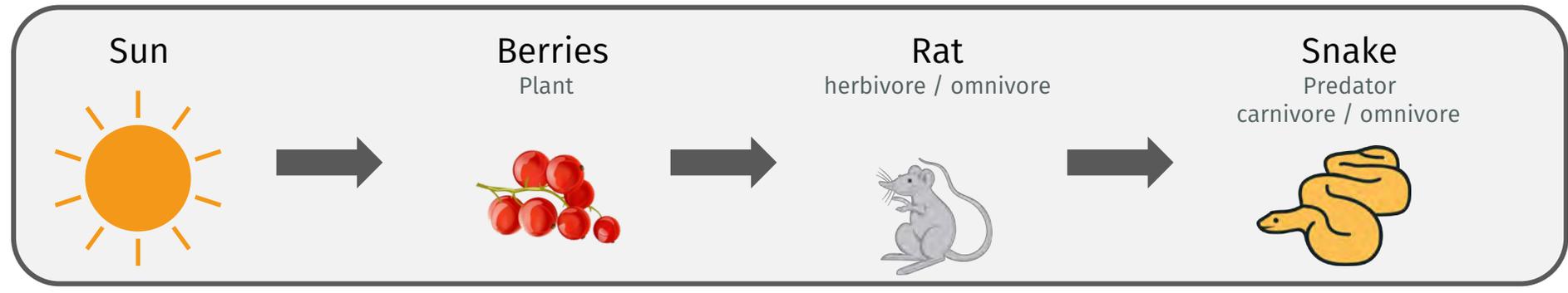
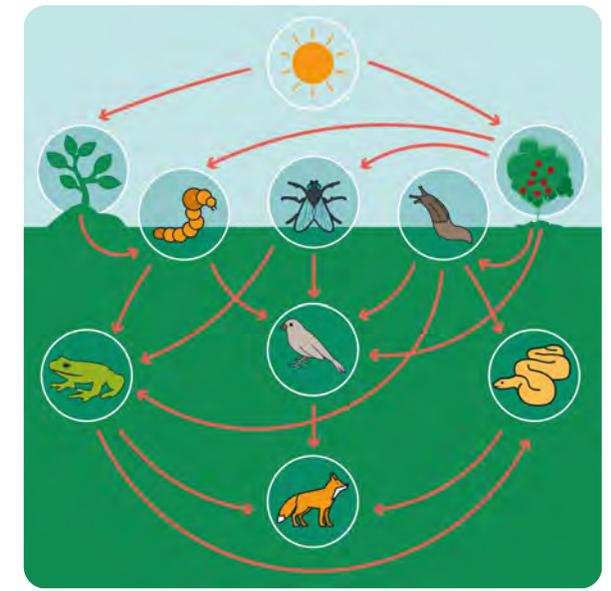
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Cut and stick to complete the food chains 1/2

Help! Some of these organisms in the food chains have disappeared from their ecosystem and other animals are now in danger of starving!

- 1) Can you replace the missing organisms in the correct places to save them!
- 2) Have you noticed that the Sun is always at the beginning of a food chain? Why do you think that is?
- 3) There are always producers, herbivores and carnivores in food chains. Can you label these in the food chains below?
- 4) Can you create your own food chain?



DID YOU KNOW?

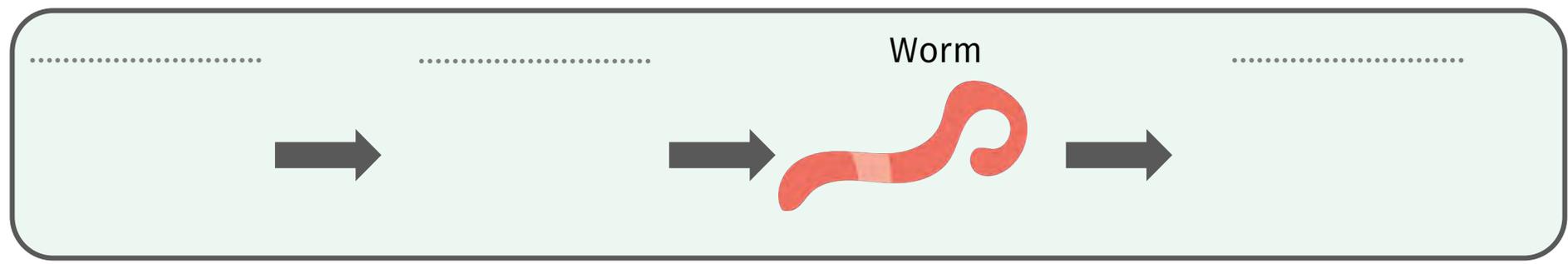
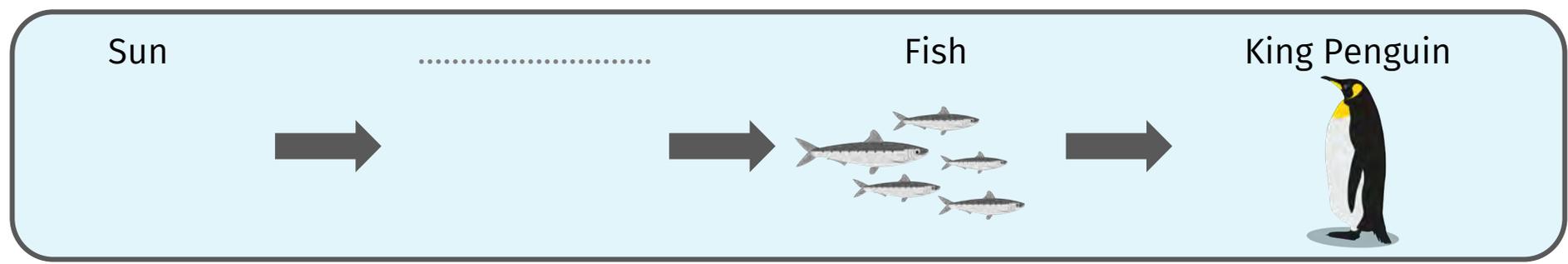
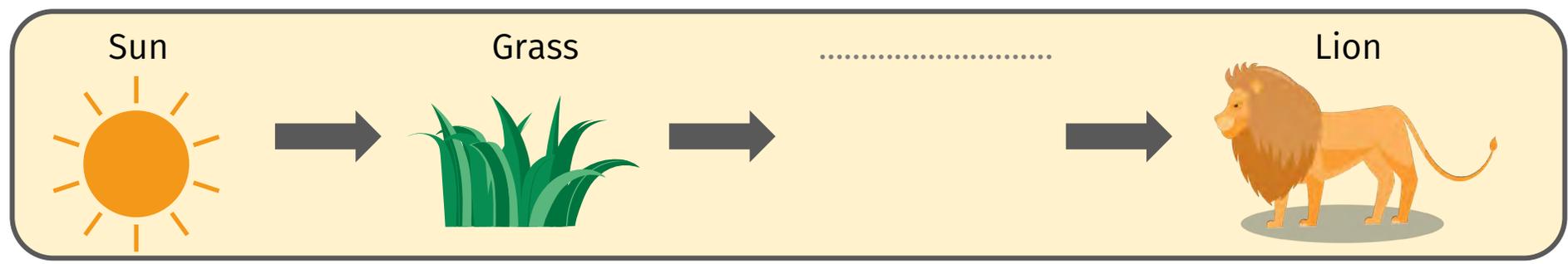
Food chains can be combined to create a complex network called a food web. They show how energy flows within an ecosystem.



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 Name _____
 Surname _____
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Cut and stick to complete the food chains 2/2



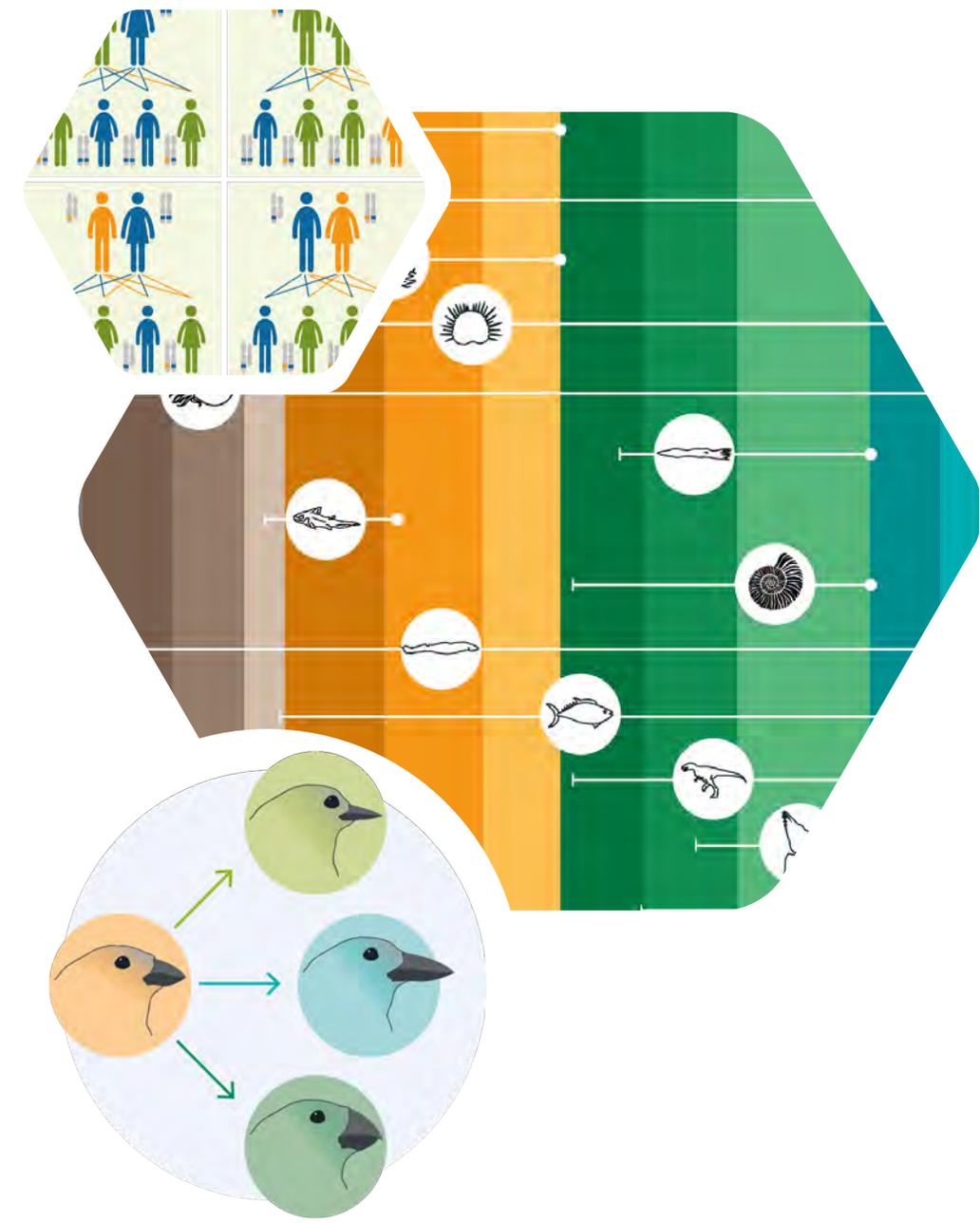


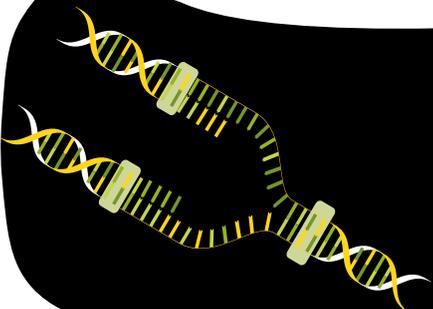
Adaptation and evolution

Biodiversity means all the living organisms in a given area. That could be the entire planet or a particular forest or lake. Biodiversity has taken hundreds of millions of years to evolve through:

- Genetic mutations
- Adaptation to environment
- Mass extinctions

If biodiversity disappears because of human actions which are causing climate disruption, then it is irreversible and will take millions of years to recover.





Genetics

Genetics is the study of the genes and heredity of living organisms (plants, bacteria, animals, humans).
Heredity is the transmission of a gene, for example eye colour, to the descendants.



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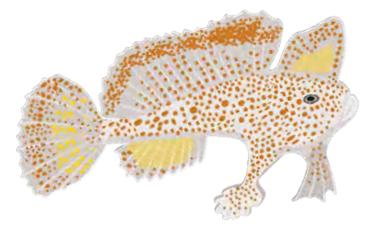


Animal adaptations

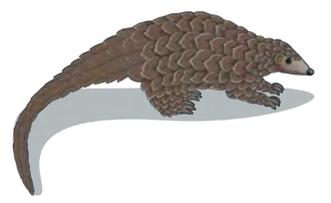
Match the adaptation with the animal



Musk Ox



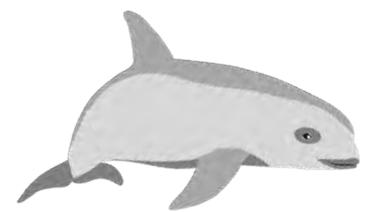
Spotted Handfish



Pangolin

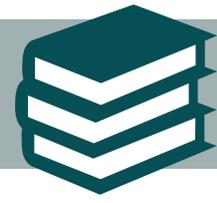


Northern Bald Ibis



Vaquita

- 1 Long beak for finding worms and beetles in sand and soil.
- 2 Thick warm fur for surviving freezing temperatures.
- 3 Hand-like fins for walking over the seabed.
- 4 Streamline body for swimming fast.
- 5 Big strong front claws for digging and tearing up rotten wood.



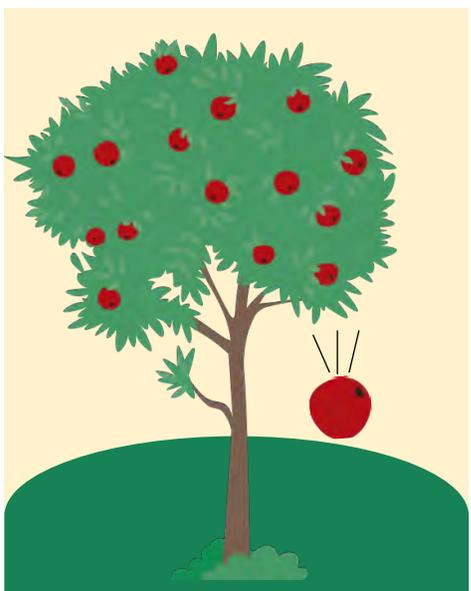
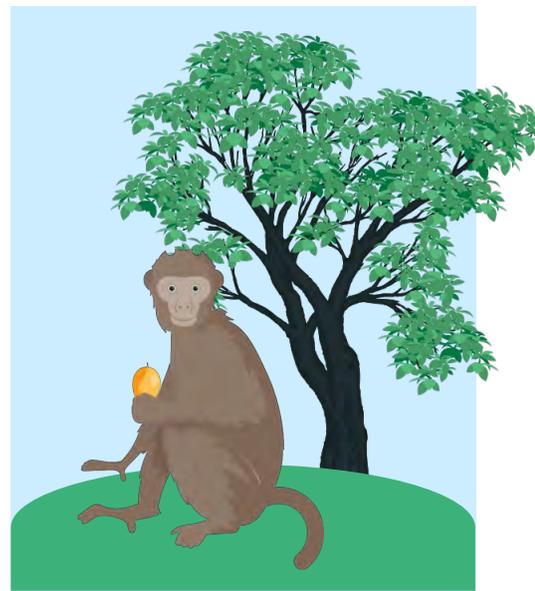
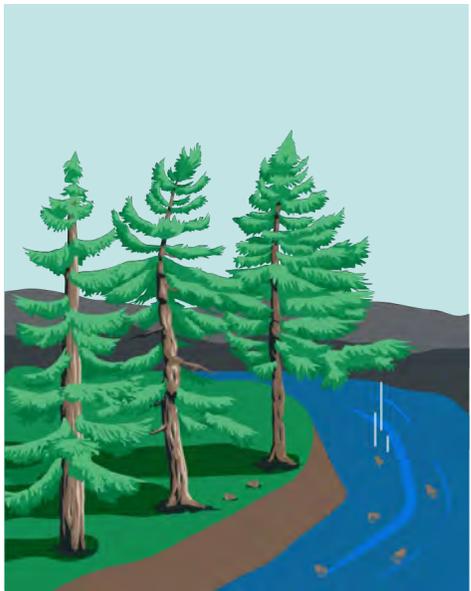
Seed dispersal

Plants have evolved to use seed dispersal techniques to plant offspring far from the parent plant.

They do this by using gravity, wind, water or animals to disperse their seeds far and wide.

There are a many examples of how animals transport seeds. Some seeds have barbs or hooks which attach to an animal's fur or body and are moved to another place.

Some animals such as mammals and birds, eat seeds in fruits which are then deposited a few days later in their waste.



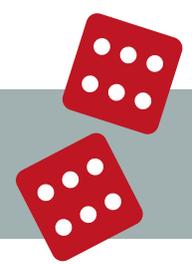
DID YOU KNOW?

Humans may disperse seeds on clothes, shoes and cars.

This is called **anthropochory**



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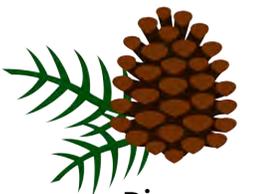
Seed dispersal game

Seeds can be dispersed in various ways to help the seed to **germinate** into a plant. Tick to match the seeds to the correct type of seed dispersal. Be careful, a few seeds have more than one seed dispersal method!



Berries

A	B	C	D	E
✓				✓



Pine

A	B	C	D	E
<input type="checkbox"/>				



Sycamore

A	B	C	D	E
<input type="checkbox"/>				



Yellow pond lily

A	B	C	D	E
<input type="checkbox"/>				



Acorn

A	B	C	D	E
<input type="checkbox"/>				



Poppy

A	B	C	D	E
<input type="checkbox"/>				



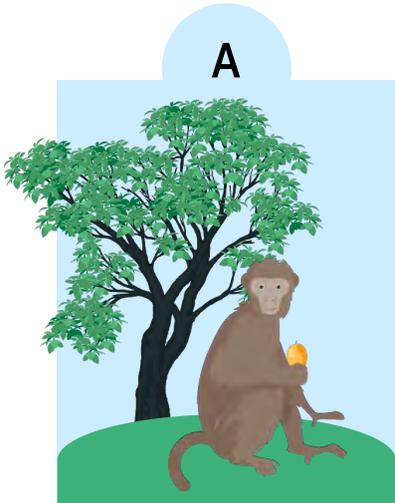
Coconut

A	B	C	D	E
<input type="checkbox"/>				



Dandelion

A	B	C	D	E
<input type="checkbox"/>				



Eaten or buried by animals



Stick to animals' fur or feathers



Float on water



Blown by the wind



Spread by gravity



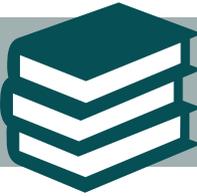
Bornean rainforest plants and orangutans

- Some seeds benefit and will germinate, or begin to grow better once they have been through an animal's digestive system.
- It has been shown that the Bornean forest and the orangutans which live there are intricately linked in this way so that if the orangutans were to go extinct, the regeneration of the forest would be badly affected, and certain trees and plants would also die out.

DID YOU KNOW?

The relationship between the seed and animal is known as **sympiotic**





The biosphere is dying

Human behaviour, habitat loss and climate change are leading to the 6th wave of mass extinction all too quickly.

Scientists believe that we are on track to lose 50% of all higher life forms on the planet by 2100.

This would lead to a collapse in many ecosystems and further extinctions over the coming decades.

Some scientists believe that we have a short window to reverse this trend, but we must work together and quickly. The United Nations Sustainable Development Goals provide a plan to achieve this globally.



DID YOU KNOW?
There have been 5 previous mass extinctions on Earth which wiped out nearly 75% of all life forms each time including the dinosaurs at the end of the Cretaceous period.



What can you do to help the Biosphere?

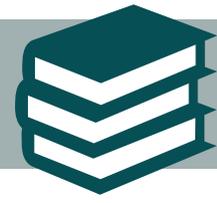


Look around you.

Think and look after our planet.

Be stewards for the next generation.

There are many ways that we can positively impact the biosphere.



Encourage insects

- Insects are very important to the success of any ecosystem. They provide a major food source for birds and small mammals, pollinate many plants and are important decomposers.
- Farming and food production rely on insects. Without them we would not be able to feed ourselves. They pollinate many crops which leads to seed growth and fruit formation. Bees also produce honey and bees wax.
- Insects are under threat because of pesticide use in food production which kills insects. Habitat loss because of city expansion and climate change are also causing a crash in numbers.



Look after our insects

You can encourage insects in your garden by leaving overgrown areas with wild flowers and bug hotels. Some ideas can be found at CountryFile.com/Wildlife



Buy organic food

This is important as it uses less pesticides, and generally, farmers that grow organically provide areas for insects to thrive.

DID YOU KNOW?

The world's heaviest insect is the Goliath Beetle which can weigh **more than 50g** and be over **10cm long**



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TRUE or FALSE



How much do you know about insects? Test yourself!

	TRUE	FALSE
1) Insects use parts of their bodies to make sounds		
2) Insects have 8 legs		
3) There are between six and ten million different types of insects		
4) Insects communicate with each other		
5) Ants pollinate crops		
6) Many insect species are found in oceans		
7) An insect's tail is called a thorax		
8) Insects make up one quarter of all animals on the planet		
9) Some insects feed on blood		
10) Only 1% of insects are harmful to humans		



DID YOU KNOW?
 The Golden Eyed Stick Insect was only discovered in 2005 in a remote part of Peru on the edge of the Amazon Rainforest but is Critically Endangered.



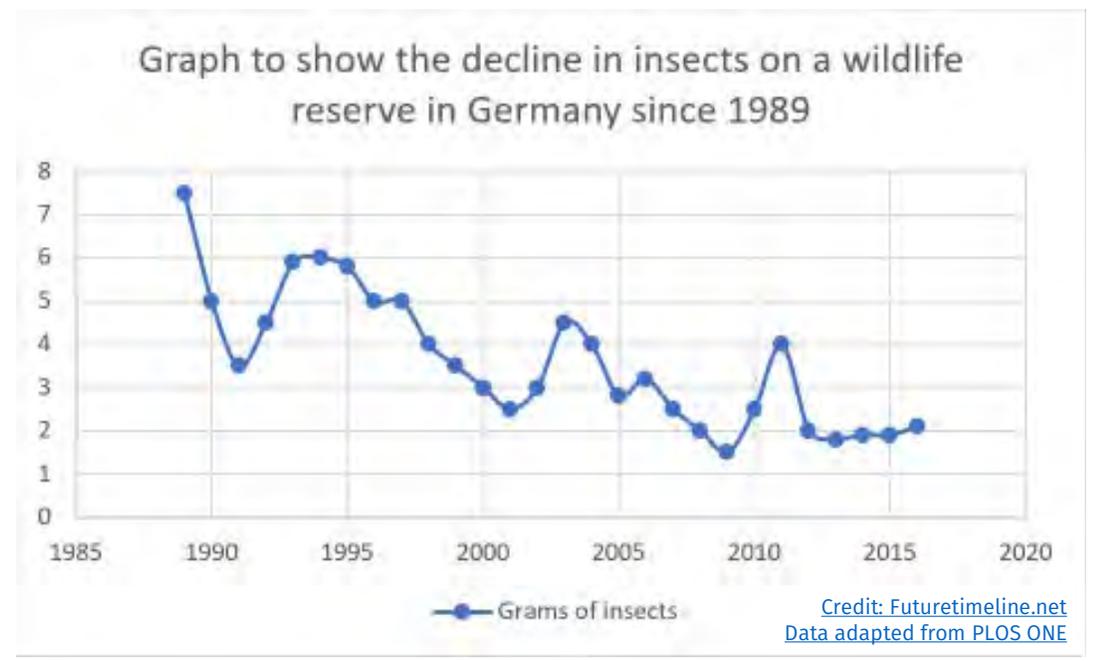
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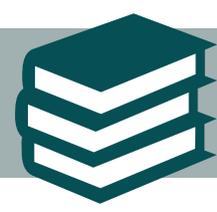
Insect population decline

This data comes from a German wildlife reserve. Scientists caught insects overnight in large nets and weighed the numbers that they caught from year to year.

Can you help them to analyse their findings?



- 1) How many grams of insects were caught in 1989?
- 2) When was the lowest amount of insects caught?
- 3) Between which years was the biggest fall in amount of insects caught?
- 4) What is the difference in grams of insects caught between 1989 and 2016?
- 5) Can you work this out as a percentage fall in insect numbers?
- 6) What could be done to increase the numbers of flying insects at the reserve?



Plant Trees

Trees are the lungs of the planet.

- Trees and other plants produce oxygen through photosynthesis which enables animals to breathe the air in the atmosphere. Trees are also important because large, old forests provide huge stores of carbon by taking carbon dioxide out of the air and storing it in their large tree trunks.
- Unfortunately, through deforestation, much of this carbon is released into the atmosphere, therefore increasing the amount of greenhouse gases and warming the planet.
- Trees also provide wonderful shelter and homes to many animals. Birds nest in them, mammals create dens and burrows under them, and insects live inside them.



You can help by planting trees in your local area

- to help reduce air pollution
- to provide homes for wildlife



Seed bombs

Seed bombs are used by people to reforest huge areas of land which have been deforested. The seed bombs are dropped by all sorts of methods such as helicopter, airplane, bicycles and sling shots.

Reforestation programs have been delivered in the USA, Australia and China and now there are big plans to reforest much of Kenya and West Africa.

It's sad that humans have destroyed these forests in the past but also a huge accomplishment by conservation groups and governments who are committed to restoring landscapes for generations to come.

A fantastic positive example of a seed bombing project is Seedballs Kenya who have managed to disperse nearly 10,000,000 seed bombs across Kenya since 2016!



Class _____
 Name _____
 Surname _____
 Date _____



Origami chatterbox 1/2

Print this page, cut it out and fold it as instructed on the next page.



How to play

- 1) Pick 1 of 4 words and spell out the letters out as you move the origami back and forth.
- 2) Pick a number and read out the fact. Then move the origami whilst counting the number of times chosen.
- 3) Pick another number and open up the origami to reveal the question. Discuss question!

 Soil	2. Soil helps plants grow and habitat for animals. What are the 4 components of soil?	3. Plants get most energy from sunlight What ecosystem is often called the 'lungs of the planet?'	Plants  4. Plants absorb carbon dioxide and release oxygen. Why do you think plants and trees are important to the biosphere?
1. The 1 planet with life is Earth. What do you think Earth would look like without soil?	8. Every year 8 million metric tons of plastic enters our oceans. What changes can you make to help protect the environment and live more sustainably? What are the world's most polluting industries?	How many different animals can you spot out your window, in your garden or in your local park? 5. The Big Five: Lion, leopard, elephant, buffalo, rhino. What can you do to help endangered animals?	Animals  6. Animal groups: Invertebrates, amphibians, reptiles, birds & mammals, fish.
Humans  7. There are over 7 billion people in the world. How many different animals can you spot out your window, in your garden or in your local park?			



Class.....
Name.....
Surname.....
Date.....



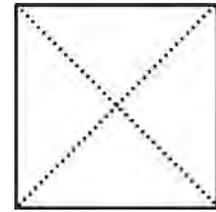
Origami chatterbox 2/2

Follow these instructions below.

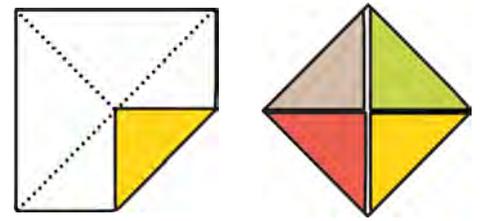
1) Print and cut out square. Fold diagonally in both directions to establish the centre.



2) Unfold and turn over, so the image is facing down.



3) Fold corners to centre point.



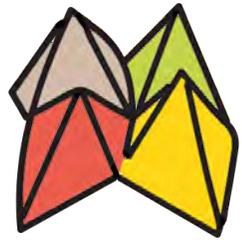
4) Turn over and fold corners to center point.



5) Fold in half vertically, crease & unfold. Fold in half horizontally.



6) Insert thumbs and index fingers under outside corners and pinch together.





Class _____
 Name _____
 Surname _____
 Date _____

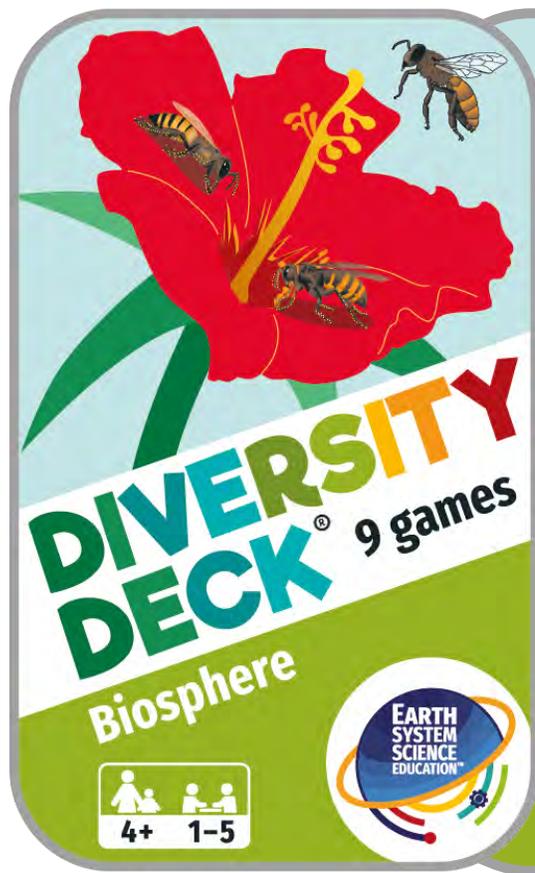


Animal diary competition

We would like you to create a story about being a wild animal and what your day would be like.

Here are some ideas to get you started:

- You can choose to write about any animal you like! For example, you could be a butterfly, a bird or a fox.
- You could ask your parents to help you spend some time watching local wildlife. This could be anything from birds in the sky from your window, a video clip from the internet or ants in between paving stones, even in urban areas there is lots to see.
- Make quick notes on what you see happening.
- Can you imagine what life is like for a wild animal?
- You may want to do some additional research about the animal you choose to write about.
- Think about all the following questions and try to include them in your story:
 - What other animals would you see?
 - Where would you go?
 - What would your home be like?
 - What do you eat and why?
 - How do you feel? Safe, scared, warm, cold?
 - What kind of things make you happy and sad?

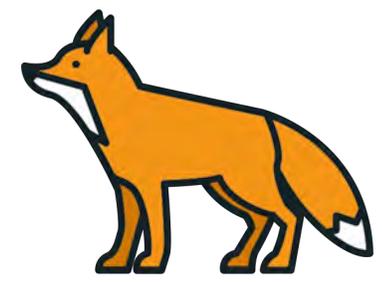


WIN A CARD DECK!

Send your completed diary entry to us at games@maintenance.org.uk

by the 31st July 2020

The best 3 entries will be published on our website and winner will also receive a copy of the amazing Biosphere DIVERSITY DECK® card game





Class

Name

Surname

Date



I pledge to ...

Start these 3 actions to live more sustainably and help bring about positive change to ensure a good future for me and generations to come.

1

2

3

Sustaining Now to Protect our Future

Sign

Date



PLAY ● LEARN ● CHANGE THE WORLD

Use code **MSNOFF20** for 20% off
DIVERSITY DECK® card games



Earth's Spheres Collection



Sustainability Collection



PLAY ● LEARN ● CHANGE THE WORLD

The United Nations Sustainable Development Goals or SDGs are a worldwide plan for all to tackle poverty and environment challenges like climate breakdown.





PLAY ● LEARN ● CHANGE THE WORLD

1	Adaptation	A feature of a living thing which helps it to survive
2	Atmosphere	The gases which surround our planet
3	Biodiversity	The variety of living things in a certain area
4	Biosphere	The areas of the Earth which contains all the living organisms on Earth
5	Carnivores	Animals which eat other animals for food
6	Deforestation	When a forest is cut down, burnt and destroyed by human activity
7	Dispersal	Spread out, as seeds do when they are scattered by the parent plant
8	Ecosystem	A community of organisms and their environment interacting together
9	Environment	The conditions of a habitat including light, temperature and other organisms
10	Evolved	The way an organism has changed genetically to fit into its environment
11	Extinction	When there are no more individuals in a species left
12	Germinate	When a seed starts to grow
13	Gravity	The force by which objects fall to the ground
14	Herbivores	Animals which eat plants for food
15	Hydrosphere	All the water on the planet
16	Lithosphere	The Earth's crust and everything in it
17	Mutation	A random change in an organism's genes which changes the way it looks or behaves
18	Nutrient	Substance that a plant needs to keep healthy
19	Organism	A living thing
20	Pesticide	Substances that are used to control pests
21	Predator	An animal which kills another animal for food
22	Prey	An animal which is killed and eaten by another animal for food
23	Producer	An organism which produces its own food, normally plants through photosynthesis
24	Photosynthesis	The process by which plants make food in their leaves. Oxygen is a waste product
25	Pollination	When pollen from one flower is taken to another
26	Respire	The way cells get energy by combining glucose and oxygen. Carbon dioxide is produced as a waste product
27	Symbiotic	A close physical association between 2 living organisms which mutually benefit from the interaction

ETYMOLOGY

The origin of a word



Biosphere

βίος	bíos	life	Greek
σφαῖρα	sphaira	sphere	Greek

Biosphere Wordsearch

Check your responses. How many right responses did you get: _____ / 10

- BIOSPHERE
- UNIQUE
- ADAPTATION
- NUTRIENT
- EVOLVED
- ENVIRONMENT
- MUTATION
- INSECTS
- EXTINCTION
- WILDLIFE

K	W	J	R	A	M	Q	U	T	A	C	T
B	I	O	S	P	H	E	R	E	V	G	Y
E	V	Y	G	E	U	Q	I	N	U	E	F
F	S	Z	S	E	V	O	L	V	E	D	W
I	E	X	T	I	N	C	T	I	O	N	I
L	C	T	M	T	N	E	I	R	T	U	N
D	T	I	O	G	K	B	W	O	R	P	S
L	E	A	W	H	Z	J	N	N	F	H	E
I	N	O	I	T	A	T	U	M	D	A	C
W	T	V	K	M	X	E	X	E	V	O	T
B	I	O	S	F	E	R	Q	N	U	Z	S
U	T	A	D	A	P	T	A	T	I	O	N

PLAY ● LEARN ● CHANGE THE WORLD

Our planet is unique

Check your responses. How many right responses did you get: _____ / 4



1) Can you find the one planet Earth in the picture?

YES



2) How many planet Mars' are there?

7



3) How many Suns are there?

5



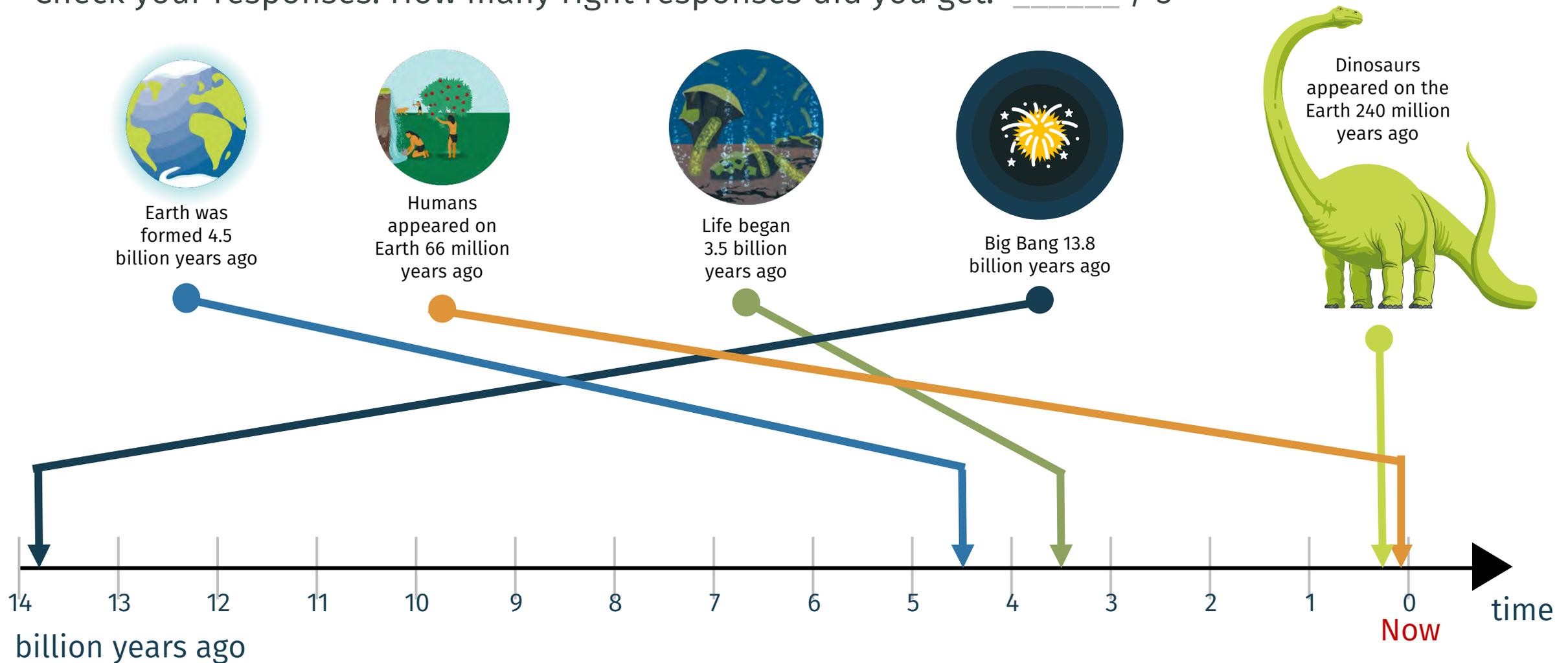
4) How many Europa moons are there?

6



Our Time in the Universe

Check your responses. How many right responses did you get: _____ / 5



PLAY ● LEARN ● CHANGE THE WORLD

Animal adaptations

Check your responses. How many right responses did you get: _____ / 5



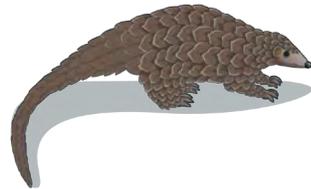
Musk Ox

2



Spotted Handfish

3



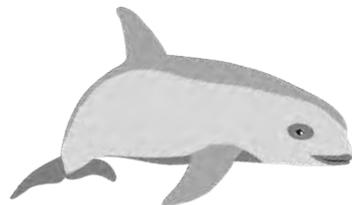
Pangolin

5



Northern Bald Ibis

1



Vaquita

4

1

Long beak for finding worms and beetles in sand and soil.

2

Thick warm fur for surviving freezing temperatures.

3

Hand-like fins for walking over the seabed.

4

Streamline body for swimming fast.

5

Big strong front claws for digging and tearing up rotten wood.

TRUE or FALSE questions

Check your responses. How many right responses did you get: _____ / 10

	TRUE	FALSE
1) Insects use parts of their bodies to make sounds	●	
2) Insects have 8 legs		● They have 6 legs
3) There are between six and ten million different types of insects	●	
4) Insects communicate with each other	●	
5) Ants pollinate crops		● Pollinators such as bees and butterflies do
6) Many insect species are found in oceans		● No insects are found in oceans
7) An insect's tail is called a thorax	●	
8) Insects make up one quarter of all animals on the planet		● No one is exactly sure as not all insects have been discovered yet, but estimates are between a half and three quarters of all animals are insects!!
9) Some insects feed on blood	●	
10) Only 1% of insects are harmful to humans	●	

PLAY ● LEARN ● CHANGE THE WORLD

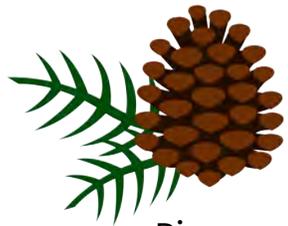
Seed dispersal game

Check your responses. How many right responses did you get: _____ / 16



Berries

A	B	C	D	E
✓				✓



Pine

A	B	C	D	E
			✓	✓



Sycamore

A	B	C	D	E
			✓	✓



Yellow pond lily

A	B	C	D	E
		✓		



Acorn

A	B	C	D	E
✓			✓	✓

squirrels bury them
in the ground



Poppy

A	B	C	D	E
	✓		✓	



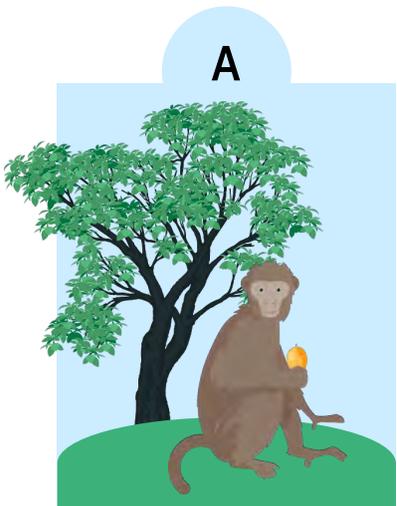
Coconut

A	B	C	D	E
		✓		✓



Dandelion

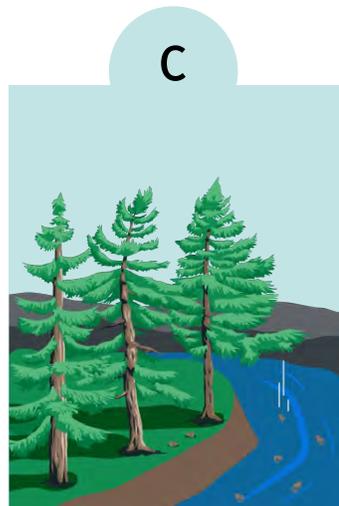
A	B	C	D	E
	✓		✓	



Eaten or buried
by animals



Stick to animals
fur or feather



Float on water



Blown by the
wind

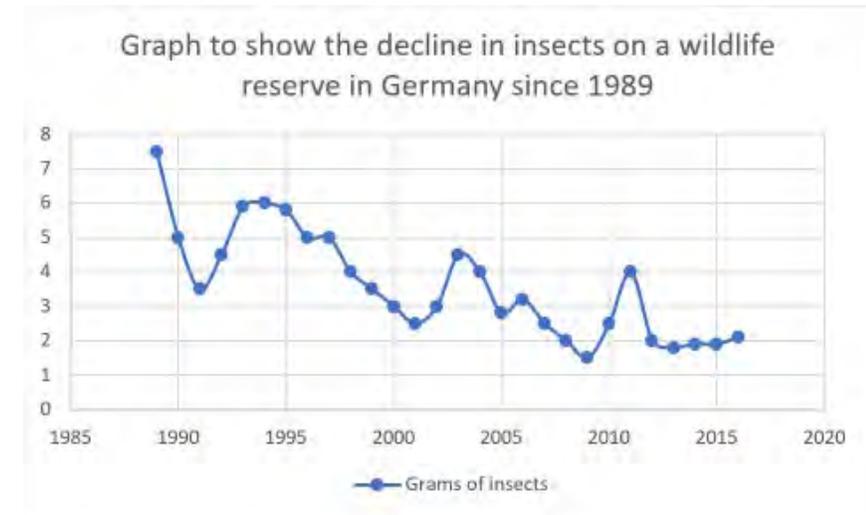


Spread by
gravity

Insect population decline

Check your responses. How many right responses did you get: _____ / 6

- 1) How many grams of insects were caught in 1989? **7.5g**
- 2) When was the lowest amount of insects caught? **2009**
- 3) Between which years was the biggest fall in amount of insects caught? **1989-1991**
- 4) What is the difference in grams of insects caught between 1989 and 2016? **$7.5 - 2.1 = 5.4g$**
- 5) Can you work this out as a percentage fall in insect numbers?
 $5.4 \div 7.4 \times 100 = 72\%$ fall in insect numbers
- 6) What could be done to increase the numbers of flying insects at the reserve?
They can increase areas of wildflowers and create bug hotels. If local farmers use pesticides, they could encourage them to stop.



Credit: Futuretimeline.net
Data adapted from [PLOS ONE](https://doi.org/10.1371/journal.pone.0158888)

PLAY ● LEARN ● CHANGE THE WORLD

Earth System Science Education™ our innovative educational methodology

The Earth is a dynamic planet in constant evolution. The Earth System Science represents our planet as a set of strongly interconnected spheres. MAINTENANT Sustaining Now adapted this global and multidisciplinary approach to tell children about Sustainability Science such as Earth's climate, renewable energy, biodiversity conservation and well being.



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Sustaining Now**
maintenant.org.uk

MAINTENANT Sustaining Now is an award-winning social enterprise producing educational sustainability science resources, and running corporate and school workshops which empower children, adults and the whole community to adapt their lifestyles now.



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