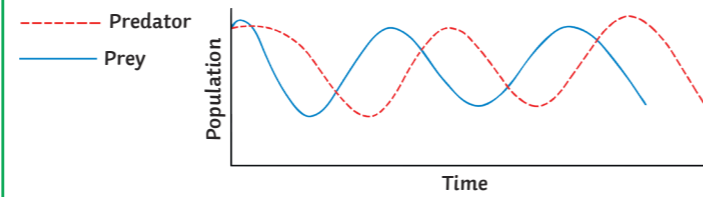


The illustration shows an ocean food chain. Label each organism with their position in the chain and what type of diet they eat (if any).

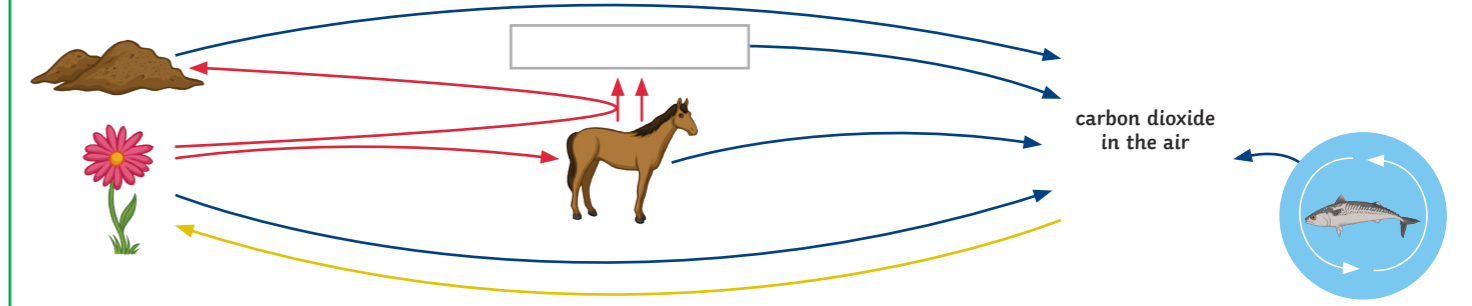


Name a predator from the food chain.
 Name an organism from the food chain that is prey.
 Explain the role of producers in food chains.

The numbers of predators and prey fall and rise in cycles. Use the graph to explain why.



Label each of the arrows in the illustration of the carbon cycle with the process that the arrow represents.



Explain the role of decomposers in the recycling of materials through an ecosystem.

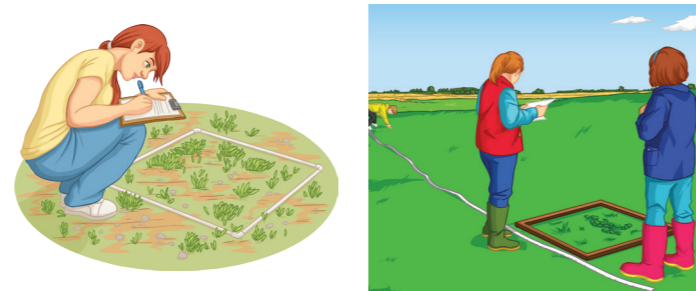
How have humans affected the use of land?

Define biodiversity.

Why is it important to maintain a good level of biodiversity?

What programmes are scientists putting into place to maintain biodiversity?

Label the illustrations with the method being used to determine the **abundance** and **distribution** of organisms.



The abundance is... _____

The distribution is... _____

Explain the importance of the water cycle to living organisms. Include the following keywords: condensation, transpiration, precipitation, evaporation, respiration.

Explain why global warming is occurring.

How does pollution occur...

in water? _____

in the air? _____

on land? _____

What are the biological consequences of global warming?

What is a decomposer?

For each of the conditions below, explain why it affects the rate of decay of dead plants and animals.

temperature

moisture

oxygen

What is compost used for?

How do gardeners and farmers ensure the rapid production of compost?

How is one of the products from anaerobic decay useful?

Write the following keywords next to the correct trophic levels below. There should be at least two key terms for each level.

herbivores, secondary consumers, plants, algae, tertiary consumers, primary consumers, carnivores, producers

Level 1: _____

Level 2: _____

Level 3: _____

Level 4: _____

Level 5: _____

Level 6: _____

Level 7: _____

What is an apex predator?

Draw a pyramid of biomass for the data shown.

Organism	Number	Biomass (g)
oak tree	1	5000
aphid	10 000	1000
ladybird	200	50

Explain how biomass can be lost between trophic levels.

How much of the energy that plants and algae take in from light is transferred to the next trophic level?

How much biomass from each trophic level is transferred to the level above it?

Explain how the loss of biomass at each trophic level affects the number of organisms at each level.

How can farming techniques improve the efficiency of food production?

Give three biological factors that are threatening food security.

How can we use fishing techniques to promote the recovery of fish stocks?

Explain the role that biotechnology can play in achieving food security.

Define the following terms.

community: **All the populations of different organisms that live together in a habitat.**

stable community: **Where all the species and environmental factors are in balance so that population sizes remain stable.**

ecosystem: **A community and its habitat.**

population: **All the members of a single species that live in a habitat.**

interdependence: **A network of relationships between different organisms in a community.**

biotic factor: **A living thing that affects the ecosystem.**

abiotic factor: **A non-living part of the environment that affects living organisms.**

a

Give three ways that animals and plants are interdependent.

Any three of the following:

- Plants produce food by photosynthesis.
- Animals eat plants.
- Animals eat other animals.
- Animals pollinate plants.
- Plants use animal waste for nutrients.
- Animals use plant and animal materials for building nests or shelters.
- Plants use animals for seed dispersal.

b

When young male lions reach maturity, the older males kick them out of the pride. Explain which factors cause them to do this.

If the males remain in the pride, they will compete for food, territory and mates with the older lions. The older males will be more likely to survive and reproduce without this competition.



c

Plants may have to compete with other plants.

Explain why plants may not grow as well on the forest floor when compared to a meadow.

The plants will receive less light because the tree canopy will block most of it from reaching the floor. Light is needed to provide energy for photosynthesis; reduction of light will reduce photosynthesis and therefore the glucose needed for growth.

The plants will have to compete for space from the bigger trees and plants. The plant may not have enough space to grow, or enough space for a big root system to get water and nutrients. This means growth would be reduced.

The bigger trees would be better at getting water and mineral ions because they have large root systems. Water is needed for photosynthesis. The plants will get less water which will reduce photosynthesis and therefore the glucose required for growth.

Mineral ions are needed to produce larger molecules for growth. If the plant gets less of these, its growth will be reduced.

d

List the factors that can affect a community under the correct headings below.

abiotic	biotic
light intensity	availability of food
temperature	new predators arriving
moisture levels	new pathogens
soil pH	one species outcompeting another
soil mineral content	
wind intensity and direction	
carbon dioxide levels for plants	
oxygen levels (for aquatic animals)	

e

Red squirrels are the native squirrel species in European woodlands. Grey squirrels were introduced to the UK in the late 19th century. Grey squirrels feed more often at ground level than red squirrels and are able to digest acorns, which the reds can't. Grey squirrels carry a deadly pox virus which does not affect them.

f

Explain why grey squirrels are now the dominant species of squirrel across much of England and Wales.



Grey squirrels outcompete the red squirrels for food because they eat more often on the ground. This means they are able to eat food that has fallen from the trees. They are also able to eat acorns as a food supply so they have more food available. This means that they are more likely to survive and reproduce than the red squirrel.

The grey squirrels brought the pox virus to the habitats when they were introduced. The red squirrels are not immune so the disease will have spread through the population and resulted in the loss of many red squirrels.

Organisms that live in extreme environments are called **extremophiles.**

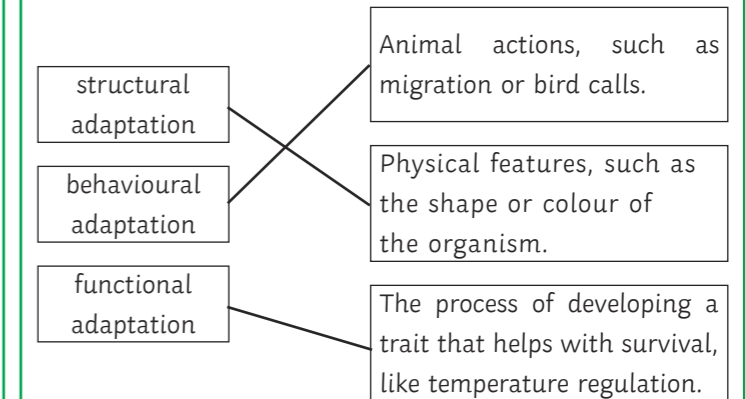
h

Give three examples of extreme environments.

- high temperature
- high pressure
- high salt concentration

Link the type of adaptation to the correct example.

i



Explain why most desert animals have a large surface area to volume ratio and large, thin ears.

j

To increase energy transfer through their skin to the surroundings to help them cool down.

In 2010, an oil spill off the coast of Mexico polluted 1100 miles of coastline. Explain how this will have affected the marine plants that live on the floor of the ocean.

g

The sunlight cannot pass through the oil on the surface of the water. The sunlight won't reach the plants so they won't be able to photosynthesise. This means they won't be able to grow.

Explain how animals that live in cold climates are adapted to survive.

k

They have a small surface area to volume ratio and small ears to reduce energy transfer to the surroundings. They have thick layers of fat and fur for insulation.

A student uses a 1m² quadrat to take 10 random readings of dandelions in the school field. The results are shown below.

l

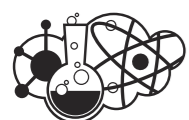
1	4	3	1	2	3	1	5	3	3
---	---	---	---	---	---	---	---	---	---

What is the range of their data? 1-5 dandelions per m²

What is the median of their data? 3 dandelions per m²

What is the mode of their data? 3 dandelions per m²

What is the mean of their data? 2.6 dandelions per m²



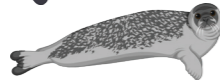
The illustration shows an ocean food chain.

Label each organism with their position in the chain and what type of diet they eat (if any).

tertiary consumer, carnivore



secondary consumer, carnivore



primary consumer, herbivore



producer



Name a predator from the food chain.

Either the whale or seal.

Name an organism from the food chain that is prey.

Either the seal or crab.

Explain the role of producers in food chains.

Producers use energy from sunlight to make glucose during photosynthesis. The glucose is used to synthesise molecules that add to the biomass of the organism.

Define biodiversity.

The variety of all the different species of organisms within an ecosystem.

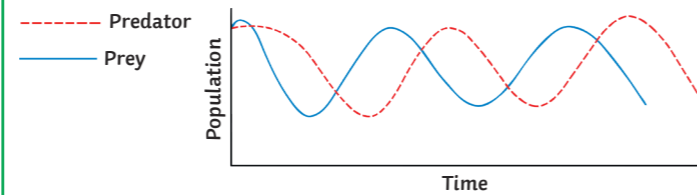
Why is it important to maintain a good level of biodiversity?

It reduces the dependence of one species on another for food, shelter and the maintenance of the physical environment.

What programmes are scientists putting into place to maintain biodiversity?

- Breeding programmes for endangered species.
- Protection and regeneration of rare habitats.
- Reintroduction of field margins and hedgerows.
- Reduction of deforestation and carbon dioxide emissions.
- Recycling resources.

The numbers of predators and prey fall and rise in cycles. Use the graph to explain why.



When there is plenty of food available, the prey animals are able to grow and reproduce successfully. As a result, their numbers rise.

This means there is plenty of food available for the predators, so they can grow and reproduce successfully. Their numbers increase shortly afterwards.

The large number of predators around to eat the prey cause the prey numbers to fall.

The reduced number of prey means there is less food for the predators, so their numbers begin to fall too.

A reduced number of predators, and lots of food available because there are fewer animals around, means the prey are able to grow and reproduce so their numbers rise again.

Label the illustrations with the method being used to determine the abundance and distribution of organisms.



quadrat

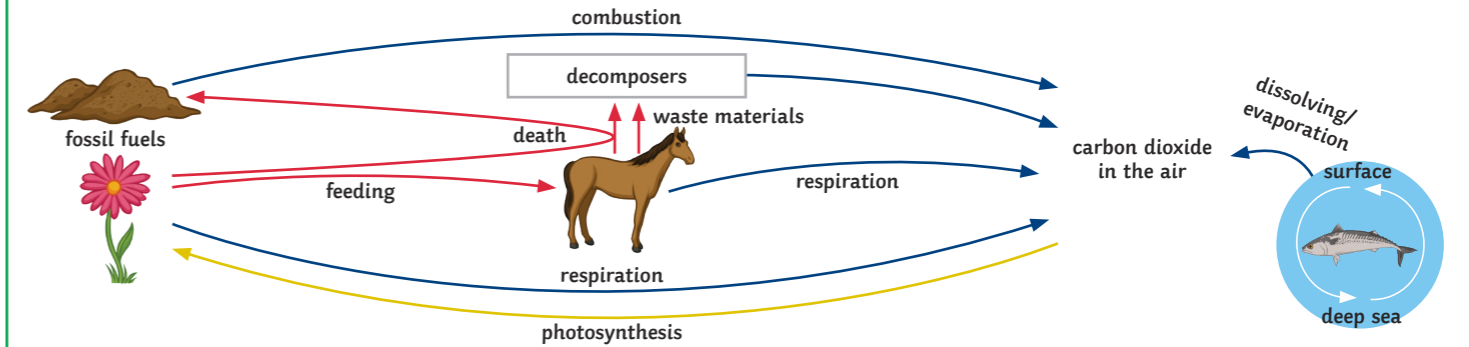


transect

The abundance is... the number of species in an area.

The distribution is... how the number of species changes from one area to another.

Label each of the arrows in the illustration of the carbon cycle with the process that the arrow represents.



Explain the role of decomposers in the recycling of materials through an ecosystem.

Decomposers break down dead bodies and waste materials. They release mineral ions as waste products back into the soil and carbon dioxide back into the air. These can then be used by producers in the food chain.

Explain the importance of the water cycle to living organisms. Include the following keywords: condensation, transpiration, precipitation, evaporation, respiration.

Water vapour is lost from organisms to the atmosphere via transpiration and respiration. Other water drains into the oceans and evaporates.

The warm water vapour in the atmosphere condenses as it cools and forms clouds of water droplets. As these get heavier, they fall onto the land as rain, hail or snow. This is called precipitation. The water cycle therefore provides fresh water for plants and animals on land.

How does pollution occur...

in water? From sewage, fertiliser or toxic chemicals that are washed or dumped into water.

in the air? From smoke and acidic gases (sulfur dioxide and nitrogen oxides) which cause acid rain.

on land? From landfill and toxic chemicals from farming.

How have humans affected the use of land?

Reduced the amount of land available to other organisms by building, quarrying, farming and putting waste into landfill.

Destroyed peat bogs which reduces biodiversity in those areas.

Large scale deforestation to provide land for cattle and rice fields, and growing crops for biofuels, reduces biodiversity.

Explain why global warming is occurring.

Deforestation reduces the rate at which carbon dioxide is removed from the atmosphere by photosynthesis. Burning the trees also releases carbon dioxide via combustion.

The land that has been cleared is often used for rice fields or cattle, both of these release methane into the atmosphere.

When peat is burnt as a fuel or used in gardens, carbon dioxide is released.

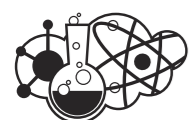
When fossil fuels are burnt in power stations, factories or vehicles, carbon dioxide is released into the atmosphere.

What are the biological consequences of global warming?

Loss of habitat by flooding reduces biodiversity.

Climate changes will affect the distribution of organisms and may cause the migration patterns of animals to change.

Climate changes may mean some organisms are no longer able to survive and will become extinct. This reduces biodiversity.



a
What is a decomposer?
A decomposer is a microorganism that breaks down dead plant and animal matter by secreting enzymes into the environment. Small food molecules then diffuse into the microorganism.

b
For each of the conditions below, explain why it affects the rate of decay of dead plants and animals.
temperature
Chemical reactions in the microorganisms responsible for decay happen faster in warmer conditions. However, in hot conditions the enzymes in the microorganisms may become denatured which will stop decay.

moisture
Microorganisms grow faster in moist conditions because they won't dry out. It's also easier for them to digest food. This means that decay will happen faster.

oxygen
Most decomposers respire aerobically so they need oxygen available for growth, reproduction and food digestion. Decay will therefore happen more rapidly when there is a lot of oxygen present.

c
What is compost used for?
natural fertiliser
How do gardeners and farmers ensure the rapid production of compost?
They try and provide optimum conditions for the rapid decay of waste biological material.

d
How is one of the products from anaerobic decay useful?
It produces methane which can be used as a fuel. It can be produced using biogas generators to use up waste and produce a renewable energy supply.

e
Write the following keywords next to the correct trophic levels below. There should be at least two key terms for each level.

herbivores, secondary consumers, plants, algae, tertiary consumers, primary consumers, carnivores, producers

Level 1: **plants, algae, producers**

Level 2: **herbivores, primary consumers**

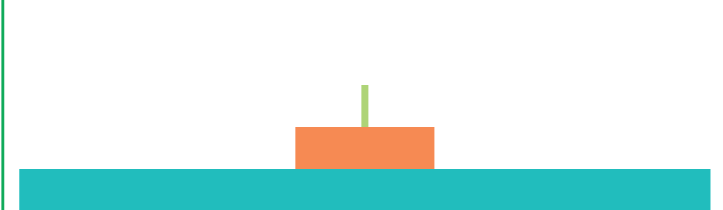
Level 3: **carnivores, secondary consumers**

Level 4: **carnivores, tertiary consumers**

f
What is an apex predator?
A carnivore with no predators.

g
Draw a pyramid of biomass for the data shown.

Organism	Number	Biomass (g)
oak tree	1	5000
aphid	10 000	1000
ladybird	200	50



h
Explain how biomass can be lost between trophic levels.
Not all material that is eaten is absorbed, some is egested as faeces.

Some material is lost as waste such as carbon dioxide and water in respiration, and urea in urine.

Glucose is used in respiration.

i
How much of the energy that plants and algae take in from light is transferred to the next trophic level?

1%

How much biomass from each trophic level is transferred to the level above it?

10%

j
Explain how the loss of biomass at each trophic level affects the number of organisms at each level.

At each trophic level, less of the original biomass is passed on. This means a smaller amount of biomass can be supported at each level, so the numbers of organisms usually decreases at each level.

k
How can farming techniques improve the efficiency of food production?

Limiting the movement of animals and controlling the temperature of their surroundings restricts the amount of energy that is transferred from the animals to the environment.

Some animals are fed high-protein diets to increase growth.

l
Give three biological factors that are threatening food security.

Three from:

- **The increasing birth rate has threatened food security in some countries.**
- **Changing diets in developed countries means scarce food resources are transported around the world.**
- **New pests and pathogens affect farming.**
- **Environmental changes that affect food production, such as widespread famine occurring in some countries during droughts.**
- **The cost of agricultural inputs.**
- **Conflicts that have arisen in some parts of the world that affect the availability of water or food.**

m
How can we use fishing techniques to promote the recovery of fish stocks?

Introduce fishing quotas on the amount and type of fish that can be caught.

Controlling the size of holes in the nets so that only the biggest fish are caught. This means the younger, smaller fish can continue to grow and breed.

n
Explain the role that biotechnology can play in achieving food security.

Genetically modified crops can give bigger yields or improved nutrition. An example is golden rice which has extra vitamin A.

Microorganisms can be cultured on a large scale for food. The fungus Fusarium is useful for producing mycoprotein, which is a protein-rich food suitable for vegetarians. The fungus is grown on glucose syrup, in aerobic conditions, and the biomass is harvested and purified.

A genetically modified bacterium produces insulin which is used to treat people with diabetes.

