Biodiversity - the variety of living organisms.

Carrion - decaying flesh and tissue of dead animals.

Community - made up of the populations of different species living in a habitat.

Competition - the negative interaction between two or more organisms which require the same limited resource.

Consumers - feed on other organisms for their energy. Can be primary, secondary or tertiary.

Decomposers - organisms which feed on dead and decaying organisms. They break down the biomass and release nutrients into the soil.

Deforestation - the removal and destruction of trees in forest and woodland.

Ecosystem - the interaction between the living organisms and the different factors of the environment.

Global warming - the increase of the average global temperature.

Habitat - where a living organism lives.

Interdependence - the interaction between two or more organisms, where it is mutually beneficial.

Population - the number of individual organisms of a single species living in a habitat.

Predators - organisms which kill for food.

Prey - the animals which are eaten by the predators.

Producers - convert the sun's energy into useful compounds through photosynthesis. They are green plants or algae.

Scavengers - organisms which feed on dead animals (carrion).

Species - organisms of similar morphology which can interbreed to produce fertile offspring.

BF2

Biodiversity is the variety of living organisms on the earth or in an ecosystem. It is important in helping to maintain stable ecosystems. Organisms are often interdependent, relying on others as food sources, or to create suitable environmental conditions to survive. Human survival is also dependent on this biodiversity.

The global human population has exceeded 7 billion.
Human population has increased due to modern medicine and farming methods, reducing famine and death from disease.
This means a greater demand for food, resources and water.
It also means more waste and emissions are created.

Sewage, toxic chemicals, household waste and gas emissions pollute the water, land and air, killing plants and animals and reducing biodiversity.

There are many ways that biodiversity and ecosystems are maintained:
· Breeding programmes can help to protect endangered species from extinction.

· Conservation programmes can help to protect and preserve specialised ecosystems and habitats such as peat bogs and coral reefs.

· Reintroduction of hedgerows and field margins on agricultural land can help improve biodiversity by breaking up the monoculture crops.

· Sustainable forestry programmes help to manage the woodlands and reduce the deforestation to a sustainable rate.

· Societies actively encourage recycling and reusing of products and packaging to reduce the household waste going to landfill sites.

Unfortunately these programmes can be difficult to manage. They are often expensive and are difficult to regulate. People who are employed in certain areas, e.g. tree felling, cannot always transfer their skills to an environmentally friendly role and so become unemployed. It is difficult to maintain biodiversity whilst preventing crops being overrun with pests and weeds, which would affect food security for the human population.

Humans use land for buildings, quarrying, mining, agriculture and landfill. As the human population increases and we take more land, there is less space for other organisms to live.

Deforestation (to use wood as a fuel/material or to clear space for other uses) destroys habitats where other organisms live.

Peat bogs are produced when decomposition occurs over a very long time. Peat stores a lot of carbon and can be extracted for use by gardeners or as an energy source. Burning peat releases a lot of carbon dioxide into the atmosphere which contributes to the greenhouse effect.

Trees absorb carbon dioxide for photosynthesis, so as they are cut down and removed, less carbon dioxide is taken from the atmosphere. Furthermore, when the trees are burned, they release carbon dioxide back into the atmosphere. The excess carbon dioxide can lead to global warming and the changes to the ecosystem cause reduced biodiversity.

Adaptations are specific features of an organism which enable them to survive in the conditions of their habitat.

Adaptations can be structural, behavioural or functional:

- **Structural adaptations** are features of the organism's body e.g. colour for camouflage.
- **Behavioural adaptations** are how the organism behaves e.g. migration to a warmer climate during colder seasons.
- **Functional adaptations** are the ways the physiological processes work in the organism e.g. lower metabolism during hibernation to preserve energy.

A plant or animal will not physically change to adapt to its environment in its lifetime. Instead, there is natural variation within the species and only organisms whose features are more advantageous in the environment survive. The survivors then go on to reproduce and pass on their features to some of their offspring. The offspring who inherit these advantageous features are better equipped to survive.
Charles Darwin described this process as 'survival of the fittest'.

Classification

Classification

Linnaeus classified living things into kingdom, phylum, class, order, family, genus and species.

Organisms are named by the binomial system of genus and species.

Due to evidence from chemical analysis, there is now a 'three-domain system' developed by Carl Woese.

Domain	bacteria	archaea	eukaryota			
Kingdom	eubacteria	archaebacteria	protista	fungi	plantae	animalia

Food Webs

When all the food chains in an ecosystem are joined up together, they form a **food web**. Here is an example of a food web:
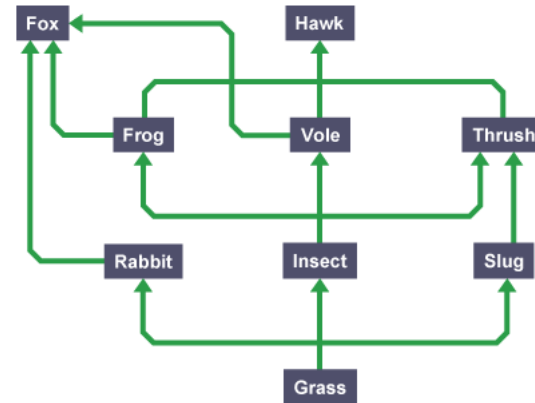
Food Chains

The source of all energy in a food chain is the sun's radiation. It is made useful by plants and algae which produce organic compounds through photosynthesis.

The living organisms use the energy to produce biomass and grow.

When a living organism is consumed, some of the biomass and energy is transferred. Some of the energy is lost.

Remember: the arrow in a food chain indicates the direction of the flow of energy.

Populations of predators and prey increase and decrease in cycles. The size of the predator population depends on the size of the prey population and vice versa. Overall, there is a stable community.

Competition

Species will compete with one another and also within their own species to survive and to reproduce.

Mutualism occurs when both species benefit from a relationship.

Parasitism occurs when a parasite only benefits from living on the host.

Animals compete for resources such as food, water and space/shelter. They may also compete within their own species for mates.

Plants compete for resources including light, water, space and minerals. All these resources are needed for photosynthesis so the plant can make its own food. Plants do not need to compete for food.
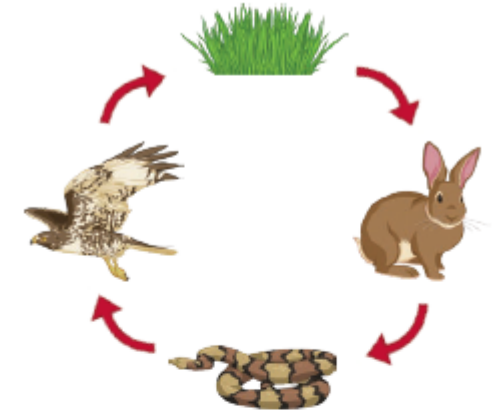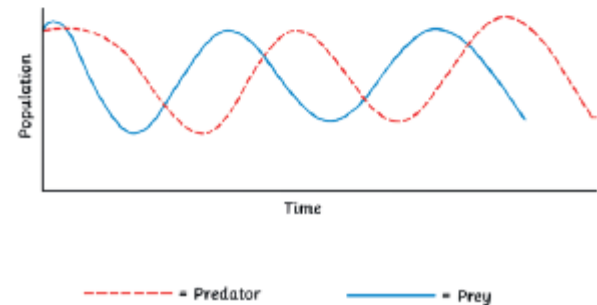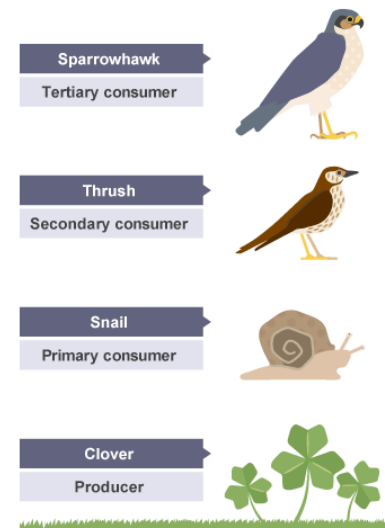
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Trophic levels

The position of an organism in a food chain, food web or pyramid is its trophic level.

Biomass

Biomass is the total **dry mass** of one animal or plant species in a **food chain** or **food web**. A **pyramid of biomass** shows the biomass at each **trophic level**, rather than the population

Factors

Abiotic factors are the non-living factors of an environment. E.g. moisture, light, temperature, CO_2, wind, O_2 or pH.

Biotic factors are the living factors of an environment. E.g. predators, competition, pathogens, availability of food.

Evolution

Change in the inherited characteristics of a population over time through a process of natural selection, which may result in the formation of a new species.

The theory of evolution by natural selection states that all species of living things have evolved from simple life forms that first developed more than three billion years ago.

Natural selection of variants that give rise to phenotypes best suited to their environment.

- Variation (mutation)
- Adaptation
- Survival
& Reproduction
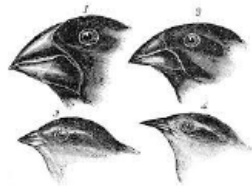
Fossils could be:

- the actual remains of an organism that has not decayed;
- mineralised forms of the harder parts of an organism, such as bones;
- traces of organisms such as footprints or burrows.

Many early life forms were soft-bodied so have left few traces behind.

Fossils help us understand how much or little organisms have changed as life developed on earth.

Coronary heart disease is a condition resulting from **blockages** in the **coronary arteries**. These are the main arteries which supply blood to the heart itself and they can become blocked by build-up of **fatty deposits**.

In the UK and around the world, coronary heart disease is a major cause of many **deaths**.

The main symptoms can include **chest pain**, **heart attack** or **heart failure**. Yet, not all people suffer the same symptoms, if any at all.

Lifestyle factors can increase the risk of a person developing coronary heart disease.

Diet – a high-fat diet (containing lots of saturated fat) can lead to higher cholesterol levels and this cholesterol forms the fatty deposits which damage and block the arteries.

Smoking – chemicals in cigarette smoke, including nicotine and carbon monoxide, increase the risk of heart disease. Carbon monoxide reduces the amount of oxygen which can be transported by the red blood cells and nicotine causes an increased heart rate. The lack of oxygen to the heart and increased pressure can lead to heart attacks.

Stress – prolonged exposure to stress or stressful situations (such as high pressure jobs) can lead to high blood pressure and an increased risk of heart disease.

Drugs – illegal drugs (e.g. ecstasy and cannabis) can lead to increased heart rate and blood pressure, increasing the risk of heart disease.

Alcohol – regularly exceeding unit guidelines for alcohol can lead to increased blood pressure and risk of heart disease.

BF2

Extinction

The permanent loss of all the members of a species

Reasons for extinction:

- Introduction of a NEW disease
- Introduction of a NEW competitor
- Introduction of a NEW predator / overhunting
- Lack of food / prey
- Environmental change (temp., rainfall, loss of habitat etc.)
- Natural disaster

Cancer is the result of **uncontrolled** cell growth and division. The uncontrolled growth of cells is called a **tumour**.

| Benign Tumour	Malignant Tumour
• Usually grows slowly.	• cancerous
• Usually grows within a membrane and can be easily removed.	• Usually grows rapidly.
• Does not normally grow back.	• Can spread around the body, via the bloodstream.
• Does not spread around the body.	• Cells can break away and cause secondary tumours to grow in other areas of the body (metastasis).
• Can cause damage to organs and be life-threatening.	

Pathogens are **microorganisms** that enter the body and cause communicable disease (infectious). Plants and animals can be infected by them.

Bacteria are small cells that can reproduce very quickly in the body. They produce **toxins** that make you feel ill, damaging your cells and tissues.
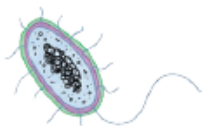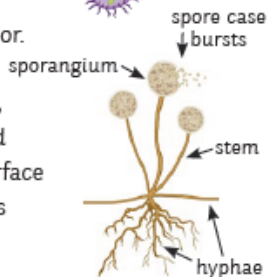
Viruses are much smaller than bacteria; they can also reproduce quickly in the body. Viruses live inside your cell where they replicate. They then burst out of the cell, releasing new viruses.
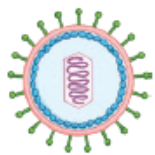
Protists are eukaryotes (multicellular). Some are parasites which live on or inside other organisms, often carried by a vector.

Fungi are sometimes single celled, others have hyphae that grow and penetrate human skin and the surface of plants. They can produce spores which can spread to other plants.

sporangium
spore case
↓ bursts
stem
hyphae

Pathogens can be spread in many ways, for example:

Water – by drinking dirty water, e.g. cholera.

Air – carried by air and breathed in, e.g. influenza.

Direct contact – touching contaminated surfaces including the skin. e.g. athlete's foot.

How to prevent the spread:

Being hygienic –

washing hands thoroughly.

Destroying vectors –

killing vectors by using insecticides or destroying their habitat.

Isolation –

isolating an infected person will prevent the spread.

Vaccination –

people cannot develop the infection and then pass it on.

BF2

Fungal

Rose black spot shows as black spots on the leaves of the plant, this means less photosynthesis occurs. As a result, the plant does not grow as well. It is spread by the wind or the water. They can be treated by using fungicides and taking the leaves off the infected plant.

Protists

Malaria is caused by a protist, mosquitoes are the vectors. They become infected when they feed on an infected animal. The protist is inserted into the blood vessel. Malaria can cause fever, it can also be fatal.

Vaccinations have been developed to protect us from future infections. A vaccination involves an injection of a **dead** or **weakened** version of the pathogen. They carry antigens which cause your body to produce antibodies which will attack the pathogen. If you are infected again, the white blood cells can produce antibodies quickly.

Salmonella bacteria causes food poisoning. Symptoms include fever, stomach cramps, vomiting and diarrhoea. The symptoms are caused by the toxins produced by the bacteria. Food contaminated with salmonella can give you food poisoning. Most poultry in the UK will have had a vaccination against salmonella.
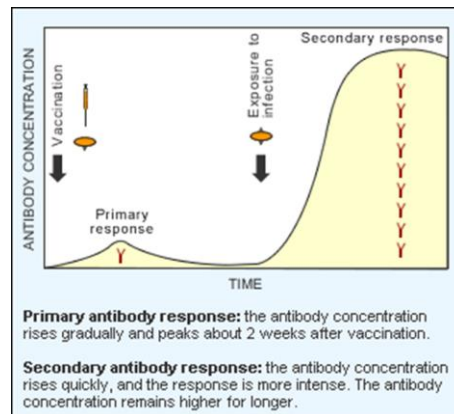
Gonorrhoea is a sexually transmitted bacterial disease, passed on by sexual contact. Symptoms include pain when urinating and thick yellow/green discharge from the vagina or penis. To prevent the spread, people should be treated with antibiotics and use a condom.

Measles is spread by droplets of liquid from sneezes and coughs etc., symptoms include a red rash on the skin and a fever. Measles can be serious or even fatal, it can lead to pneumonia. Most people are vaccinated against measles when they are very young.

HIV is spread by sexual contact or exchanging body fluids. HIV can be controlled be antiviral drugs; this stops the viruses replicating. The virus attacks the cells in the immune system. If the immune system is badly damaged, the body cannot cope with other infections. This is the late stage and is called aids.

Tobacco mosaic virus affects plants, parts of the leaves become discoloured. This means plants cannot carry out photosynthesis; this will affect the plants growth.

ANTIBODY CONCENTRATION

Vaccination

Exposure to infection

Secondary response

Primary response

TIME

Primary antibody response: the antibody concentration rises gradually and peaks about 2 weeks after vaccination.

Secondary antibody response: the antibody concentration rises quickly, and the response is more intense. The antibody concentration remains higher for longer.

Having one type of illness can often make a person more susceptible to another type of illness:

- immune disorders ⟶ increased risk of infectious disease

- viral infection of cells ⟶ increased risk of cancer

- immune reactions ⟶ can trigger allergies

- very poor physical health ⟶ increased risk of depression or other mental illness

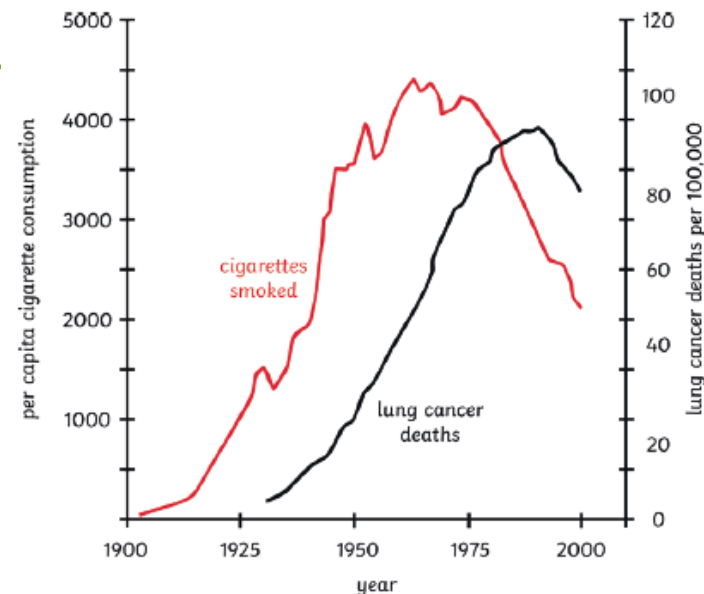There can often be correlations between some factors and types of illness or specific diseases.

For example, in the graph shown to the right, there is a positive correlation between the number of cigarettes smoked and the number of lung cancer deaths.

However, there are other factors which can contribute to the development of lung cancer e.g. working with asbestos, genetic predisposition.

This means that although the evidence in the graph gives a strong indication that smoking is a cause of lung cancer, it cannot be stated that 'smoking will cause lung cancer'. Not every person who smokes will develop lung cancer and not every person who develops lung cancer will be a smoker.

Therefore, it can be stated that smoking increases the risk of lung cancer.

Health Risk Factors

BF2

Treatment for Heart Disease

Health is the state of being free from illness or disease. It refers to physical and mental wellbeing.

Disease and lifestyle factors, such as diet, stress, smoking, alcohol consumption and the use of illegal drugs, can all impact the health of a person.

Some conditions are associated with certain lifestyle choices:

- Liver conditions are associated with poor diet and prolonged excessive alcohol consumption.

- Lung cancer is associated with smoking.

- Memory loss, poor physical health and hygiene are associated with the use of illegal or recreational drugs.

- Obesity and diabetes are associated with poor diet.

- Anxiety and depression are associated with stress and prolonged excessive alcohol consumption.

Treatment	Description	Advantages	Disadvantages
statins	Drugs used to lower cholesterol levels in the blood, by reducing the amount produced in the liver.	• Can be used to prevent heart disease developing. • Improved quality of life.	• Long-term treatment. • Possible negative side-effects.
stents	Mechanical device which is used to stretch narrow or blocked arteries, restoring blood flow.	• Used for patients where drugs are less effective. • Offers long-term benefits. • Made from metal alloys so will not be rejected by the patients body. • Improved quality of life.	• Requires surgery under general anaesthetic, which carries risk of infection.
heart transplant	The entire organ is replaced with one from an organ donor (a person who has died and previously expressed a wish for their organs to be used in this way).	• Can treat complete heart failure in a person. • extended life • Improved quality of life. • Artificial plastic hearts can be used temporarily until a donor is found.	• Requires major surgery under general anaesthetic, which carries risks. • Lack of donors available. • Risk of infection or transplant rejection. • Long recovery times.

Bodies defense system

Defence System

1. The skin acts as a barrier to pathogens.
2. Hairs and mucus in your nose trap particles.
3. The trachea and bronchi secrete mucus to trap pathogens. They also have cilia which move backwards and forwards to transport the mucus towards the throat. This traps any pathogens and the mucus is usually swallowed.
4. The stomach contains hydrochloric acid to kill any pathogens that enter the body via the mouth.

Fighting diseases

Painkillers relive the pain and symptoms, but do not tackle the cause.

Antibiotics kill the bacteria causing the problem, but do not work on viruses. Viruses are very difficult to kill because they live inside the body cells.

Random sampling

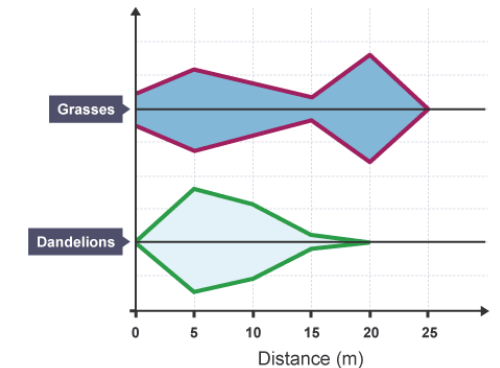The distribution of an organism is affected by the environment and abiotic factors.

Quadrats can be used to measure the frequency of an organism in a given area e.g. the school field. You could count the individual organisms or estimate the percentage cover. You must collect data from at least two areas to make a comparison. Quadrats should always be placed randomly.

Immune system

This kills any pathogens that enter the body.

White blood cells:

- **Phagocytosis** is when white blood cells engulf pathogens and then digest them.
- They produce **antitoxins** to neutralise the **toxins**.
- They also produce **antibodies**. Pathogens have **antigens** on their surface, antibodies produced by the white blood cells lock on to the antigen on the outside of the pathogen. White blood cells can then destroy the pathogens. Antibodies are specific to one antigen and will only work on that pathogen.

BF2

Transect Sampling

Transects are used to measure the change of distribution across an area e.g. from the edge of a river and moving further from the water's edge. You could either count the number of organisms touching the transect at regular intervals or use a quadrat placed at regular intervals along the transect.

$$mean = \frac{total\ number\ of\ organisms}{number\ of\ quadrats}$$

The results from transects can be drawn into kite diagrams. The width of the bar from the middle at any distance shows how many individuals were observed at that point.

Grasses

Dandelions

Distance (m)

Phagocytosis