



# How do we use Knowledge Organisers in Biology

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Term	Topic/s	Year group
1	Ecology	9

### Tier 2 'unlocking' language

Characteristic

Environment

Transfer

Web

Chain

Energy

Predict

Level

### Tier 3 subject relevant language

Adaptation

Ecosystem

Variation

Communities

Interdependence


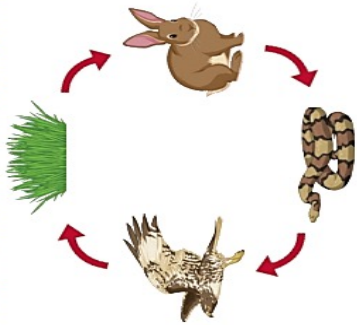
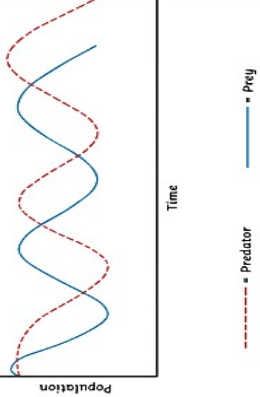

Photosynthesis

Biodiversity

Trophic



# Knowledge Organiser: Ecology

<h3>Abiotic and Biotic Factors</h3> <p><b>Abiotic factors</b> are the non-living factors of an environment. E.g. moisture, light, temperature, CO<sub>2</sub>, wind, O<sub>2</sub> or pH.</p> <p><b>Biotic factors</b> are the living factors of an environment. E.g. predators, competition, pathogens, availability of food.</p> <h3>Adaptations</h3> <p>Adaptations are specific features of an organism which enable them to survive in the conditions of their habitat.</p> <p>Adaptations can be structural, behavioural or functional:</p> <ul style="list-style-type: none"> <li>• <b>Structural adaptations</b> are features of the organism's body e.g. colour for camouflage.</li> <li>• <b>Behavioural adaptations</b> are how the organism behaves e.g. migration to a warmer climate during colder seasons.</li> <li>• <b>Functional adaptations</b> are the ways the physiological processes work in the organism e.g. lower metabolism during hibernation to preserve energy.</li> </ul> <p>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.</p> <p>Charles Darwin described this process as 'survival of the fittest'.</p> 	<h3>Food Chains</h3> <p>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.</p>  <p>The living organisms use the energy to produce biomass and grow.</p> <p>When a living organism is consumed, some of the biomass and energy is transferred. Some of the energy is lost.</p> <p>Remember: the arrow in a food chain indicates the direction of the flow of energy.</p> <p>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.</p> 	<h3>Competition</h3> <p>Species will compete with one another and also within their own species to survive and to reproduce.</p> <p><b>Mutualism</b> occurs when both species benefit from a relationship.</p> <p><b>Parasitism</b> occurs when a parasite only benefits from living on the host.</p> <p>Animals compete for resources such as food, water and space/shelter. They may also compete within their own species for mates.</p> <p>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.</p>	<h3>Biodiversity and Waste Management</h3> <p>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.</p> <p>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.</p>  <p>Sewage, toxic chemicals, household waste and gas emissions pollute the water, land and air, killing plants and animals and reducing biodiversity.</p>	<h3>Deforestation and Land Use</h3> <p>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.</p> <p>Deforestation (to use wood as a fuel/material or to clear space for other uses) destroys habitats where other organisms live.</p> <p>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.</p> <p>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.</p>
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Term	Topic/s	Year group
2	Our World	9

### Tier 2 'unlocking' language

Transfer

Breakdown

Competition

Cycle

Death

Data

Analysis

Global

### Tier 3 subject relevant language

Biodiversity

Decay

Pollution

Decomposers

Extinction

Population

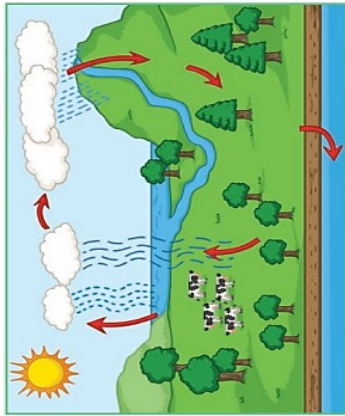
Deforestation

Atmosphere



# Knowledge Organiser: Our World

## Water Cycle



**Convection** is the movement caused within a fluid as the hotter, less dense material rises and colder, denser material sinks under the influence of gravity. This results in the transfer of heat.

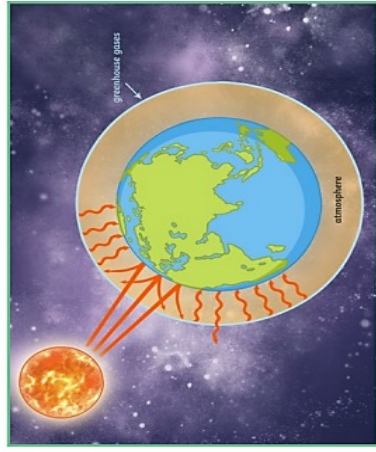
**Evaporation** occurs when heat energy from the surroundings (or a heat source) is transferred to water particles as kinetic energy. The particles begin to move more rapidly and can turn from a liquid into a gas.

**Condensation** occurs when moving particles transfer kinetic energy to the surroundings. The particles begin to move even more slowly and can turn from a gas into a liquid.

**Precipitation** occurs when rain, snow, sleet, or hail falls to (or condenses on) the ground.

**Transpiration** is the process by which water is carried through plants from roots to the stomata on the underside of leaves and it evaporates into the surroundings.

## Global Warming



The **greenhouse effect** is the natural process where some of the Sun's radiation is trapped within the insulating layer of the atmosphere. This maintains a temperature suitable to support life on Earth.

Most of the radiation from the Sun is absorbed by the Earth when it reaches the surface. The rest of the infrared radiation is reflected from the surface and absorbed by the greenhouse gases and clouds in the atmosphere. This is then re-emitted in all directions.

However, due to many contributing factors, the global temperature is gradually increasing. Several gases, called greenhouse gases, trap the heat around the Earth; the most concerning is carbon dioxide. Human activities contribute to the excess amount of carbon dioxide in the atmosphere and so are a cause of global warming.

Global warming leads to the melting of ice caps, rising sea levels, flooding, changes to climate, changes in migration patterns, changes in species distribution and reduction in biodiversity.

## RPI: Field Techniques Quadrats and Transects

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.

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.

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



## Carbon Cycle

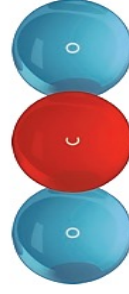


The main focus on the carbon cycle is its transfer to and from the atmosphere. When carbon is in the atmosphere, it combines with oxygen to form carbon dioxide, a greenhouse gas.

Carbon is transferred from the atmosphere when plants absorb carbon dioxide for photosynthesis and when the gas is dissolved into oceans.

Carbon is transferred to the atmosphere through respiration by animals, plants and bacteria and by combustion of fossil fuels (coal, oil and natural gas).

Dead animals and plants are decomposed and their matter is broken down by microbes and fungi. These organisms are collectively called decomposers. When the organisms are broken down, the microbes and fungi release carbon dioxide into the atmosphere through respiration.



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Term	Topic/s	Year group
3	Topic 1: Cells	9

### Tier 2 'unlocking' language

Transfer

Particle

Concentration

Reaction

Divide

Clone

Microscope

Differences

### Tier 3 subject relevant language

Eukaryotic

Prokaryotic

Multicellular

Mitosis

Meiosis

Resolution

Magnification

Specialisation

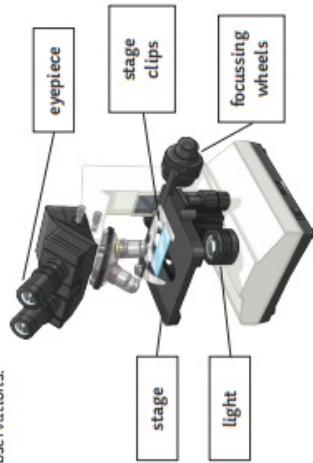


# Knowledge Organiser: What is life made of?

## Required Practical

### Microscopy Required Practical

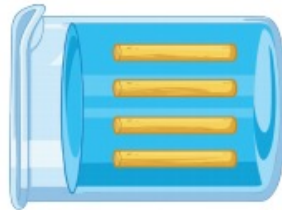
- Includes preparing a slide, using a light microscope, drawing any observations – use a pencil and label important observations.



### Osmosis and Potato Practical

- Independent variable – concentration.
- Dependent variable – change in mass.
- Control variable – volume of solution, temperature, time, surface area of the potato.

The potato in the sugar solution will lose water and so will have less mass at the end; the potato in the pure water solution will gain water.



## Specialised Cells

When a cell changes to become a specialised cell, it is called differentiation.

Specialised Cell	Function	Adaptation
sperm	To get the male DNA to the female DNA.	Streamlined head, long tail, lots of mitochondria to provide energy.
nerve	To send electrical impulses around the body.	Long to cover more distances. Has branched connections to connect in a network.
muscle	To contract quickly.	Long and contain lots of mitochondria for energy.
root hair	To absorb water from the soil.	A large surface area to absorb more water.
phloem	Transports substances around the plant.	Pores to allow cell sap to flow. Cells are long and joined end-to-end.
xylem	Transports water through the plant.	Hollow in the centre. Tubes are joined end-to-end.

## Equations and Maths

### Equation

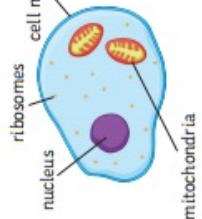


### Maths Skills

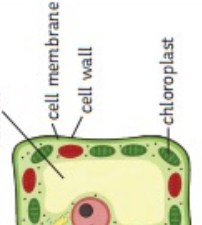
Conversions:  
 Micrometres to millimetres: divide by 1000.  
 Standard Form:  
 $0.003 = 3 \times 10^{-3}$   
 $5.6 \times 10^{-4} = 0.00056$

## Prokaryotic and Eukaryotic Cells

### Animal Cells



### Plant Cells

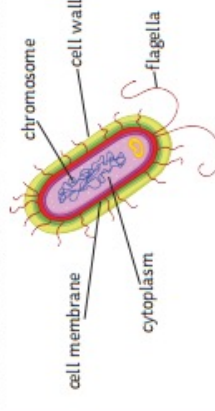


Plant and animal cells have similarities and differences:

	Animal	Plant
nucleus	✓	✓
cytoplasm	✓	✓
chloroplast	X	✓
cell membrane	✓	✓
permanent vacuole	X	✓
mitochondria	✓	✓
ribosomes	✓	✓
cell wall	X	✓

### Bacterial Cells

Bacterial cells do not have a true nucleus, they just have a single strand of DNA that floats in the cytoplasm. They contain a plasmid.



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