How do we use Knowledge Organisers in Biology

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Term	Topic/s	Year group
1	Life	7

Tier 2 'unlocking' language
Energy
Transfer
Chain
Web
Physical
behavioural
features
classify

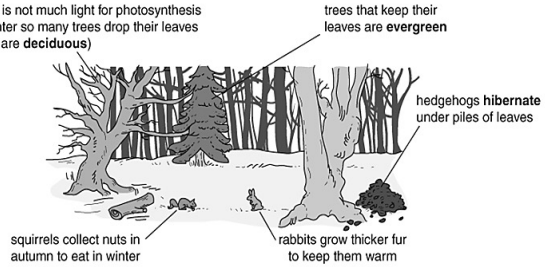
Tier 3 subject relevant language
Predator
Prey
Producer
Photosynthesis
Ecosystem
Adaptation
Kingdom
Habitat

Habitats and environments

A **habitat** is the area where an organism lives. The conditions in a habitat are called the **environment**. An environment is affected by non-living factors (e.g. light, dampness, temperature), called **physical environmental factors.**

Physical environmental factors change from day to day (**daily changes**). As the conditions change, the organisms respond. For example, **nocturnal** animals are only active at night.

Physical environmental factors change over the year (**seasonal changes**). Organisms respond to these changes. For example, in autumn some birds **migrate** to warmer countries to feed during the winter.

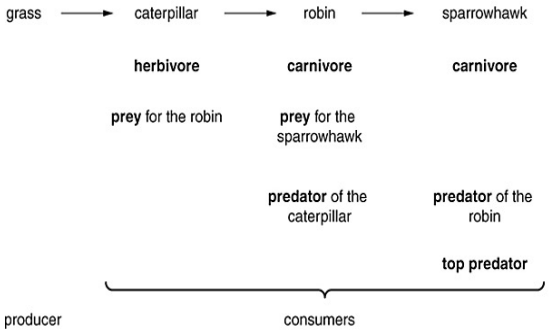


To survive in a habitat, organisms need **resources**. An animal needs space, food, water, shelter and a mate to reproduce. Plants need space, light, water and mineral salts.

All the organisms in a habitat form a **community**. Within a community, the total number of one species is called a **population**.

Food chains and webs

Food chains show what eats what in a habitat. However, organisms depend on other organisms in other ways. For example, many birds depend on trees in which to build nests.

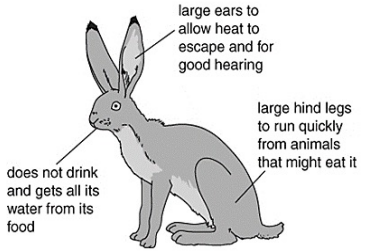


Food chains are joined to form **food webs**. Food webs can also show **omnivores** (animals that eat both plants and other animals).

The populations of the organisms at each level in a food chain can be shown as a **pyramid of numbers**. The size of each bar represents the number of organisms. Usually there are fewer organisms as you go along a food chain because energy is lost at each level (e.g. through movement, keeping warm, in waste materials).

Adaptations

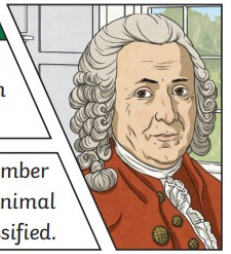
Organisms have **adaptations** that allow them to survive in a habitat. For example, fish are adapted to living underwater. They have gills to take oxygen out of the water, fins to swim with and streamlined bodies to help them move easily through the water. Organisms that are better adapted to survive in an area will have a better chance of survival.



Jackrabbits are adapted to living in a desert habitat.

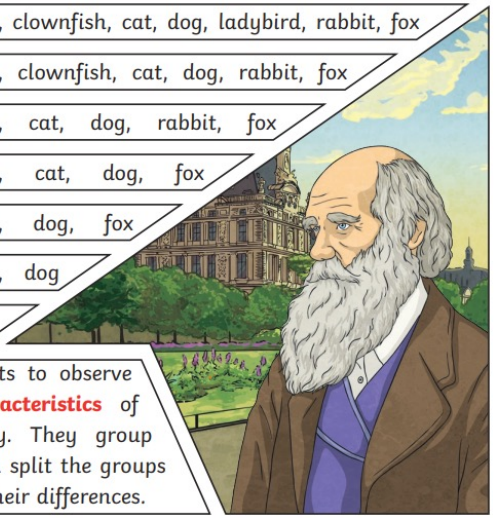
Classification

In 1735, Swedish Scientist Carl Linnaeus first published a system for **classifying** all living things. An adapted version of this system is still used today: The Linnaeus System.



Living things can be **classified** by these eight levels. The number of living things in each level gets smaller until the one animal is left in its species level. This is how a dog would be classified.

Domain: Eukarya	jackal, clownfish, cat, dog, ladybird, daisy, rabbit, fox
Kingdom: Animalia	jackal, clownfish, cat, dog, ladybird, rabbit, fox
Phylum: Chordata	jackal, clownfish, cat, dog, rabbit, fox
Class: Mammalia	jackal, cat, dog, rabbit, fox
Order: Carnivora	jackal, cat, dog, fox
Family: Canidae	jackal, dog, fox
Genus: Canis	jackal, dog
Species: Lupus	dog



Each group allows scientists to observe and understand the **characteristics** of living things more clearly. They group similar things together then split the groups again and again based on their differences.

Knowledge Organiser: Life

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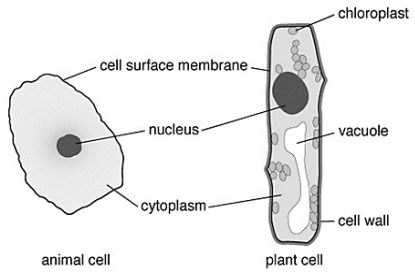
Term	Topic/s	Year group
1 & 2	What is Life made of	7

Tier 2 'unlocking' language
Results
Image
Organs
System
Life
Dissection
Specialised
Lens

Tier 3 subject relevant language
Cell
Microscope
Tissues
Transplant
Organism
Magnification
Multicellular
Tissue

Cells, tissues, organs and organ systems

All **organisms** carry out **seven life processes** (movement, reproduction, sensitivity, growth, respiration, excretion, nutrition). All organisms are made from **cells**:



Cell part	Function
cell surface membrane	keeps cell together and controls what goes into and out of the cell
nucleus	controls the cell
cytoplasm	where activities happen, including respiration (which occurs in **mitochondria**)
chloroplast	contains **chlorophyll** to trap sunlight for photosynthesis
cell wall	made of **cellulose** and provides support
vacuole	storage space

A **microscope** is used to **magnify** tiny things such as cells.

total magnification = magnification of **objective lens** × magnification of **eyepiece lens**.

The object you look at is the **specimen**. It has to be thin to let light get through it. It is placed with a drop of water onto a **slide**. A **coverslip** is carefully lowered on top, to stop the specimen drying out, hold it flat and stop it moving. A **stain** can be used to help you see parts of the cell.

To use a microscope:

A Place the smallest objective lens over the hole in the stage.

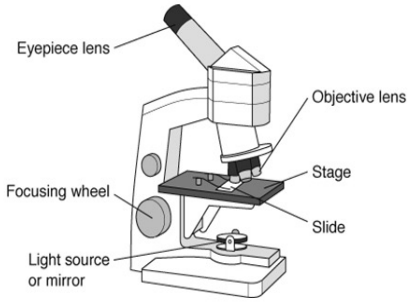
B Turn the focusing wheel to move the objective lens close to the stage.

C Place the slide on the stage.

D Adjust the light source or mirror.

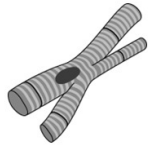
E Look into the eyepiece lens.

F Turn the focusing wheel until what you see is in focus.

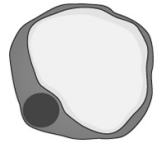


Some cells are specialised and have special **functions**.

In animals



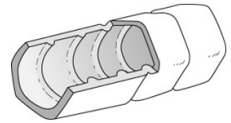
Muscle cells *shape to move things.*



Fat cells *in animals store fat.*

In plants

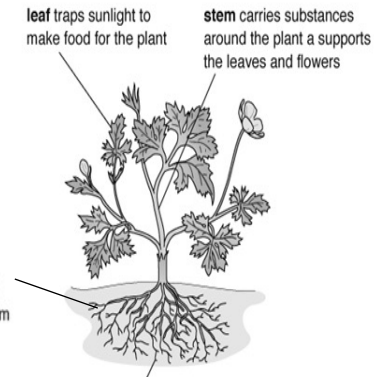
Root hair cells *take in water.*



Xylem cells *carry water.*

A group of cells that are the same, all doing the same job, is called a **tissue** (e.g. muscle tissue).

A group of different tissues working together to do an important job is an **organ**. For example, the **heart** is an organ and is made of muscle tissue and nerve tissue. Organs have important functions.



Organs often work together in **organ systems**.

Organ system	Organs	Job
breathing system	windpipe (trachea), lungs	takes air into the body and gets rid of waste gases
circulatory system	heart, blood vessels	carries oxygen and food around the body
digestive system	mouth, gullet, stomach, intestines	breaks down food
nervous system	brain, spinal cord, nerves	carries signals around the body
urinary system	bladder, kidneys	gets rid of waste
locomotor system	muscles, bones	allows movement
water transport system (plants)	roots, stem, leaves	carries water up a plant

Knowledge Organiser: What is life made of?

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Term	Topic/s	Year group
2	You are what you eat	7

Tier 2 'unlocking' language
Digest
Food
Breakdown
Unbalanced
Balanced
Lifestyle
Diet
absorb

Tier 3 subject relevant language
Nutrients
Diffusion
Absorption
Molecule
Villi
Intestine
Enzyme
Deficiency

Food

We need to eat a wide variety of foods to get all the food substances that we need. When we do this, we are said to have a **balanced diet**. Carbohydrates, proteins, fats and oils (lipids), vitamins and minerals are **nutrients**, which means that they provide the raw materials for making other substances that the body needs.

Substance needed	Examples	Why it is needed	Good sources
carbohydrate	starch, sugars	for energy (in respiration)	pasta, bread, rice, potatoes
protein		for growth and repair (building new substances)	meat, fish, beans
vitamins	vitamin C	for health	fruits and vegetables (e.g. oranges contain lots of vitamin C)
minerals	calcium	for health	fruits, vegetables and dairy products (e.g. milk contains calcium)
fibre		for health (helps to stop constipation)	wholemeal bread, wholegrain rice, celery and other fibrous vegetables
water		for health (water dissolves substances and fills up cells)	

We can do tests to find out which substances are in foods. For example, starch makes iodine solution go a blue-black colour.

Nutrition information labels on foods tell us what the food contains. The labels also tell us how much energy is stored in the substances that make up the food. The amount of energy is measured in **kilojoules (kJ)**. The amount of energy a person needs in a day depends on:

- levels of activity (more active people need more energy)
- age (teenagers need more energy from food than adults do)
- whether the person is a girl or a boy (boys need more energy than girls).

Food labels may also have health claims on them, which use persuasive language.

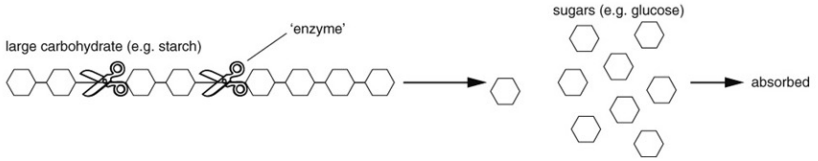
Eating too much or too little can cause problems. Too much fat may cause **heart disease** and can make people overweight. Very overweight people are **obese**.

People starve and become weak if they eat too little. **Starvation** and obesity are both forms of **malnutrition**. Other forms include **deficiency diseases** such as **scurvy**, which is due to a lack of vitamin C.

Digestion

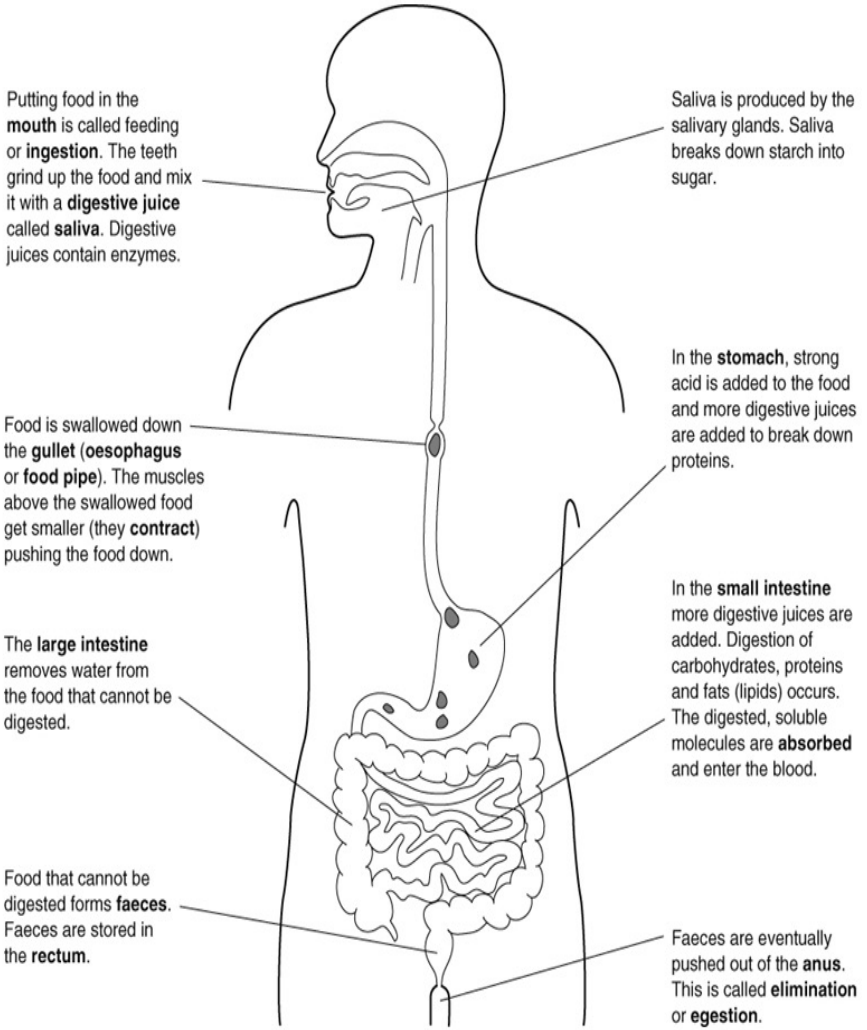
Digestion turns large **insoluble** substances into small **soluble** ones. The organs of the **digestive system** help us digest food. Many of them produce **enzymes** (substances that are **catalysts** and help speed up food digestion).

We can use a **model** to make it easier to think about how enzymes work:



The gut

Food is digested in the **gut**.



Knowledge Organiser: You are what you eat

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3	Why do we breathe?	7

Tier 2 'unlocking' language
Breathe
Gas
Lung
Volume
Movement
Energy
Exchange
Structure

Tier 3 subject relevant language
Trachea
Bronchi
Diaphragm
Ventilation
Respiratory
Vessel
Diffusion
Oxygenated

Knowledge Organiser: Why do we breathe?

Types of respiration

All living cells **respire** to release energy. Organisms need energy for everything they do (for example, making new substances, moving).

Aerobic respiration is a series of **chemical reactions** that can be summarised as:

glucose + oxygen → carbon dioxide + water

Energy is released (but is not a chemical substance and so is not shown in the word equation).

Carbon dioxide can be detected using:

- **limewater** (which it turns cloudy)
- an **indicator** (such as hydrogen carbonate) because it is acidic.

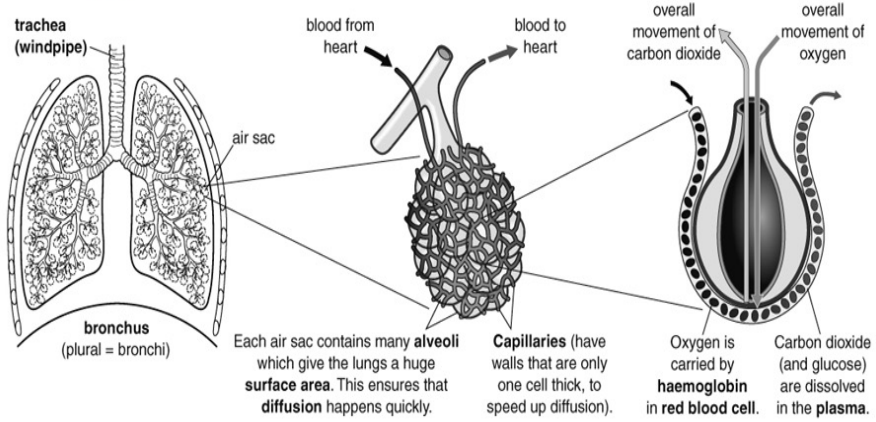
Anaerobic respiration does not require oxygen. In humans it is used to release energy from glucose when more energy is needed than can be supplied by aerobic respiration (for example, during strenuous exercise).

glucose → lactic acid

Gas exchange

Different organisms use different organs for **gas exchange** (swapping one gas for another):

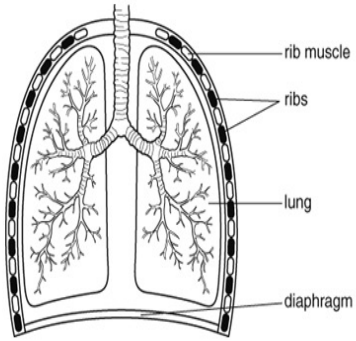
- **gills** (e.g. fish)
- **skin** (e.g. frogs)
- **stomata** in leaves (plants)
- lungs.

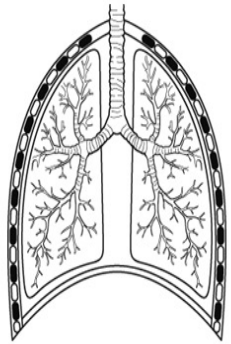


Ventilation and breathing

When you exercise, your **breathing rate** (number of breaths in one minute) and your **pulse rate** (number of times your heart beats in one minute) increase. This is because your cells need more oxygen and glucose for respiration.

Breathing is the movement of muscles in the **diaphragm** and attached to the ribs. These movements change the volume of the chest.





Breathing in (**inhalation**):

- Diaphragm contracts and moves downwards.
- Rib muscles contract and lift ribs up and outwards.
- Volume of the chest increases.
- Lungs expand.
- Pressure in lungs is reduced.
- Pressure outside is now higher than inside the lungs, so air flows into the lungs.

Breathing in (**exhalation**):

- Diaphragm relaxes and moves upwards.
- Rib muscles relax and move ribs down and inwards.
- Volume of the chest decreases.
- Lungs get smaller.
- Pressure in lungs is increased.
- Pressure inside the lungs is now higher than outside, so air flows out of the lungs.

Breathing **ventilates** the lungs. **Ventilation** is the movement of air into and out of the lungs.

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