



How do we use Knowledge Organisers in Biology

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Term	Topic/s	Year group
1	Respiration	8

Tier 2 'unlocking' language

Breathe

Reaction

Organ

Function

Process

Compare

Equation

Effect

Tier 3 subject relevant language

Alveoli

Muscular

Exercise

Circulatory

Respiration

Aerobic

Breathing

Anaerobic

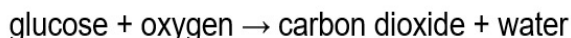


Knowledge Organiser: Respiration

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:

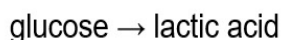


Energy is released (but is not a chemical substance and so is not shown in the word equation).

Carbon dioxide can be detected using:

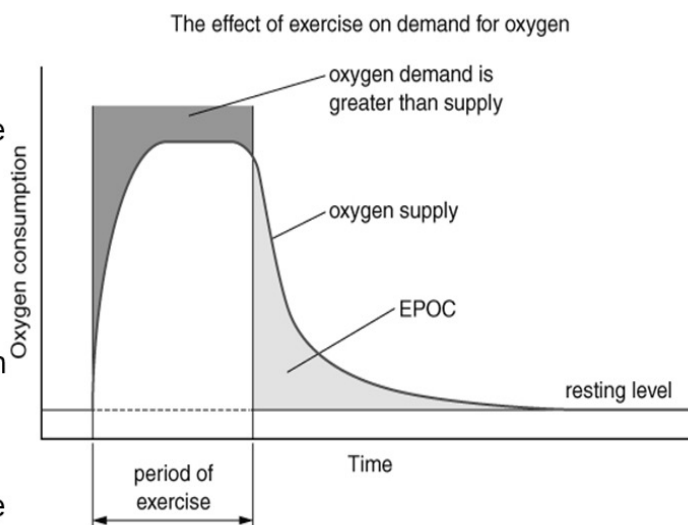
- **limewater** (which it turns cloudy)
- an **indicator** (such as hydrogen carbonate) because it is acidic.

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).



Anaerobic respiration causes muscles to tire quickly and so cannot be used for extended periods. A lot of the lactic acid travels from the muscles to the liver, where it is converted back to glucose. Anaerobic respiration releases less energy than aerobic respiration.

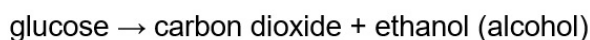
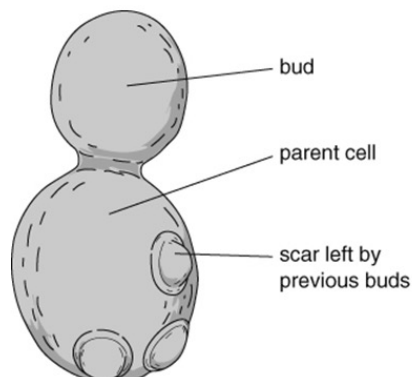
After strenuous exercise, the body needs extra oxygen. This **excess post-exercise oxygen consumption (EPOC)** (or 'oxygen debt') replaces oxygen lost from oxygen stores (in the blood and in muscles) and provides oxygen for increased levels of aerobic respiration (for example, to provide energy for removing lactic acid, for faster breathing, for faster heart rate).



Microscopic fungi

These include, for example, yeast. They:

- reproduce asexually by budding
- can use aerobic respiration, which is important in baking
- can use anaerobic respiration (fermentation), which is important in alcoholic drink manufacture.



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Term	Topic/s	Year group
1 & 2	Movement and Health	8

Tier 2 'unlocking' language

Movement

Structure

Support

Alcohol

Muscles

Health

Impact

Exchange

Tier 3 subject relevant language

Skeleton

Joint

Asthma

Ligaments

Antagonistic

Biomechanics

Coronary

Non-communicable



Knowledge Organiser: Movement and health

Locomotor system

The **locomotor system** consists of bones and muscles and lets you move.

Bones are organs that form the **skeleton**, which:

- protects some organs (e.g. the **ribs** and **sternum** protect the lungs; the **skull** protects the brain)
- supports your body (e.g. the **vertebrae** in your '**backbone**' hold you up straight)
- allows you to move (using muscles at your **joints**).

Bones are hard (to withstand knocks and pressure) and light (so they are easy to move). Many have a hollow centre containing **bone marrow**, where **blood cells** are made.

Drugs

Drugs are chemicals that affect how the body works. Some can damage your organs (e.g. the liver), particularly if they are abused. Some drugs are **addictive**.

Medicines (e.g. **antibiotics**) are drugs that can help people who are suffering from diseases.

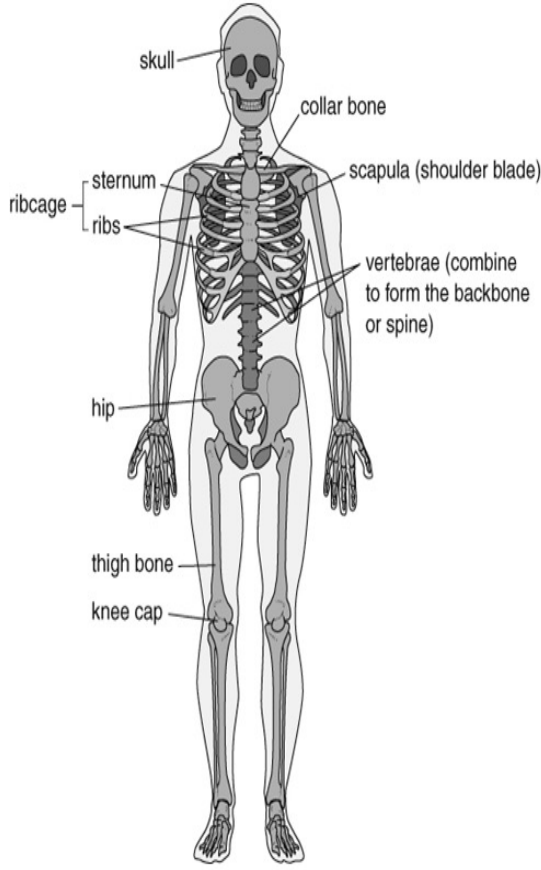
Recreational drugs are drugs that people take because they like the effect that they have on their bodies (e.g. **caffeine** in coffee and **alcohol**, which are both **legal drugs**). Some are **illegal drugs** (e.g. **heroin** and **ecstasy**) because they have very harmful **side-effects**.

Drugs that slow down the **nervous system** are called **depressants**. Alcohol is a depressant. It alters behaviour and slows reaction times. Drugs that speed up the nervous system are called **stimulants** (e.g. **caffeine**).

Smoking

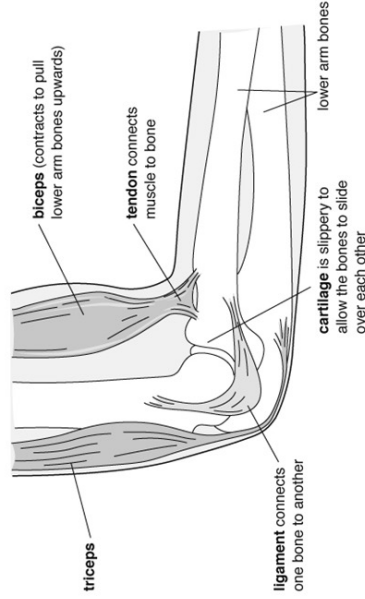
The chemicals in cigarette smoke are harmful.

Found in cigarette smoke:	Harm it causes:
nicotine	makes arteries narrower, causes heart disease
tar	can cause cancer, coats lungs reducing surface area, can cause alveoli to break apart (emphysema)
carbon monoxide	stops red blood cells carrying so much oxygen
high temperature of smoke	stops cilia working so lungs are not cleaned and mucus collects



Muscle action

Muscles cannot push and so bones need pairs of muscles (**antagonistic pairs**) to pull them in opposite directions. One muscle **contracts** (gets shorter and fatter) to pull a bone. At the same time, the other muscle in the pair **relaxes**.



The **elbow joint** is a **flexible joint** (whereas the bones in the skull meet at **fixed joints**).

Muscles are controlled by the **nervous system**. Impulses from the brain travel down the **spinal cord** and along **nerves** to muscles.

Muscle cells are adapted to their function by containing strands that can shorten to produce a pulling force. This requires energy from **respiration**.

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Term	Topic/s	Year group
2	Reproduction	8

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



Knowledge Organiser: Reproduction

Reproduction

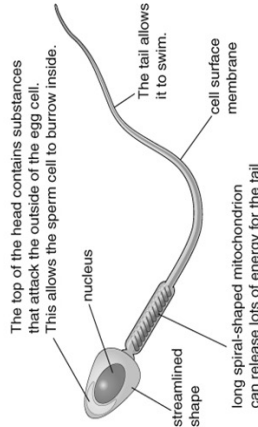
Reproduction produces new living things (**offspring**). Two **parents** are needed for **sexual reproduction**.

Males and females have **reproductive systems**, which contain **reproductive organs** to allow them to reproduce. The ovaries and testes produce **gametes** or **sex cells**.

Sexual intercourse in mammals

During **sexual intercourse**, **semen** (sperm cells mixed with special liquids from the **glands**) is forced out of the penis and into the top of the **vagina**. This is called **ejaculation**. The semen travels into the top of the **uterus** and the sperm cells then swim down the **oviducts**.

Sperm and egg cells are **adapted** to their **functions**. A sperm cell is much smaller than an egg cell.



Pregnancy in mammals

If an egg cell meets a sperm cell in an oviduct, **fertilisation** can occur (the nuclei from the two cells **fuse**). The **fertilised egg cell** divides to form a ball of cells (an **embryo**). The embryo travels to the uterus where it sinks into the uterus lining (**implantation**). The woman is now **pregnant**. Once the embryo has developed all its organs it is called a **fetus**. It takes about 40 weeks (9 months) for a human fertilised egg cell to grow into a baby ready to be born. This time is called the **gestation period**.

While inside the uterus, the fetus is supplied with oxygen and food by the **placenta**. The placenta also gets rid of waste (especially carbon dioxide) from the fetus. The **umbilical cord** connects the fetus to the placenta.

If a mother smokes, drinks too much alcohol or takes drugs while pregnant, she might damage the baby. The baby might be **premature**.

Birth in mammals

- The uterus starts **contractions** and the woman goes into **labour**.
- The muscles of the **cervix** relax.
- The baby is pushed out head first through the cervix and the vagina.
- The baby starts to breathe and the umbilical cord is cut. The scar left behind is the **navel**.
- Then the placenta is pushed out of the uterus. This is the **afterbirth**.

The mother's breasts contain **mammary glands** that produce milk to feed the baby. Breast milk contains all the nutrients that a baby needs and **antibodies**, which help destroy micro-organisms that might cause diseases.

Growing up

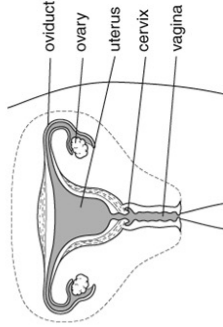
The stages through which an organism goes as it grows and develops are its **lifecycle**. In the human lifecycle, a baby grows into a child. Between the ages of 10 and 14 years, most children start to go through **puberty**. During puberty, **sex hormones** cause big physical changes to occur. **Adolescence** is the time when emotional as well as physical changes occur. It ends at about 18.

Changes in boys	Changes in girls
• hair grows under arms, on face and on chest	• hair grows under arms
• pubic hair grows	• pubic hair grows
• shoulders get wider	• hips get wider
• body smell increases	• body smell increases
• testes start to make sperm cells	• ovaries start to release egg cells
• testes and penis get bigger	• breasts develop
• voice deepens ('breaks')	

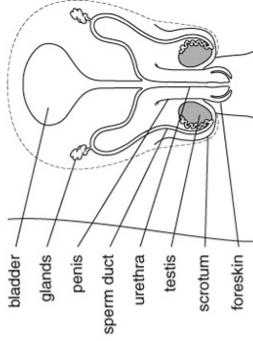
After puberty, animals are able to sexually reproduce. Men produce sperm cells for the rest of their lives. Women stop releasing egg cells at the age of 45-55 and this is called the **menopause**.

In all mammals fertilisation happens inside the female. This is called **internal fertilisation**. In some animals (e.g. frogs, fish) fertilisation happens outside the female (**external fertilisation**).

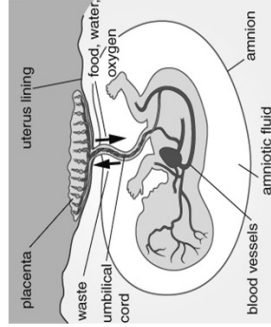
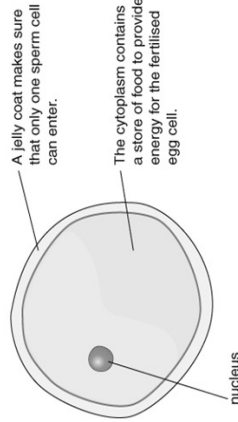
The fertilised egg cells of many animals also grow and develop outside their parents. This is called **external development**. Amphibians, birds and fish use external development. Humans use **internal development** and produce fewer offspring than animals using external development because the growing embryos are protected inside the mother.



The female reproductive system



The male reproductive system



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Term	Topic/s	Year group
3	All about plants	8

Tier 2 'unlocking' language

Transport

Growth

Reproduction

Plant

Roots

Reaction

Rate

Structure

Tier 3 subject relevant language

Photosynthesis

Chloroplasts

Pollination

Xylem

Phloem

Vessel

Glucose

Adaptations



Knowledge Organiser: What is life made of?

The plant kingdom

Organisms are **classified** into groups. The plant kingdom contains organisms that have green leaves, cell walls made of cellulose and can **photosynthesise**. Kingdoms are subdivided into smaller and smaller groups. The last two of these are the **genus** and the **species**. The names of these two groups are used to give each species a two-word scientific name.

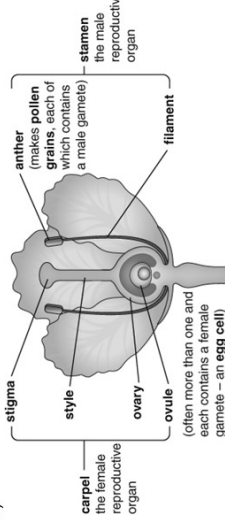
Biodiversity

The range of species in an area is called **biodiversity**. We should preserve biodiversity because:

- organisms depend on one another (they are **interdependent**)
- we won't be able to make use of organisms if they become **extinct**
- more biodiverse areas recover better from natural disasters.

Sexual reproduction in plants

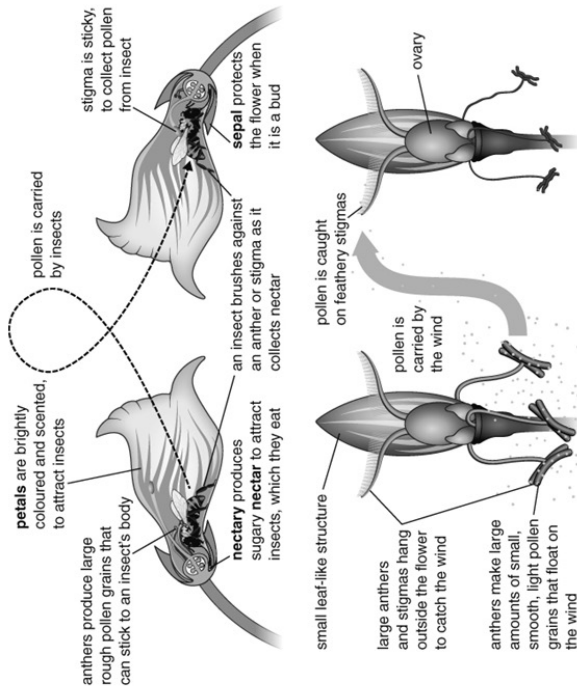
Reproduction produces new living things (**offspring**). **Sexual reproduction** needs two parents to produce **sex cells** or **gametes**. The gametes fuse to produce a **fertilised egg cell** or **zygote**. The zygote uses **cell division** to grow into an **embryo**, which can grow into an adult and become a parent (completing its **life cycle**).



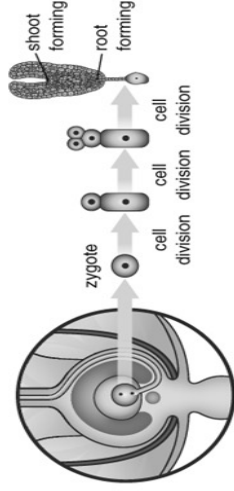
The offspring from sexual reproduction contain **characteristics** from both parents. The differences in these characteristics is **inherited variation**.

Gametes are produced by **reproductive organs**. In plants, these are contained inside **flowers**.

The **pollen grains** made in the **anther** need to be carried to the **stigma** of another flower. They are usually carried by insects or the wind. The carrying of pollen from an anther to a stigma is called **pollination**.



Once on the stigma, a pollen grain grows a **pollen tube**, which enters the **ovule** containing an **egg cell**. The nucleus from the male gamete inside the pollen grain joins with the nucleus inside the egg cell to form a **zygote**. This is called **fertilisation**. The zygote grows into an embryo and the ovule becomes a seed, containing the embryo and a food store.

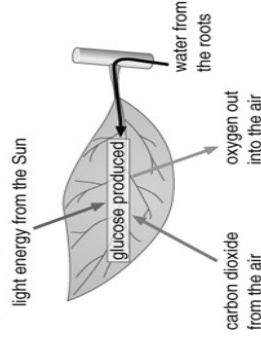


A part of the flower forms a **fruit**. This is used for **seed dispersal**, which stops the new plants competing with the parent plants for water, nutrients, light and space.

- Some fruits are eaten by animals and the seeds come out in their **faeces** (e.g. apples).
- Some fruits are carried on the fur of animals (e.g. burdock).
- Some fruits are carried by the wind (e.g. dandelion).
- Some fruits explode, scattering the seeds (e.g. lupins).

When conditions are right, seeds **germinate**. The **resources** needed are water, oxygen and warmth (WOW). Water allows chemical reactions to start, which break down the food store and allows cells in the embryo to swell up. Oxygen is needed for **respiration**, to release energy from the food store. Warmth is needed to speed up the chemical reactions.

The root grows first then the shoot. Finally new leaves open and **photosynthesis** can start in the **chloroplasts**. The glucose from photosynthesis is turned into **starch** to be stored.



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