



How do we use Knowledge Organisers in Biology

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Term	Topic/s	Year group
1	Topic 1: Cells	10

Tier 2 ‘unlocking’ language	Tier 3 subject relevant language
Transfer	Eukaryotic
Particle	Prokaryotic
Concentration	Multicellular
Reaction	Mitosis
Divide	Meiosis
Clone	Resolution
Microscope	Magnification
Differences	Specialisation

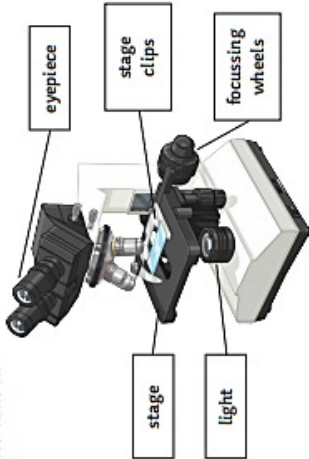


Knowledge Organiser: What is life made of?

Required Practical

Microscopy Required Practical

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



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 distance. 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.

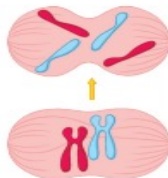
Chromosomes and Mitosis

In the nucleus of a human cell there are 23 pairs of chromosomes. Chromosomes contain a double helix of DNA. Chromosomes have a large number of genes.



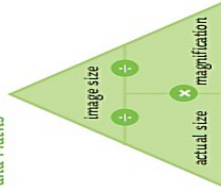
The cell cycle makes new cells.

Mitosis: DNA has to be copied/replicated before the cell carries out mitosis.



Equations and Maths

Equation



Maths Skills

Conversions:

Micrometres to millimetres divide by 1000.

Standard Form:

$$0.003 = 3 \times 10^{-3}$$

$$5.6 \times 10^4 = 0.0056$$

Stem Cells

Embryonic stem cells are undifferentiated cells, they have the potential to turn into any kind of cell.



Adult stem cells are found in the bone marrow, they can only turn into some types of cells e.g. blood cells.

Uses of stem cells:

- Replacing faulty blood cells;
- making insulin producing cells;
- making nerve cells.

Some people are against stem cell research.

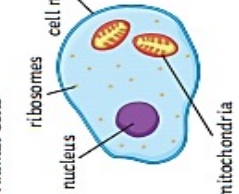
For Stem Cell Research	Against Stem Cell Research
Curing patients with stem cells - more important than the rights of embryos.	Embryos are human life.
They are just using unwanted embryos from fertility clinics, which would normally be destroyed.	Scientists should find other sources of stem cells.

Stem Cells in Plants

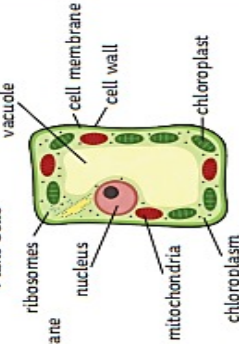
In plants, stem cells are found in the meristem. These stem cells are able to produce clones of the plant. They can be used to grow crops with specific features for a farmer, e.g. disease resistant.

Prokaryotic and Eukaryotic Cells

Animal Cells



Plant Cells

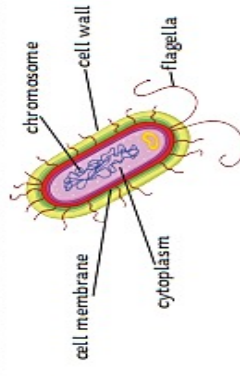


Plant and animal cells have similarities and differences:

	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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Term	Topic/s	Year group
1	Topic 2: Organisation, Breathing and Digestion	10

Tier 2 'unlocking' language

Complementary

Transport

Organisation

Efficient

Break down

Organs

Reaction

Breathing

Tier 3 subject relevant language

Diffusion

Catalyst

Enzyme

Digestion

Alveoli

Substrate

Absorption

Respiratory



Knowledge Organiser: Ecology

Principles of Organisation

cell	tissue	organ	organ system	organism
Cells are the basic building blocks of all living things.	A group of cells with a similar structure and function is called a tissue.	An organ is a combination of tissues carrying out a specific function.	Organs work together within an organ system.	Organ systems work together to form whole living organisms.

Food Tests (Required Practical)

What are you testing for?	Which indicator do you use?	What does a positive result look like?
sugar	Benedict's reagent	Once heated, the solution will change from blue-green to yellow-red.
starch	iodine	Blue-black colour indicates starch is present.
protein	biuret	The solution will change from blue to pink-purple.
lipid	sudan III	The lipids will separate and the top layer will turn bright red.

Effect of pH on the Rate of Reaction of Amylase (Required Practical)

Iodine is used to test for the presence of starch. If starch is present, the colour will change to blue-black.

The **independent variable** in the investigation is the pH of the buffer solution.

The **dependent variable** in the investigation is the time taken for the reaction to complete (how long it takes for all the starch to be digested by the amylase).

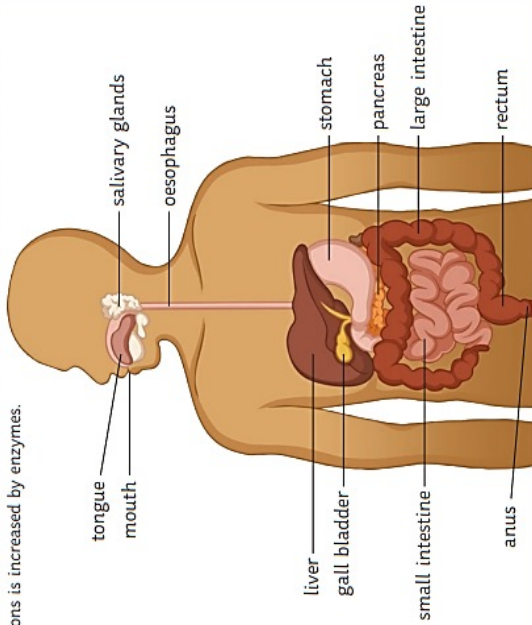
Method:

1. Use the marker pen to label a test tube with the first value of pH buffer solution (pH 4) and stand it in the test tube rack.
2. Into each well of the spotting tiles, place a drop of iodine.
3. Using a measuring cylinder, measure 2cm³ of amylase and pour into the test tube.
4. Using a syringe, measure 1cm³ of the buffer solution and pour into the test tube.
5. Leave this to stand for five minutes and then use the thermometer to measure the temperature. Make a note of the temperature.



The Digestive System

The purpose of the digestive system is to break down large molecules into smaller, soluble molecules, which are then absorbed into the bloodstream. The rate of these reactions is increased by enzymes.



6. Add 2cm³ of starch solution into the test tube, using a different measuring cylinder to measure, and begin a timer (leave the timer to run continuously).
7. After 10 seconds, use a pipette to extract some of the amylase/starch solution, and place one drop into the first well of the spotting tile. Squirt the remaining solution back into the test tube.
8. Continue to place one drop into the next well of the spotting tile, every 10 seconds, until the iodine remains orange.
9. Record the time taken for the starch to be completely digested by the amylase by counting the wells that were tested positive for starch (indicated by the blue/black colour change of the iodine). Each well represents 10 seconds of time.
10. Repeat steps 1 to 8 for pH values 7 and 10.

Enzymes

An enzyme is a biological catalyst; enzymes speed up chemical reactions without being changed or used up. This happens because the enzyme lowers the activation energy required for the reaction to occur. Enzymes are made of chains of amino acids folded together into a globular shape.

Enzyme	Reactant	Product
amylase	starch	sugars (glucose)
protease	protein	amino acids
lipase	lipid	glycerol and fatty acids

Enzymes have an active site which the substrate (reactant) fits into. Enzymes are very specific and will only catalase one reaction. In extreme conditions the active site can denature (change shape) meaning the substrate will no longer fit.

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Term	Topic/s	Year group
2	Topic 3: Cardiovascular System	10

Tier 2 ‘unlocking’ language	Tier 3 subject relevant language
Vessel	Diffusion
Transport	Artery
Organisation	Vein
Cycle	Metabolism
Valve	Cardiac
Pressure	Atrium
Heart	Ventricle
Breathing	Respiratory



Knowledge Organiser: Topic 3- Cardiovascular system

The Heart and Blood Vessels

The **heart** is a large muscular organ which **pumps blood** carrying oxygen or waste products around the body. The **lungs** are the site of **gas exchange** where oxygen from the air is exchanged for waste carbon dioxide in the blood. Oxygen is used in the **respiration** reaction to release energy for the cells and carbon dioxide is made as a waste product during the reaction.



vein	artery	capillary

The three types of blood vessels, shown above, are each adapted to carry out their specific function.

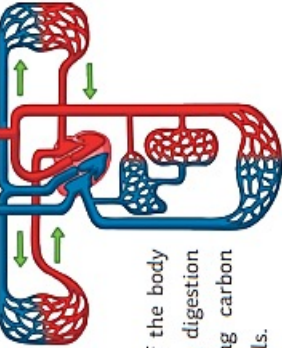
Capillaries are narrow vessels which form networks to closely supply cells and organs between the veins and arteries. The walls of the capillaries are only **one cell thick**, which provides a short **diffusion pathway** to increase the rate at which substances are transferred.

The table below compares the structure and function of arteries and veins:

	Artery	Vein
direction of blood flow	away from the heart	towards the heart
oxygenated or deoxygenated blood?	oxygenated (except the pulmonary artery)	deoxygenated (except the pulmonary vein)
pressure	high	low (negative)
wall structure	thick, elastic, muscular, connective tissue for strength	thin, less muscular, less connective tissue
lumen (channel inside the vessel)	narrow	wide (with valves)

The Heart as a Double Pump

The heart works as a **double pump** for two circulatory systems; the **pulmonary** circulation and the **systemic** circulation.



The pulmonary circulation serves the lungs and bring deoxygenated blood to exchange waste carbon dioxide gas for oxygen at the **alveoli**.

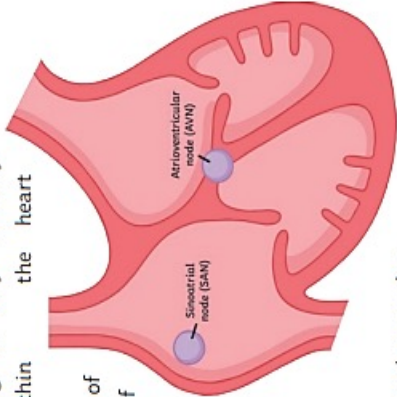
The systemic circulation serves the rest of the body and transports oxygen and nutrients from digestion to the cells of the body, whilst carrying carbon dioxide and other waste away from the cells.

The systemic circulation flows through the whole body. This means the blood is flowing at a much higher pressure than in the pulmonary circuit.

The Heart as Pacemaker

The rate of the heart beating is very carefully, and automatically, controlled within the heart itself.

Located in the muscular walls of the heart are small groups of cells which act as pacemakers. They produce electrical impulses which stimulate the surrounding muscle to contract, squeezing the chambers of the heart and pumping the blood.



The **sino-atrial node (SAN)** is located near the right atrium and it stimulates the atria to contract.

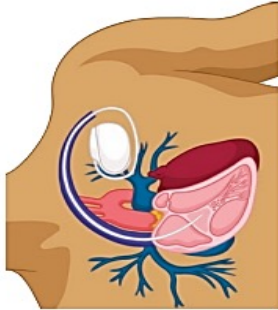
The **atrio-ventricular node (AVN)** is located in between the ventricles and stimulates them to contract.

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Knowledge Organiser: Topic 3- Cardiovascular system

Artificial pacemakers can be surgically implanted into a person if their heart nodes are not functioning correctly.



Coronary Heart Disease

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.

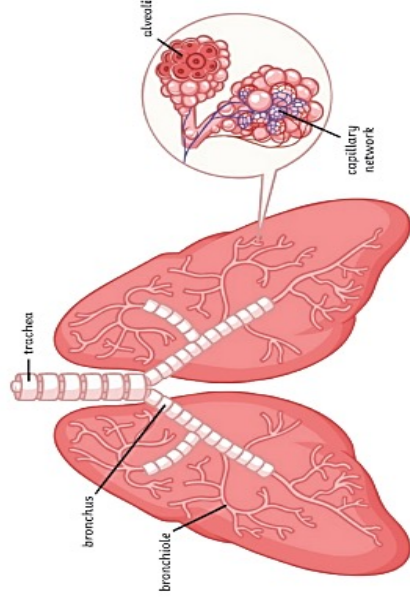
Diet – a high-fat diet (containing lots of saturated fat) can lead to higher cholesterol levels and this cholesterol forms the fatty deposits which damage and block the arteries.

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.



Blood

Blood is composed of red blood cells (erythrocytes), white blood cells and platelets, all suspended within a plasma (a tissue).

The **plasma** transports the different blood cells around the body as well as carbon dioxide, nutrients, urea and hormones. It also distributes the heat throughout the body.

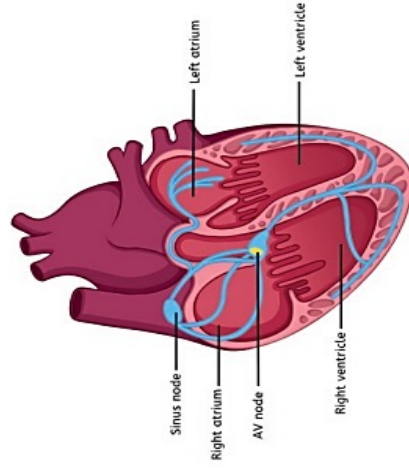
Red blood cells transport oxygen attached to the haem group in their structure. It has a biconcave shape to increase surface area and does not contain a nucleus so it can bind with more oxygen molecules.

White blood cells form part of the immune system and ingest pathogens and produce antibodies. **Platelets** are important blood clotting factors.

at the lungs

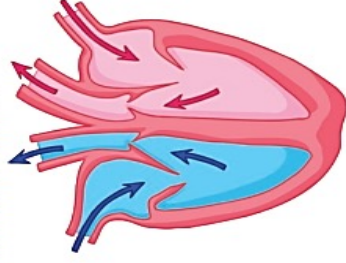
haemoglobin + oxygen \rightleftharpoons oxyhaemoglobin

at the cells



The **right atrium** receives deoxygenated blood via the **vena cava**. It is then pumped down through the valves into the right ventricle. From here, it is forced up through the **pulmonary artery** towards the **lungs** where it exchanges carbon dioxide for oxygen. The oxygenated blood then enters the **left atrium** via the **pulmonary vein** and down into the left ventricle. The muscular wall of the **left ventricle** is much thicker so it can pump the blood more forcefully out of the heart and around the entire body, via the **aorta**.

The blood only flows in **one direction**. This is because there are **valves** in the heart which close under pressure and prevent the backward flow of blood.



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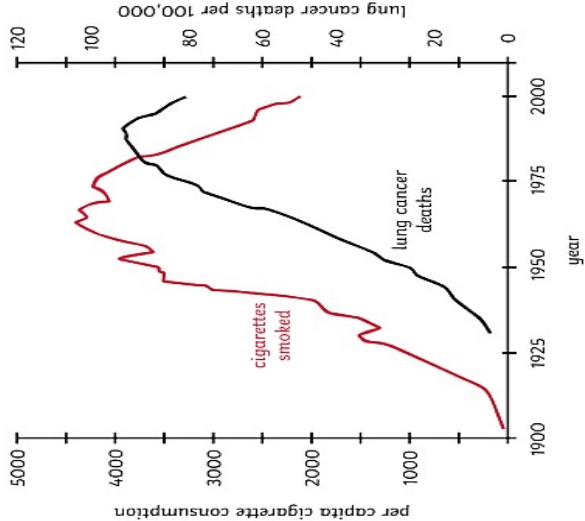
Term	Topic/s	Year group
2	Topic 4: Non communicable diseases	10

Tier 2 ‘unlocking’ language	Tier 3 subject relevant language
Health	Nicotine
Mental	Cirrrosis
Social	Liver
Physical	Carcinogen
Risk	Communicable
Addict	Carbon Monoxide
Exercise	Diet
Disease	Cancerous



Knowledge Organiser: Topic 4: Non Communicable disease

Disease Interactions	Health and Disease	Coronary Heart Disease				
<p>Having one type of illness can often make a person more susceptible to another type of illness:</p> <ul style="list-style-type: none">• 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	<p>Health is the state of being free from illness or disease. It refers to physical and mental wellbeing.</p> <p>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.</p> <p>Some conditions are associated with certain lifestyle choices:</p> <ul style="list-style-type: none">• 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.	<p>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.</p> <p>In the UK and around the world, coronary heart disease is a major cause of many deaths.</p> <p>The main symptoms can include chest pain, heart attack or heart failure. Yet, not all people suffer the same symptoms, if any at all.</p> <p>Lifestyle factors can increase the risk of a person developing coronary heart disease.</p> <p>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.</p> <p>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.</p> <p>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.</p>				
<p>There can often be correlations between some factors and types of illness or specific diseases.</p> <p>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.</p> <p>However, there are other factors which can contribute to the development of lung cancer e.g. working with asbestos, genetic predisposition.</p> <p>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.</p> <p>Therefore, it can be stated that smoking increases the risk of lung cancer.</p>		<p>Cancer</p> <p>Cancer is the result of uncontrolled cell growth and division. The uncontrolled growth of cells is called a tumour.</p> <table><tr><th>Benign Tumour</th><th>Malignant Tumour</th></tr><tr><td><ul style="list-style-type: none">• Usually grows slowly.• Usually grows within a membrane and can be easily removed.• Does not normally grow back.• Does not spread around the body.• Can cause damage to organs and be life-threatening.</td><td><ul style="list-style-type: none">• cancerous• Usually grows rapidly.• Can spread around the body, via the bloodstream.• Cells can break away and cause secondary tumours to grow in other areas of the body (metastasis).</td></tr></table>	Benign Tumour	Malignant Tumour	<ul style="list-style-type: none">• Usually grows slowly.• Usually grows within a membrane and can be easily removed.• Does not normally grow back.• Does not spread around the body.• Can cause damage to organs and be life-threatening.	<ul style="list-style-type: none">• cancerous• Usually grows rapidly.• Can spread around the body, via the bloodstream.• Cells can break away and cause secondary tumours to grow in other areas of the body (metastasis).
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Term	Topic/s	Year group
2/3	Topic 5: Health and Disease	10

Tier 2 'unlocking' language

Communicable

Non-Communicable

Disease

Health

Infect

Immune

Defences

Hygiene

Tier 3 subject relevant language

Disease

Vaccine

Anti-biotic

Antibody

Pathogen

Placebo

Virus

Bacteria



Knowledge Organiser: Topic 5- Health and Disease

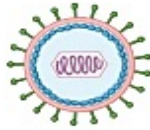
Communicable Disease

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.

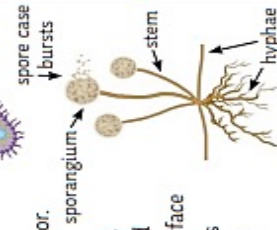


Protists

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.



How Pathogens Are Spread

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.

Viral Diseases

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 by 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.



Fungal and Protist Diseases

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.

Bacterial Diseases

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.

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.



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Knowledge Organiser: Topic 5- Health and Disease

Fighting Diseases

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.

The 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.



Vaccinations

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.



Pros	Cons
Helps to control communicable diseases that used to be very common.	They don't always work.
Epidemics can be prevented.	Some people can have a bad reaction to a vaccine - however, that is very rare.

Fighting Disease – Drugs

Painkillers relieve 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.



Developing Drugs

There are **three main stages in drug testing**:

Pre-clinical testing:

1. Drugs are tested on human cells and tissues.
2. Testing carried out on living animals.

Clinical testing:

3. Tested on healthy human volunteers in clinical trials. Starts with a very low dose, then tested on people with the illness to find the optimum dose.

Placebo is a substance that is like the drug, but does not do anything.

Placebo effect is when the patient thinks the treatment will work even though their treatment isn't doing anything.

Blind trial is when the patient does not know whether they are getting the drug or the placebo.

Double-blind trial is when both the doctor and the patient do not know whether they are getting the drug.

Drugs from Plants

Chemicals produced by plants to defend themselves can be used to treat human diseases or help with symptoms.

Drug	Plant/Microorganism
aspirin	willow
digitalis	foxglove
penicillin	mould - penicillium

New drugs are now made by chemists, who work for the pharmaceutical industry, in laboratories.

Key Vocabulary

antibodies
antigens
antitoxins
bacteria
blind trial
double-blind
fungus
microorganism
phagocytosis
placebo
protist
toxins
vaccination
vector
virus

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How do we use Knowledge Organisers in Biology

How can you use knowledge organisers at home to help us?

- **Retrieval Practice:** Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards:** Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps:** Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it:** Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it:** Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Biology?

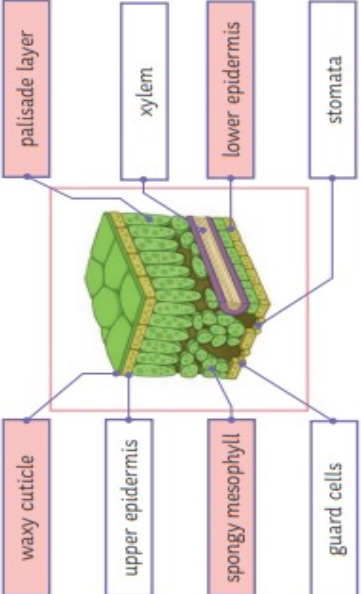


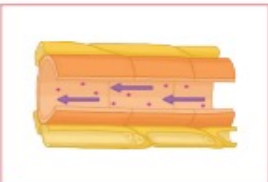
- **Test:** We will do regular low stakes tests to check your ability to retrieve information from memory.
- **Mark our answers:** Once you have done a low stake test you can mark your work using the knowledge organiser.
- **Improve our work:** Once you have finished a piece of work you may be asked to check your knowledge organiser to see if there is any information on it that you could add into an answer.

Term	Topic/s	Year group
3	Topic 6: All about Plants	10

Tier 2 ‘unlocking’ language	Tier 3 subject relevant language
Rate	Xylem
Efficient	Phloem
Transport	Transpiration
Storage	Photosynthesis
Energy	Osmosis
React	Chloroplast
Product	Starch
Factor	Evaporation



Knowledge Organiser: Topic 6- All about plants

<p>Plant Tissues, Organs and Systems</p> <p>Leaves are plant organs and their main function is to absorb sunlight energy for use in photosynthesis. Within the cells are small organelles called chloroplasts which contain a green pigment called chlorophyll. This is the part of the plant which absorbs the sunlight and where photosynthesis occurs.</p> <p style="text-align: center;">sunlight carbon dioxide + water → oxygen + glucose</p> <p>Leaves are adapted to carry out their function. Leaves are typically flat and thin with a large surface area. This means they have a maximum area to absorb the sunlight and carbon dioxide. The thin shape reduces the distance for diffusion of water and gases.</p> <p>Leaves contain vessels called xylem and phloem. The xylem transport water and dissolved minerals toward the leaves. The phloem transport glucose and other products from photosynthesis around the plant.</p> <p>The large air spaces between the cells of the spongy mesophyll layer allow for the diffusion of gases. Carbon dioxide enters the leaves and oxygen exits the leaves.</p>		<p>Root Hair Cells</p> <p>Plants absorb water by osmosis through the root hair cells of the roots. Dissolved in the water are important minerals for the plant's growth and development, which are absorbed by active transport.</p> <p>The root hair cells are adapted to their function with the following features:</p> <ul style="list-style-type: none">• Finger-like projection in the membrane increases the surface area available for water and minerals to be absorbed across.• The narrow shape of the projection can squeeze into small spaces between soil particles, bringing it closer and reducing the distance of the diffusion pathway.• The cell has many mitochondria, which release energy required for the active transport of some substances.		<p>Phloem vessels transport food such as dissolved sugars and glucose from photosynthesis. The food is transported around the plant to where growth is occurring (root and shoot tips), as well as to the organs which store the food. The transport occurs in all directions throughout the plant. The cells making up the phloem tube are living, with small holes in the walls where the cells are joined.</p> <p>Transpiration and Translocation</p> <p>Transpiration is the loss of water, by evaporation and diffusion, from the leaves of the plant. Water is a cohesive molecule and as it evaporates, there is less water in the leaf, so water from further back moves up to take its place. This, in turn, draws more water with it. This is the transpiration stream.</p> <p>Transpiration occurs naturally as there is a tendency for water to diffuse from the leaves (where the concentration is relatively high) to the air around the plants (where the concentration is relatively low), via the stomata.</p> <p>Environmental factors can change the rate at which transpiration occurs:</p> <ul style="list-style-type: none">• Increased light intensity will increase the rate of transpiration because light stimulates the stomata to open. The leaf will also be warmed by the sunlight.• Increased temperature will cause the water to evaporate more quickly and so increase the rate of transpiration.• Increased humidity (moisture in the air) will reduce the rate of transpiration. Whereas if the air becomes drier, the rate increases. A greater concentration gradient will increase the rate of diffusion.• If the wind speed increases, then the rate of transpiration also increases. This is because as the water surrounding the leaves is moved away more quickly, the concentration gradient is increased.• If the water content in the soil is decreased, then the rate of absorption in the roots decreases. This causes the stomata to become flaccid and close, reducing transpiration. If the loss of turgor affects the whole plant, then it will wilt.	
		<p>Xylem and Phloem</p> <p>Xylem vessels transport water through the plant, from roots to leaves. They are made up of dead, lignified cells, which are joined end to end with no walls between them, forming a long central tube down the middle. The movement of the water, and dissolved minerals, along the xylem is in a transpiration stream.</p> <p>Xylem vessels also provide support and strength to the plant structure. They are found in the middle of roots so they aren't crushed within the soil. They are found in the middle of the stem to provide strength and prevent bending. In the leaves, they are found in vascular bundles alongside the phloem and can be seen as the veins which network across the leaf.</p>			

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