

Cells and levels of organisation

List the levels of organisation from smallest to largest.

Cells and levels of organisation

What is a tissue?

Cells and levels of organisation

Why is the stomach an organ?

Cells and levels of organisation

Function of the nucleus?

Cells and levels of organisation

Function of mitochondria?

Cells and levels of organisation

Function of ribosomes?

Cells and levels of organisation

Function of the cell membrane?

Cells and levels of organisation

Which structures do plant cells have that animal cells do not?

A group of cells with a similar structure and function.

Organelles, cells, tissues, organs, organ systems (then the organism).

Contains the genetic material (DNA) and controls the activities of the cell.

It is made of several different tissues that work together to do a specific job.

Where proteins are made (protein synthesis).

Where aerobic respiration takes place, releasing energy for the cell.

Cell wall, chloroplasts and a large permanent vacuole.

Controls the movement of substances into and out of the cell.

Cells and levels of organisation

Function of the cell wall and the vacuole in a plant cell?

Biological molecules and enzymes

Which elements are in carbohydrates and lipids?

Biological molecules and enzymes

Which elements are in proteins?

Biological molecules and enzymes

What are starch and glycogen made from?

Biological molecules and enzymes

What are proteins and lipids made from?

Biological molecules and enzymes

Food test for glucose?

Biological molecules and enzymes

Food test for starch?

Biological molecules and enzymes

Food test for protein?

Carbon, hydrogen and oxygen.

The cell wall (cellulose) strengthens and supports the cell. The vacuole contains cell sap and keeps the cell firm.

Many simple sugars (glucose) joined together.

Carbon, hydrogen, oxygen and nitrogen, and sometimes sulfur.

Add Benedict's solution and heat in a water bath. Blue turns green, yellow, orange or brick-red.

Proteins: amino acids. Lipids: fatty acids and glycerol (three fatty acids to one glycerol).

Add biuret reagent. Blue turns purple (lilac).

Add iodine solution. Orange-brown turns blue-black.

Biological molecules and enzymes

Food test for fat?

Biological molecules and enzymes

What is an enzyme?

Biological molecules and enzymes

What is the active site?

Biological molecules and enzymes

Why are enzymes specific?

Biological molecules and enzymes

Why does the rate rise with temperature up to the optimum?

Biological molecules and enzymes

What happens to an enzyme above its optimum temperature?

Biological molecules and enzymes

How does pH affect an enzyme?

Biological molecules and enzymes

Practical: how do you show when amylase has digested all the starch?

A protein that acts as a biological catalyst, speeding up metabolic reactions without being used up.

Shake the sample with ethanol, then pour into water. A cloudy white emulsion shows fat is present.

Only a substrate with a shape complementary to the active site can fit, so each enzyme catalyses one type of reaction.

The region of an enzyme with a shape complementary to its substrate, where the reaction takes place.

The shape of the active site changes, the substrate no longer fits and the enzyme is denatured.

Particles have more kinetic energy, so enzyme and substrate collide more often.

Test samples with iodine solution. When it stays orange-brown and does not turn blue-black, the starch has gone.

Away from the optimum pH the shape of the active site is altered, so the rate falls. At extreme pH the enzyme is denatured.

Movement of substances into and out of cells

Define diffusion.

Movement of substances into and out of cells

Define osmosis.

Movement of substances into and out of cells

Define active transport.

Movement of substances into and out of cells

Which of diffusion, osmosis and active transport are passive?

Movement of substances into and out of cells

Give an example of active transport in plants.

Movement of substances into and out of cells

Name four factors affecting rate of movement into and out of cells.

Movement of substances into and out of cells

How do you calculate surface area : volume ratio?

Movement of substances into and out of cells

How do distance and concentration gradient affect the rate of diffusion?

The diffusion of water from a dilute solution to a more concentrated solution through a partially permeable membrane.

The net movement of particles from an area of higher concentration to an area of lower concentration.

Diffusion and osmosis. They do not need energy from respiration.

Movement of substances against a concentration gradient (low to high), using energy from respiration.

Surface area to volume ratio, distance, temperature and concentration gradient.

Root hair cells take in mineral ions from the soil against the concentration gradient.

A shorter distance and a steeper concentration gradient both make diffusion faster.

Surface area $\div$ volume. For a cube, surface area is $6 \times \text{side}^2$, volume is side^3 .

Movement of substances into and out of cells

Equation for percentage change in mass?

Movement of substances into and out of cells

In the potato practical, what does a mass increase show?

Movement of substances into and out of cells

Why can glucose but not starch pass through Visking tubing?

Movement of substances into and out of cells

How do agar cubes show surface area : volume ratio?

Nutrition in flowering plants

What is photosynthesis?

Nutrition in flowering plants

What energy conversion happens in photosynthesis?

Nutrition in flowering plants

Word equation for photosynthesis?

Nutrition in flowering plants

Balanced symbol equation for photosynthesis?

The solution was more dilute than the cell contents, so water moved in by osmosis.

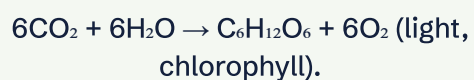
$$(\text{final mass} - \text{initial mass}) \div \text{initial mass} \times 100.$$

Small cubes, with a larger ratio and shorter distance to the centre, turn completely colourless sooner when placed in acid.

Visking tubing is partially permeable. Glucose molecules are small enough to pass through its pores, starch molecules are too large.

Light energy is converted to chemical energy, stored in glucose.

The process by which plants make glucose from carbon dioxide and water, using light energy absorbed by chlorophyll.



Carbon dioxide + water → glucose + oxygen
(in the presence of light and chlorophyll).

Nutrition in flowering plants

What is a limiting factor?

Nutrition in flowering plants

Which three factors affect the rate of photosynthesis?

Nutrition in flowering plants

Why does the rate fall at high temperature?

Nutrition in flowering plants

Which leaf cells do most photosynthesis, and why?

Nutrition in flowering plants

Why does the spongy mesophyll have air spaces?

Nutrition in flowering plants

How is the upper epidermis adapted for photosynthesis?

Nutrition in flowering plants

Why do plants need magnesium ions?

Nutrition in flowering plants

Why do plants need nitrate ions?

Carbon dioxide concentration, light intensity and temperature.

A factor in short supply that stops the rate of a process from increasing.

Palisade mesophyll cells: packed with chloroplasts and close to the light at the top of the leaf.

The enzymes controlling photosynthesis are denatured above their optimum temperature.

It is thin and transparent, so light passes through to the palisade cells.

So carbon dioxide can diffuse through the leaf to the cells and oxygen can diffuse out.

To make amino acids for proteins. A shortage causes stunted growth.

To make chlorophyll. A shortage makes the leaves yellow.

Nutrition in flowering plants

How can you measure the rate of photosynthesis in pondweed?

Nutrition in flowering plants

How is light intensity changed in the pondweed practical?

Nutrition in flowering plants

Why is a plant destarched before a starch test?

Nutrition in flowering plants

Why is a leaf boiled in ethanol before the iodine test?

Nutrition in flowering plants

What does a variegated leaf show in the starch test?

Nutrition in flowering plants

How do you show that carbon dioxide is needed for photosynthesis?

Human nutrition

What are the seven components of a balanced diet?

Human nutrition

How do energy requirements vary?

By changing the distance between the lamp and the plant.

Count the oxygen bubbles released per minute, or measure the volume of gas collected.

Ethanol removes chlorophyll so the colour change can be seen. Turn off the Bunsen burner first.

So any starch found was made during the investigation. It is kept in the dark for 24 to 48 hours.

Compare a leaf in a flask with soda lime, which absorbs carbon dioxide, with a control leaf. Test both for starch.

Only the green areas turn blue-black, so chlorophyll is needed for photosynthesis.

They are higher with greater activity, are higher in teenagers than in older adults, and are higher in pregnancy.

Carbohydrate, protein, lipid, vitamins, minerals, water and dietary fibre.

Human nutrition

Sources and function of carbohydrate?

Human nutrition

Sources and function of protein?

Human nutrition

Sources and function of lipids?

Human nutrition

Function of vitamin A, and a source?

Human nutrition

Function of vitamin C, and a source?

Human nutrition

Function of vitamin D, and a source?

Human nutrition

Function of calcium, and a source?

Human nutrition

Function of iron, and a source?

Meat, fish, eggs and beans. Growth and repair.

Bread, pasta, rice and potatoes. Provides energy.

Healthy eyes and vision in dim light. Liver, carrots.

Butter, oils and nuts. Energy store, insulation and cell membranes.

Helps absorb calcium for strong bones. Oily fish, eggs, sunlight on skin.

Healthy skin and gums. Citrus fruits.

Makes haemoglobin in red blood cells. Red meat, spinach.

Strong bones and teeth. Milk and cheese.

Human nutrition

Why is dietary fibre needed?

Human nutrition

Name the parts of the alimentary canal in order.

Human nutrition

What does the pancreas do in digestion?

Human nutrition

What happens in the ileum and in the colon?

Human nutrition

What is peristalsis?

Human nutrition

What do amylase and maltase do?

Human nutrition

What do proteases digest, and to what?

Human nutrition

What do lipases digest, and to what?

Mouth, oesophagus, stomach, small intestine (duodenum, ileum), large intestine (colon, rectum), anus.

It adds bulk, which helps peristalsis move food through the gut.

Ileum: digestion is finished and products are absorbed. Colon: water is absorbed.

Makes amylase, protease and lipase and releases them into the duodenum.

Amylase digests starch to maltose. Maltase digests maltose to glucose.

Waves of contraction of circular and longitudinal muscles that squeeze food along the gut.

Lipids to fatty acids and glycerol.

Proteins to amino acids.

Human nutrition

Where is bile made and stored?

Human nutrition

What are the two roles of bile?

Human nutrition

Why does emulsifying lipids speed up digestion?

Human nutrition

How does a villus increase absorption?

Human nutrition

What does the lacteal do?

Respiration

What is respiration?

Respiration

How is ATP made in respiration?

Respiration

What does ATP do?

It neutralises stomach acid and emulsifies lipids.

Made in the liver. Stored in the gall bladder.

Large surface area (villi, microvilli), wall one cell thick, and a capillary network that keeps the concentration gradient steep.

Small droplets have a larger surface area, so lipase can work faster.

The chemical process in cells that releases energy from food, such as glucose, and uses it to make ATP.

It absorbs fatty acids and glycerol into the lymph system.

ATP provides energy for cells, for example for muscle contraction, active transport and making large molecules.

Energy released from the breakdown of glucose is used to join a phosphate group to ADP, making ATP.

Respiration

Word equation for aerobic respiration

Respiration

Balanced symbol equation for aerobic respiration

Respiration

Word equation for anaerobic respiration in animals

Respiration

Word equation for anaerobic respiration in plants

Respiration

Why does aerobic respiration release more energy than anaerobic?

Respiration

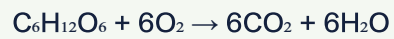
Does anaerobic respiration need oxygen?

Respiration

Why are boiled seeds used in the respiring seeds practical?

Respiration

What happens to hydrogen-carbonate indicator when seeds respire?



glucose + oxygen → carbon dioxide + water

glucose → ethanol + carbon dioxide

glucose → lactic acid

No. Aerobic respiration needs oxygen;
anaerobic respiration happens without it.

Glucose is completely broken down in
aerobic respiration, but only partly broken
down in anaerobic respiration.

It changes from red/orange to yellow,
because the seeds release carbon dioxide.

They are dead, so they act as a control and
show that the changes are caused by living
seeds.

Gas exchange in flowering plants

Which two gases are waste products of metabolism in a leaf?

Gas exchange in humans

Name the path of air from the trachea to the gas exchange surface.

Gas exchange in humans

What do the pleural membranes do?

Gas exchange in humans

What keeps the trachea open?

Gas exchange in humans

What happens when you breathe in?

Gas exchange in humans

What happens when you breathe out?

Gas exchange in humans

How are alveoli adapted for gas exchange?

Gas exchange in humans

Which direction do oxygen and carbon dioxide diffuse at the alveoli?

Trachea, bronchi, bronchioles, alveoli.

Carbon dioxide (from respiration) and oxygen (from photosynthesis). Both leave by diffusion through the stomata.

Rings of cartilage.

They surround the lungs, and the fluid between them reduces friction when the lungs move.

Intercostal muscles and diaphragm relax, ribs move down and in, volume decreases, pressure rises and air moves out.

Intercostal muscles and diaphragm contract, ribs move up and out, volume of thorax increases, pressure falls and air moves in.

Oxygen diffuses from the alveoli into the blood. Carbon dioxide diffuses from the blood into the alveoli.

Large surface area, walls one cell thick, good blood supply, moist lining, and ventilation to keep a steep concentration gradient.

Gas exchange in humans

What does tar do in the lungs?

Gas exchange in humans

How does carbon monoxide harm the body?

Gas exchange in humans

How does smoking increase the risk of coronary heart disease?

Gas exchange in humans

What is emphysema?

Gas exchange in humans

How does limewater show that exhaled air contains carbon dioxide?

Gas exchange in humans

What is the effect of exercise on breathing?

The need for transport and transport in plants

Why can a unicellular organism rely on diffusion?

The need for transport and transport in plants

Why do multicellular organisms need a transport system?

It combines with haemoglobin, so red blood cells carry less oxygen and the heart works harder.

It destroys cilia, so mucus is not removed. It also contains carcinogens that cause lung cancer.

A lung disease in which alveoli walls break down, reducing the surface area for gas exchange.

Smoke damages artery linings so fatty deposits build up in the coronary arteries. Nicotine raises heart rate and blood pressure; carbon monoxide reduces oxygen carried.

Breathing rate and depth increase, because muscles respire faster and make more carbon dioxide.

It turns cloudy (milky) when carbon dioxide is bubbled through it.

Small surface area : volume ratio and long diffusion distances, so diffusion alone is too slow.

It has a large surface area compared with its volume, so substances only have a short distance to diffuse.

The need for transport and transport in plants

**What is the formula for surface area :
volume ratio?**

The need for transport and transport in plants

What does the xylem transport?

The need for transport and transport in plants

What does the phloem transport?

The need for transport and transport in plants

How is xylem adapted for its function?

Blood and the immune system

Name the four components of blood.

Blood and the immune system

What does plasma transport?

Blood and the immune system

**Where is urea transported from and
to?**

Blood and the immune system

**How is the shape of a red blood cell
adapted?**

Water and mineral ions from the roots to other parts of the plant.

Surface area $\div$ volume. A cube with 3 cm sides has $54 \text{ cm}^2 \div 27 \text{ cm}^3 = 2 : 1$.

Dead cells with no end walls form hollow tubes; lignin strengthens the walls.

Sucrose and amino acids between the leaves and other parts of the plant.

Carbon dioxide, digested food, urea, hormones and heat energy.

Red blood cells, white blood cells, platelets and plasma.

Biconcave disc: a large surface area for absorbing and releasing oxygen.

From the liver, where it is made, to the kidneys, to be removed in urine.

Blood and the immune system

Why do red blood cells have no nucleus?

Blood and the immune system

What is the role of haemoglobin?

Blood and the immune system

How do phagocytes defend the body?

Blood and the immune system

How do lymphocytes defend the body?

Blood and the immune system

Why are antibodies specific?

The heart and circulation

Name the four chambers of the heart.

The heart and circulation

What is the function of the septum?

The heart and circulation

What do heart valves do?

It combines with oxygen to form oxyhaemoglobin, so red blood cells can carry oxygen.

It leaves more room for haemoglobin, so they can carry more oxygen.

They release antibodies that are specific to the antigens on a pathogen.

They ingest pathogens and destroy them.

Right atrium, left atrium, right ventricle and left ventricle.

Each antibody has a shape that fits the antigens of one pathogen only.

They open to let blood flow forwards and close to prevent backflow.

It separates the two sides of the heart so oxygenated and deoxygenated blood do not mix.

The heart and circulation

Which vessel takes blood from the left ventricle to the body?

The heart and circulation

Why is the left ventricle wall thicker than the right?

The heart and circulation

Why does heart rate increase during exercise?

The heart and circulation

What is the effect of adrenaline on the heart?

The heart and circulation

What happens in coronary heart disease?

The heart and circulation

List risk factors for coronary heart disease.

The heart and circulation

How is an artery adapted for its function?

The heart and circulation

How is a vein adapted for its function?

It pumps blood around the whole body, which needs higher pressure.

The aorta.

It increases the heart rate, so blood reaches the muscles faster.

Muscles respire faster, so more oxygen and glucose are needed and more carbon dioxide must be removed.

Saturated fat and cholesterol, smoking, lack of exercise, high blood pressure, obesity, stress, genetics and age.

Fatty material builds up in the coronary arteries, narrowing them and reducing blood flow to the heart muscle.

Wide lumen and valves, to let blood flow at low pressure and stop backflow.

Thick muscular wall with elastic fibres to withstand high pressure; narrow lumen.

The heart and circulation

How is a capillary adapted for its function?

The heart and circulation

What is a double circulatory system?

The heart and circulation

Name the blood vessels to and from the liver.

The heart and circulation

Name the blood vessels to and from the kidneys.

Excretion

Define excretion.

Excretion

What is the excretory product of the lungs?

Excretion

What does the skin excrete in sweat?

Excretion

What do the kidneys excrete?

Blood passes through the heart twice on each circuit: heart to lungs and back, then heart to body and back.

Wall one cell thick for a short diffusion distance; a huge network gives a large surface area.

Renal artery to the kidneys and renal vein from the kidneys.

Hepatic artery and hepatic portal vein carry blood in; hepatic vein carries blood out.

Carbon dioxide (with water vapour).

The removal from the body of the waste products of metabolism.

Urea, with excess water and ions, in urine.

Water, salts (ions) and urea.

Coordination, homeostasis and plant responses

What three parts make a co-ordinated response?

Coordination, homeostasis and plant responses

What is an effector?

Coordination, homeostasis and plant responses

How do animals and plants respond to changes in their environment?

Coordination, homeostasis and plant responses

Define homeostasis.

Coordination, homeostasis and plant responses

Give two examples of homeostasis.

Coordination, homeostasis and plant responses

How do shoots respond to light and to gravity?

Coordination, homeostasis and plant responses

How do roots respond to light and to gravity?

Coordination, homeostasis and plant responses

Where is auxin made in a shoot?

A muscle or gland that carries out the response.

A stimulus, a receptor and an effector.

The maintenance of a constant internal environment.

Animals use the nervous system and hormones. Plants respond by changing how they grow.

Positive phototropism (towards light) and negative geotropism (upwards).

Control of body water content and control of body temperature.

In the tip of the shoot.

Negative phototropism (away from light) and positive geotropism (downwards).

Coordination, homeostasis and plant responses

How does auxin make a shoot bend towards light?

The nervous system and the eye

What is the central nervous system (CNS)?

The nervous system and the eye

How are the sense organs linked to the CNS?

The nervous system and the eye

What happens when a receptor is stimulated?

The nervous system and the eye

What is a synapse?

The nervous system and the eye

How does a signal cross a synapse?

The nervous system and the eye

Put the reflex arc in order.

The nervous system and the eye

Why is a reflex fast?

The brain and spinal cord.

Auxin moves to the shaded side and makes those cells elongate more, so the shoot bends towards the light.

Electrical impulses are sent along nerves into the CNS, giving a rapid response.

By nerves.

A neurotransmitter is released, diffuses across the gap and binds to receptors on the next neurone, starting a new impulse.

A gap between two neurones.

It is automatic and impulses do not have to reach the conscious part of the brain first.

Stimulus, receptor, sensory neurone, relay neurone, motor neurone, effector, response.

The nervous system and the eye

What does the cornea do?

The nervous system and the eye

What does the retina contain?

The nervous system and the eye

What does the optic nerve do?

The nervous system and the eye

**Near object: ciliary muscles,
ligaments, lens?**

The nervous system and the eye

**Distant object: ciliary muscles,
ligaments, lens?**

The nervous system and the eye

**Bright light: what do the iris muscles
do?**

The nervous system and the eye

Dim light: what do the iris muscles do?

Hormones and temperature control

**Give three differences between
nervous and hormonal
communication.**

Light receptor cells: rods (dim light) and cones (colour, bright light).

Refracts (bends) light as it enters the eye.

Ciliary muscles contract, suspensory ligaments loosen, lens becomes thicker.

Carries impulses from the retina to the brain.

Circular muscles contract and radial muscles relax, so the pupil gets smaller.

Ciliary muscles relax, suspensory ligaments are pulled tight, lens is pulled thin.

Nervous: electrical impulses, fast, short-lived. Hormonal: chemicals in the blood, slower, longer-lasting.

Radial muscles contract and circular muscles relax, so the pupil gets larger.

Hormones and temperature control

What is a hormone?

Hormones and temperature control

Source and role of adrenaline?

Hormones and temperature control

Source and role of insulin?

Hormones and temperature control

Source and role of testosterone?

Hormones and temperature control

Source and role of oestrogen?

Hormones and temperature control

Source and role of progesterone?

Hormones and temperature control

Name two skin responses when the body is too hot.

Hormones and temperature control

What is vasoconstriction?

Adrenal glands. Prepares the body for fight or flight: raises heart rate and blood glucose.

A chemical messenger secreted by a gland into the blood, which affects a target organ.

Testes. Male secondary sexual characteristics and sperm production.

Pancreas. Lowers blood glucose: cells take up glucose and the liver stores it as glycogen.

Ovaries. Maintains the lining of the uterus.

Ovaries. Female secondary sexual characteristics; builds up the uterus lining.

Blood vessels supplying the skin narrow, so less blood flows near the surface and less heat is lost.

Sweating, and vasodilation (blood vessels near the surface widen).

Hormones and temperature control

How does sweating cool the body?

Sweat evaporates from the skin and takes heat with it.