

Principles of organisation

What are cells?

Principles of organisation

What is a tissue?

Principles of organisation

What is an organ?

Principles of organisation

What is an organ system?

Animal tissues, organs and organ systems

What is the digestive system an example of?

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What do digestive enzymes do?

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Why does an enzyme catalyse only one type of reaction?

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Describe the lock and key theory.

A group of cells with a similar structure and function.

The basic building blocks of all living organisms.

Organs organised to work together. Organ systems work together to form organisms.

An aggregation of tissues performing specific functions.

Convert food into small soluble molecules that can be absorbed into the bloodstream.

An organ system in which several organs work together to digest and absorb food.

The substrate fits the enzyme's active site like a key fits a lock, because their shapes are complementary. It is a simplified model.

Because of the shape of its active site, which only fits a specific substrate.

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What does it mean when an enzyme is denatured?

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How does temperature affect enzyme activity?

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How does pH affect enzyme activity?

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How do you calculate the rate of a reaction?

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Amylase: what does it break down and where is it made?

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Protease: what does it break down and where is it made?

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Lipase: what does it break down and where is it made?

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What are the products of digestion used for?

Rate rises with temperature up to the optimum, then falls quickly as the enzyme denatures.

The shape of its active site has changed, so the substrate no longer fits. It happens at high temperature or extreme pH.

Rate = amount of product formed $\div$ time. If the end point is a colour change, rate = $1 \div$ time taken.

Each enzyme has an optimum pH. Away from the optimum the active site changes shape and the enzyme is denatured.

Breaks proteins into amino acids. Made in the stomach, pancreas and small intestine.

A carbohydrase that breaks starch into simple sugars. Made in the salivary glands, pancreas and small intestine.

To build new carbohydrates, lipids and proteins. Some glucose is used in respiration.

Breaks lipids (fats) into glycerol and fatty acids. Made in the pancreas and small intestine.

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Where is bile made and stored, and what does it do?

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Why does emulsifying fat speed up digestion?

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Benedict's test: what is it for and what is the positive result?

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Iodine test: what is it for and what is the positive result?

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Biuret test: what is it for and what is the positive result?

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How do you test for lipids?

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Amylase and pH practical: how do you tell when all the starch is digested?

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What is a double circulatory system?

It breaks fat into small droplets, which have a larger surface area for lipase to act on, so fat is broken down faster.

Made in the liver and stored in the gall bladder. It is alkaline, so it neutralises stomach acid, and it emulsifies fat into small droplets, increasing the surface area.

Tests for starch. Orange-brown changes to blue-black.

Tests for sugars. Heat with Benedict's solution. Blue changes to green, yellow, orange or brick-red.

Add Sudan III stain and shake: a red-stained oily layer forms on top. (Alternative: ethanol emulsion test gives a cloudy white emulsion.)

Tests for protein. Blue changes to purple (lilac).

Blood passes through the heart twice per circuit: once to the lungs and once around the rest of the body.

Test samples with iodine every 30 seconds. When the iodine stays orange-brown there is no starch left.

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What does each ventricle pump blood to?

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Which vessels carry blood to and from the lungs?

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Which vessels carry blood to and from the body?

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What do the coronary arteries do?

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How are the alveoli adapted for gas exchange?

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What route does air take to reach the blood in the lungs?

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What controls the natural resting heart rate?

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How is an artery adapted to its function?

The pulmonary artery carries blood from the heart to the lungs. The pulmonary vein carries blood back from the lungs.

Right ventricle: to the lungs, where gas exchange takes place. Left ventricle: around the rest of the body.

They supply the heart muscle with oxygenated blood.

The aorta carries oxygenated blood from the left ventricle. The vena cava brings blood back to the right atrium.

Trachea, then bronchi, then alveoli. Oxygen diffuses from the alveoli into the capillary network surrounding them.

Large surface area, thin walls, a good blood supply from the capillary network, and ventilation, which keeps a steep concentration gradient.

Carries blood at high pressure away from the heart. Thick walls with muscle and elastic fibres, and a narrow lumen.

A group of cells in the right atrium that act as a pacemaker. Artificial pacemakers are electrical devices that correct irregular heart rate.

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How is a vein adapted to its function?

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How is a capillary adapted to its function?

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What is the equation for rate of blood flow?

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What is blood made of?

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What does plasma transport?

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What is the function of red blood cells and how are they adapted?

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What do white blood cells do?

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What are platelets and what do they do?

Exchanges substances with cells. Walls are one cell thick, giving a short diffusion distance, and are permeable.

Carries blood at low pressure to the heart. Thinner walls, a wide lumen and valves to prevent backflow.

A tissue of plasma, in which red blood cells, white blood cells and platelets are suspended.

Rate of blood flow = volume of blood $\div$ time
(for example cm³/min).

Carry oxygen using haemoglobin.
Biconcave shape gives a large surface area, and no nucleus leaves room for haemoglobin.

Carbon dioxide, soluble products of digestion, urea and hormones.

Small fragments of cells with no nucleus. They help the blood to clot at a wound.

Defend the body against pathogens, for example by engulfing them or producing antibodies and antitoxins.

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How can you tell a red blood cell from a white blood cell in a photograph?

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What happens in coronary heart disease?

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What is a stent?

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What do statins do?

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What can go wrong with a heart valve, and how can it be treated?

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What treatments are used for heart failure?

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What is health?

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Give two ways different types of disease can interact.

Layers of fatty material build up inside the coronary arteries, narrowing them. Less blood flows, so the heart muscle gets less oxygen.

Red blood cells are small, round and have no nucleus. White blood cells are larger with a visible nucleus.

Reduce blood cholesterol levels, which slows down the rate of fatty material deposit.

A device used to keep the coronary arteries open.

A donor heart, or heart and lungs, can be transplanted. Artificial hearts keep patients alive while waiting, or let the heart rest.

It may not open fully, so less blood flows through, or it may leak, so blood flows backwards. Faulty valves can be replaced with biological or mechanical valves.

Immune system defects make infections more likely. Viruses can trigger cancers. Immune reactions to a pathogen can trigger allergies. Severe physical illness can lead to depression.

The state of physical and mental well-being. Disease, diet, stress and life situations can all affect health.

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Why should a study of disease or risk factors use a large, representative sample?

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What is a risk factor?

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What is a causal mechanism?

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Which disease is obesity a risk factor for?

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What are the effects of alcohol and smoking on unborn babies?

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How does smoking affect health?

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What is a carcinogen?

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What costs do non-communicable diseases have?

Something linked to an increased rate of a disease, such as an aspect of lifestyle or a substance in the body or environment.

Not everyone can be tested. A large sample that represents the population gives more reliable data and conclusions.

Type 2 diabetes.

An explanation of how a risk factor causes a disease. It has been proven for some risk factors but not others.

It raises the risk of cardiovascular disease, lung disease and lung cancer.

Smoking can cause low birth weight and premature birth. Alcohol can damage the baby's development, including the brain.

Human costs (suffering, early death) and financial costs (treatment, lost work), for individuals, communities, nations and globally.

A substance or radiation that can cause cancer. Ionising radiation is one example.

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What is cancer?

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**Benign tumour or malignant tumour:
which is cancer, and how do they
differ?**

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**List the plant tissues you need to
know.**

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**What is meristem tissue and where is
it found?**

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**How is palisade mesophyll adapted
for photosynthesis?**

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What is the role of spongy mesophyll?

Plant tissues, organs and systems

**What do the roots, stem and leaves
form?**

Plant tissues, organs and systems

How is a root hair cell adapted?

Malignant tumours are cancers: they invade neighbouring tissues and spread in the blood to form secondary tumours. Benign tumours stay in one area, usually within a membrane.

The result of changes in cells that lead to uncontrolled growth and division.

Tissue at the growing tips of shoots and roots, where cells divide to produce new cells.

Epidermal tissues, palisade mesophyll, spongy mesophyll, xylem and phloem, and meristem tissue. The leaf is an organ made of these tissues.

Air spaces let gases diffuse through the leaf, such as carbon dioxide for photosynthesis.

Tightly packed cells near the top of the leaf containing many chloroplasts, to absorb light.

Long root hair gives a large surface area. Takes up water by osmosis and mineral ions by active transport, which needs energy from respiration (many mitochondria).

A plant organ system for transport of substances around the plant.

Plant tissues, organs and systems

What does xylem do and how is it adapted?

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What is translocation?

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What is transpiration?

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What do stomata and guard cells do?

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How do temperature, humidity, air movement and light affect transpiration?

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How can you measure the rate of transpiration?

The movement of dissolved sugars through phloem from the leaves to the rest of the plant. Phloem is tubes of elongated cells with pores in the end walls.

Transports water and mineral ions from roots to stems and leaves. Hollow tubes strengthened by lignin.

They control gas exchange and water loss. Guard cells open and close the stomata.

The loss of water vapour from the leaves. Water moves up the xylem, evaporates from leaf cells and diffuses out through the stomata.

Use a potometer to measure water uptake by a shoot. Rate = distance the bubble moves $\div$ time.

Higher temperature, more air movement and more light increase the rate. Higher humidity decreases it.