KS3 Bitesize

Life processes

There are seven processes that are common to living things. These seven processes are movement, respiration, sensitivity, growth, reproduction, excretion and nutrition.

Introduction

This Revision Bite covers:

MRS GREN

Living things have certain life processes in common. There are seven things that they need to do to count as being alive. The phrase **MRS GREN** is a way to remember them:

M	Movement	All living things move, even plants
R	Respiration	Getting energy from food
S	Sensitivity	Detecting changes in the surroundings
G	Growth	All living things grow
R	Reproduction	Making more living things of the same type
E	Excretion	Getting rid of waste
N	Nutrition	Taking in and using food

It can be easy to tell if something is living or not. A teddy bear might look like a bear, but it can't do any of the seven things it needs to be able to do to count as being alive.

What about a car? A car can move, it gets energy from petrol (like nutrition), it might have a car alarm (sensitivity), and it gets rid of waste gases through its exhaust pipe (excretion). But it can't grow or make baby cars. So a car is not alive.

Respiration

Respiration is a chemical reaction that happens in all living cells. It is the way that energy is released from glucose, for our cells to use to keep us functioning.

Remember that respiration is **not** the same as breathing (which is properly called ventilation).

Aerobic respiration

The glucose and oxygen react together in the cells to produce carbon dioxide and water. The reaction is called **aerobic respiration** because oxygen from the air is needed for it to work.

Here is the word equation for aerobic respiration:

glucose + oxygen → carbon dioxide + water (+ energy)

(Energy is released in the reaction. We show it in brackets in the equation because energy is not a substance.)

Now we will look at how glucose and oxygen get to the cells so that respiration can take place and how we get rid of the carbon dioxide.

Glucose from food to cells

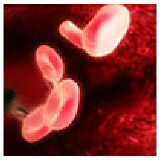
Glucose is a type of **carbohydrate**, obtained through digestion of the food we eat. Digestion breaks food down into small molecules. These can be absorbed across the wall of the small intestine into the bloodstream.

Glucose is carried round the body dissolved in blood plasma, the pale yellow liquid part of our blood. The dissolved glucose can diffuse into the cells of the body from the **capillaries**. Once in the cell glucose can be used in respiration.

Oxygen from the air to cells

When we breathe in oxygen enters the small air sacs, called **alveoli**, in the lungs. Oxygen diffuses from there into the bloodstream.

Oxygen is not carried in the plasma, but is carried by the red blood cells. These contain a red substance called **haemoglobin**, which joins onto oxygen and carries it around the body in the blood, then lets it go when necessary. Like glucose, oxygen can diffuse into cells from the capillaries.



Red blood cells carry oxygen around the body

Carbon dioxide from cells to the air

The carbon dioxide produced during respiration diffuses out of the cells and into the blood plasma. The blood carries it to the lungs. It then diffuses across the walls of the alveoli and into the air, ready to be exhaled.

The respiratory system and ventilation

The respiratory system

The human respiratory system contains the organs that allow us to get the oxygen we need and to remove the waste carbon dioxide we don't need. It contains these parts:

- lungs
- tubes leading from the lungs to the mouth and nose
- various structures in the chest that allow air to move in and out of the lungs.

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Ventilation

Movements of the ribs, rib muscles and diaphragm allow air into and out of the lungs. Take care - this is called **breathing** or **ventilation**, not respiration. When we breathe in, we inhale. When we breathe out, we exhale.

Air passes between the lungs and the outside of the body through the **windpipe**, called the **trachea**. The trachea divides into two bronchi, with one bronchus for each lung.

Each bronchus divides further in the lungs into smaller tubes called bronchioles. At the end of each bronchiole, there is a group of tiny air sacs. These air sacs have bulges called **alveoli** to increase their surface area.

Gas exchange

We need to get oxygen from the air into the blood, and we need to remove waste carbon dioxide from the blood into the air. Moving gases like this is called gas exchange. The alveoli are adapted to make gas exchange in lungs happen easily and efficiently.

Here are some features of the alveoli that allow this:

- they give the lungs a really big surface area
- they have moist, thin walls (just one cell thick)
- they have a lot of tiny blood vessels called capillaries.

The gases move by **diffusion** from where they have a high concentration to where they have a low concentration:

- Oxygen diffuses from the air in the alveoli into the blood.
- Carbon dioxide diffuses from the blood into the air in the alveoli.

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Some **water vapour** is also lost from the surface of the alveoli into the lungs - we can see this condensing when we breathe out on cold days.

Movement

Why do we need a skeleton?

Our skeleton is made of more than 200 bones. **Calcium** and other minerals make the bone strong but slightly flexible. Bone is a living **tissue** with a blood supply. It is constantly being dissolved and laid down, and it can repair itself if a bone is broken. Exercise and a balanced diet are important for a healthy skeleton.

The skeleton has three main functions:

- to support the body
- to protect some of the vital organs of the body
- to help the body move.

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Support

The skeleton supports the body. For example, without a backbone we would not be able to stay upright.

Protection

Here are some examples of what the skeleton protects:

- the skull protects the brain
- the ribcage protects the heart and lungs
- the backbone protects the spinal cord.

Movement

Some bones in the skeleton are joined rigidly together and cannot move against each other. Bones in the skull are joined like this. Other bones are joined to each other by **flexible joints**. Muscles are needed to move bones attached by joints.

Joints

This page is about the joints in the skeleton that allow movement.

Basic structure

If two bones just moved against each other, they would eventually wear away. This can happen in people who have a disease called **arthritis**. To stop this happening, the ends of the bones in a joint are covered with a tough, smooth substance called **cartilage**. This is kept slippery by **synovial fluid**. Tough **ligaments** join the two bones in the joint and stop it falling apart.

The diagram shows the main features of a joint.

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Movement

Different types of joint allow different types of movement.

Hinge joints allow simple movement, the same as a door opening and closing. Knee and elbow joints are hinge joints.

Ball and socket joints allow movement in more directions. Hip and shoulder joints are ball and socket joints.

The bones cannot move on their own - they need muscles for this to happen.

Antagonistic muscles

Muscles work by getting shorter. We say that they **contract**, and the process is called contraction.

Muscles are attached to bones by strong **tendons**. When a muscle contracts, it pulls on the bone, and the bone can move if it is part of a joint.

Muscles can only pull and cannot push. This would be a problem if a joint was controlled by just one muscle. As soon as the muscle had contracted and pulled on a bone, that would be it, with no way to move the bone back again. The problem is solved by having muscles in pairs, called **antagonistic muscles**.

Biceps and triceps

The elbow joint lets our forearm move up or down. It is controlled by two muscles, the **biceps** on the front of the upper arm, and the **triceps** on the back of the upper arm. The biceps and the triceps are **antagonistic muscles**.

when the biceps muscle contracts, the forearm moves up

when the triceps muscle contracts, the forearm moves down.

This solves the problem. To lift the forearm, the biceps contracts and the triceps relaxes. To lower the forearm again, the triceps contracts and the biceps relaxes.

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More from Life processes