



Unit 1

Teaching ideas

Background knowledge

The human body consists of a number of different systems that work together so that we can survive. At all times, the different body systems work together on specific jobs. These different body systems depend on one another. The musculo-skeletal system is made of a skeleton of bones with muscle attached to them. It supports the body and allows movement. The circulatory system consists of the heart and blood vessels, which ensure that all parts of the body receive food and oxygen and that wastes are taken away from body organs and tissues. In the digestive system, organs break down large food molecules into smaller molecules that can be absorbed into the bloodstream. The respiratory system is made up of organs that supply the body cells with oxygen and remove carbon dioxide. In the nervous system, the brain and nerves send messages to and receive messages from body organs. The messages allow us to regulate body actions and processes. In the excretory system, the kidneys remove impurities from the blood and control the concentration of water and salts in the blood. Wastes are removed as urine. In the reproductive system, organs make sperm in males and ova in females. The sperm and ova join during fertilisation. The young develop from the fertilised egg. The endocrine system consists of glands that make chemicals called hormones. These are released into the blood to control certain body processes.

This unit focuses on the circulatory, digestive, respiratory, excretory and nervous systems.

The circulatory system

The main function is to transport substances such as oxygen, food and wastes.

The circulatory system in humans consists of three main parts: (1) a fluid (blood) that transports substances in the body; (2) blood vessels that carry the blood; and (3) a heart that pumps the blood round the body.

The heart pumps blood around the body through the blood vessels. There are three types of blood vessels: arteries, capillaries and veins. Arteries pump blood away from the heart to the rest of the body. A good way of remembering this is that both arteries and away start with the letter 'a'. Arteries have a thick muscular wall which contracts and forces the blood along. This can be felt as a pulse. They carry oxygenated blood, except for the pulmonary artery. Capillaries are a network of tiny blood vessels that connect the arteries and veins. The capillaries release substances such as oxygen and digested food molecules into the cells and carry away waste substances such as carbon dioxide from cells. They have thin walls. Veins carry blood to the heart. Some veins have one-way valves to stop blood from flowing backwards. Veins are wider than arteries and have thinner walls. They carry de-oxygenated blood, except for the pulmonary veins.

The heart and double circulation

The heart is really two separate pumps joined together. One pump pushes the blood into the lungs. In the lungs, oxygen diffuses into the blood through the thin capillary walls and carbon dioxide diffuses out of the blood. The oxygenated blood is pumped from the lungs to the left side of the heart. The other pump takes the oxygenated blood and pumps it, under pressure, to other parts of the body through the arteries.

Note: all the arteries carry oxygenated blood to the body organs except for the pulmonary artery. The pulmonary artery carries deoxygenated blood from the heart to the lungs where the blood is oxygenated.

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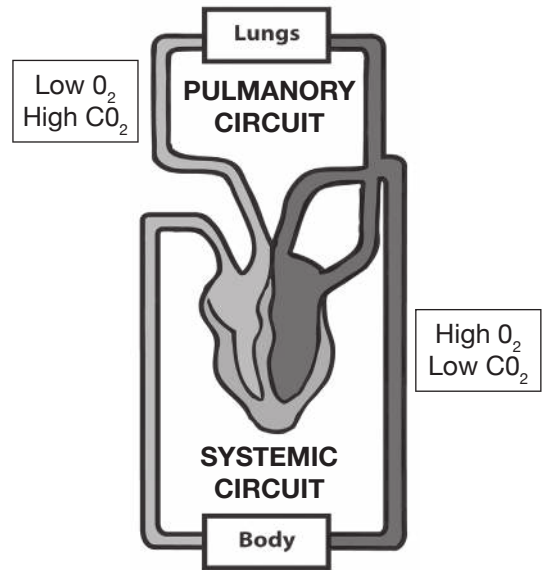
The system of two pumps is called double circulation. Deoxygenated blood returns to the right side of the heart. Oxygenated blood enters and leaves the left side of the heart.

In the rest of the body, cells absorb oxygen and food from the blood and release carbon dioxide and other wastes into the blood. In the lungs, blood absorbs oxygen and carbon dioxide diffuses out of the blood.

Heartbeat and pulse

The adult human heart beats about 70 times per minute at rest. The number of beats can be higher or lower than this figure depending on factors like a person's age, fitness and how active they are. If we feel anxious or scared, our heart beats faster. Each time the heart beats, the heart muscle contracts and relaxes.

The pulse is the contraction and relaxation of the arteries each time the heart beats. The pulse is different to the heartbeat. When the ventricles contract, the blood is forced into the arteries. This makes the arteries expand a little as the blood is pushed into them. The elastic walls of the arteries then contract until the next heartbeat forces more blood into them. When you take your pulse you are feeling the expansion of the artery wall, followed by its contraction. This occurs once every heartbeat. The easiest place to feel your pulse is on your wrist. We can use a person's pulse rate as an indicator of how fit they are. The lower the pulse at rest and after exercise, the fitter the person is.



The digestive system

We need to eat food to get nutrients that supply the body with raw materials and with energy. The job of the digestive system is to absorb nutrients from food. In the digestive system, food is broken down into molecules that are small enough to be absorbed or taken in by the digestive system and then passed into the blood. The nutrients dissolve in the blood and are carried in the bloodstream to all parts of the body.

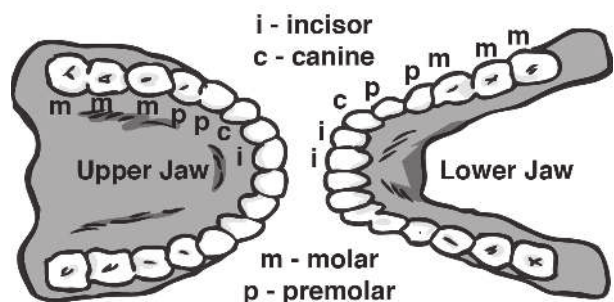
The main processes that happen to food in the digestive system are: (1) ingestion – taking of food into the body through the mouth; (2) digestion – the breakdown of large food molecules into small soluble food molecules that can be carried in the bloodstream; (3) absorption – the movement of digested, soluble food molecules through the wall of the digestive system and into the blood; and (4) egestion – the passing out of food that is not digested in the form of faeces.

The digestive system, or alimentary canal, is a one-way tube that passes through the body. It starts at the mouth and ends at the anus. It is about nine metres long and is made up of different parts including the mouth, oesophagus, stomach, small intestine and large intestine.

Digestion

Digestion is a process where large, insoluble food molecules are broken up into simpler molecules that are soluble. After digestion the smaller, soluble molecules can be absorbed through the gut wall and into the blood. There are two types of digestion: mechanical digestion and chemical digestion.

Mechanical digestion is the physical breakdown of food into smaller pieces. It involves the breaking, crushing and mashing of food. It starts in the mouth where the teeth tear and crush the moistened food into a paste. The incisors are used to cut and bite, canine teeth tear food and the large flat molars are used to crush and mash food.



Mechanical digestion is also brought about by the churning action of the alimentary canal. In the stomach, the muscles of the stomach wall churn and mix stomach fluids with food to produce a soup-like mixture.

Chemical digestion is the breakdown of chemical bonds in food molecules to produce smaller molecules. Enzymes are involved in this process. Enzymes are chemicals that break down large food molecules into smaller ones. Different enzymes act on different food molecules. Chemical digestion starts in the mouth where enzymes in the saliva start to break chemical bonds in the food.

The respiratory system

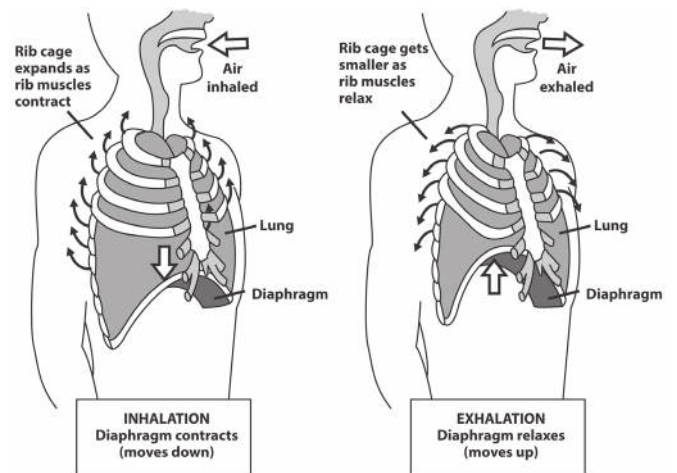
This consists of the nose and mouth, trachea (wind pipe) and other air passageways (bronchi), lungs and diaphragm muscle.

The respiratory system supplies oxygen to all cells and removes carbon dioxide. Oxygen is absorbed into the blood in the lungs. The oxygen is carried in the blood to all cells of the body where it is used for cellular respiration to release energy from simple food molecules, such as glucose. The process of respiration forms carbon dioxide as a waste product. The carbon dioxide moves from all body cells into the blood and is carried by the blood to the lungs, where it is breathed out.

Breathing is the movement of air into and out of the lungs. Breathing in is called inhalation. Breathing out is called exhalation. The lungs are inside the chest, surrounded and protected by the ribs. Muscles between the ribs and a sheet of muscle below the lungs, called the diaphragm, make the lungs work.

Inhalation takes place as follows: (1) the muscles between the ribs contract and lift the ribs upwards and outwards; (2) the diaphragm muscle contracts and is flattened; (3) the volume of the chest increases; (4) the pressure in the chest decreases; and (5) air is drawn into the lungs.

Exhalation takes place as follows: (1) the muscles between the ribs relax and lower the ribs downwards and inwards; (2) the diaphragm muscle relaxes and the diaphragm bulges upwards; (3) the volume of the chest decreases; (4) the pressure in the chest increases; and (5) air is pushed out of the lungs.



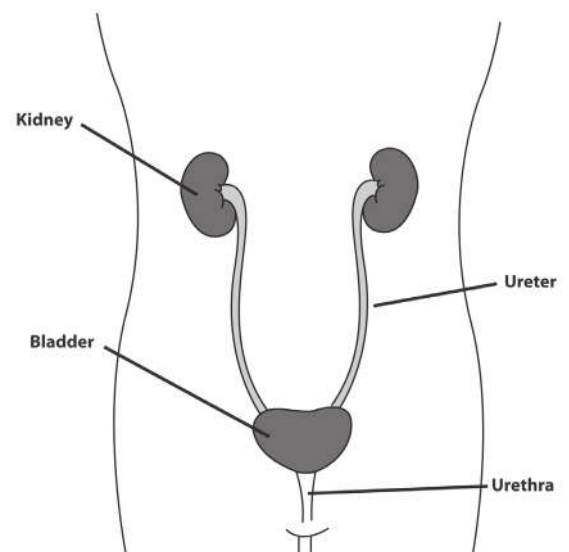
The breathing rate is controlled by the nervous system. Breathing speeds up automatically when the body needs more oxygen or needs to release more carbon dioxide, for example when exercising. Normal breathing rate at rest in adults is between 12 and 16 times a minute. It is higher in children. Fitness increases the efficiency of breathing. As a result the breathing rate of fit people increases less during exercise than that of unfit people.

Excretory system

Our bodies produce many waste products as a result of body processes. These waste products must be removed from our bodies because they can be harmful. The removal of waste products formed during body processes is called excretion. The excretory system removes wastes from the blood and regulates the body's fluids.

The main components of the excretory system include the kidneys, bladder and ureters. The kidneys filter harmful wastes from the blood and form urine. The ureters carry urine from the kidneys to the bladder. The bladder stores urine until it is released.

The diagram shows the excretory system in a human female.



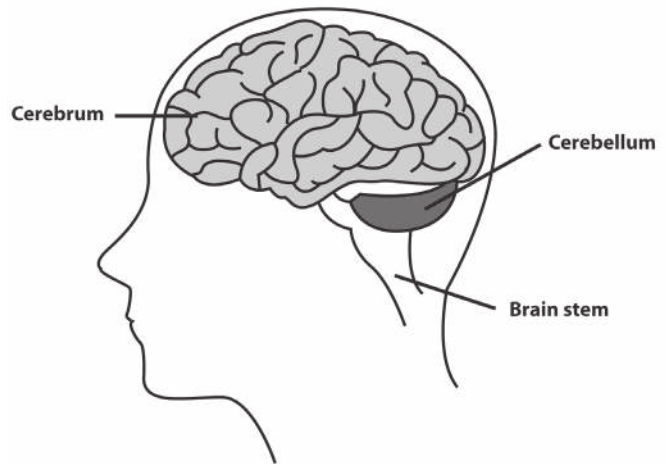
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The function of the excretory system is to collect blood containing waste substances such as urea, unwanted salts and excess water, and to filter it so that the wastes are removed. Useful substances such as glucose are absorbed back into the blood.

The nervous system

The main components include: the brain that processes and analyses information; the spinal cord which is the main communications link between the brain and the rest of the body; the nerves which are the cells that carry messages in the form of electrical impulses; and the receptors or sense organs which react to stimuli from the environment. The sense organs are: ears which react to sound; nose which reacts to smells; eyes which react to light; skin which responds to touch; and tongue which reacts to taste.

This unit deals with the brain. The three main parts of the brain are: (1) the cerebrum – this is the largest brain structure in humans and accounts for about two-thirds of the brain’s mass. It is divided into two sides, the left and right hemispheres, which are separated by a deep groove down the centre from the back of the brain to the forehead. The cerebrum controls most of our body functions including the senses, the body’s motor skills, reasoning and language; (2) the cerebellum – this consists of two peach-sized mounds of folded tissue located at the top of the brain stem and is responsible for coordinated movement and balance. The cerebellum is also involved in some learning pathways; and (3) the brain stem or medulla oblongata – this part of the brain connects to the spinal cord. The brain stem controls functions essential to the survival of all animals, such as heart rate, breathing, digestion and sleeping.



Unit overview

Topic	Number of lessons	Outline of lesson content	Resources in Learner’s Book	Resources in Activity Book	Resources in Teacher’s Resource
1.1 Body organs	1	The major body organs are the heart, stomach and intestines, lungs, kidneys and brain.	Activity 1.1 Questions 1–5	Exercise 1.1 Su	Worksheet 1.1
1.2 The heart	1	The heart pumps blood carrying food and oxygen to all parts of the body.	Questions 1–3	Exercise 1.2	Worksheet 1.2
1.3 Heartbeat and pulse	2	The heartbeat creates a pulse which increases during exercise.	Activity 1.3 SE Questions 1–5 SE	Exercise 1.3 SE Su	Worksheet 1.3A SE Ex Worksheet 1.3B SE Su Worksheet 1.3C SE Ex
1.4 The lungs and breathing	2	The lungs breathe in air containing oxygen and breathe out air containing carbon dioxide.	Activity 1.4 SE Questions 1–4	Exercise 1.4	Worksheet 1.4 SE

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1.5 The digestive system	2	Food is broken down into small particles by the process of digestion in the stomach and intestines and undigested food leaves the body as waste.	Questions 1–5	Exercise 1.5	Worksheet 1.5 Resource sheet 1.5
1.6 What do the kidneys do?	1	The kidneys remove waste products from the body.	Activity 1.6 Questions 1–4	Exercise 1.6 L Su	Worksheet 1.6
1.7 What does the brain do?	1 Note: The day before the lesson you will need to prepare the oatmeal.	The brain controls all body functions.	Questions 1–3 Challenge question Ex	Exercise 1.7	Worksheet 1.7 SE
Check your progress	1		Questions 1 L 2, 3 L , 5, 6	Language review L	Worksheet 1.8

Ex Extension **L** Language **SE** Enquiry **Su** Support

Resources

- newspaper
- white paper
- colouring pens
- crayons
- glue
- scissors
- the inner cardboard tube of a roll of kitchen paper or toilet roll or a paper cup with the bottom cut out
- a plastic washing up liquid bottle or water bottle with narrow drinking nozzle, filled with water
- chalk
- four empty containers
- red and blue balls, marbles or balloons
- a watch with a second hand
- scrap pieces of paper
- a stethoscope (if possible)
- large containers (for water)
- a bulb syringe
- a long balloon
- balloons
- a ball of string
- cardboard
- plastic bottles
- drinking straws
- plastic or paper bags
- bread
- iodine solution

- saucers
- droppers
- corn starch
- a measuring cylinder
- water
- beans
- oatmeal
- zip-lock plastic bags
- simple line diagrams of the human brain
- models, posters or pictures of human body systems

Topic 1.1 Body organs

The key concepts explored in this topic are that body organs work together to form systems that carry out the functions which keep us alive. Body organs are found in specific positions within the body.

Learning objectives

- Use scientific names for some major organs of body systems.
- Identify the position of major organs in the body.

Curriculum links

In Stage 4, learners found out that the brain, heart and lungs are protected by the skeleton.

Unit 1 Teaching notes

Ideas for the lesson

In this topic, learners will find out about the organs of the body through the use of diagrams and a hands-on activity that will help them develop an awareness of organ structure and function. In addition, they will learn the scientific names of the organs of the body.

- Begin the lesson by telling the class that we can think of the body in the same way as a city. Ask them what things a town or city needs to function. The city needs things such as an energy supply, a transport system, a waste removal system, a water supply system. It needs a police force to protect and defend it. A city needs a mayor and local government to make decisions and manage the activities of the city. You can then have an ideas session on which body organs and systems they think could do these jobs in our bodies. Record their ideas in a mind map on the board. You can ask them where in the body they think each organ is located and what its function is. Then get learners to do Activity 1.1.
- Next, ask the class to tell you the function of each of the organs using their best guess. They may know quite a few. For your reference, the functions of the major organs in the body are: **brain** – the part of the body that thinks and reasons and controls all body functions; **heart** – the circulatory organ that pumps blood carrying food and oxygen to all parts of the body (the blood also carries waste products to organs that remove them); **lungs** – two spongy, saclike organs in the chest that provide the body with oxygen and remove carbon dioxide from it; **liver** – a large, reddish-brown organ located in the upper right portion of the abdominal cavity that stores energy and breaks down harmful substances in the body. It also plays a role in digestion by secreting bile to help breakdown fats. Also, it helps in the formation of certain blood proteins and in the breakdown of carbohydrates, fats, and proteins; **stomach** – the enlarged, saclike portion of the alimentary canal. It is located in vertebrates between the oesophagus and the small intestine. The stomach starts the digestion of protein and mixes the chewed, swallowed food with digestive juices; **small intestine** – the part of the digestive system where digestion of proteins, fats and carbohydrates is completed. It is the place where nutrients are

absorbed by the blood; **large intestine** – the part of the intestine involved in re-absorption of water from undigested food from which nutrients have been removed. The remains of undigested food are then got rid of when they pass out of the anus; **kidneys** – a pair of organs that maintain proper water and salt balance and regulate blood acidity. They filter the blood of metabolic wastes, which are then excreted as urine.

- Finish the lesson by getting learners to answer questions 1–5 in the Learner's Book. Exercise 1.1 in the Activity Book is a useful support activity.

Notes on practical activities

Activity 1.1

Each group will need:

- a newspaper
- white paper
- colouring pens
- crayons
- glue
- scissors.

Learners should work in groups of 4 to 5.

The group members should be all boys or all girls to avoid any issues pertaining to gender relations in different cultures and to respect the individual feelings of learners.

A large poster of the human body will be helpful for learners to see the approximate size and position of the different organs in the body.

Stick sheets of newspaper together to form a sheet large enough for the size of the upper body. Each group should pick one learner to be the model for the body. Have the learner lie on the newspaper and have another learner trace around his or her body.

Have each group use the white paper to draw, label, colour and cut out the major organs of the body, which should be life size. You can prepare these in advance if time is short. Learners should glue the organs in their proper place on the human body by looking at a human body poster or the picture of the human body from the Learner's Book.

Internet and ICT

- http://www.kidsbiology.com/human_biology/index.php gives interactive explanations of how different body systems work.

Differentiation

- Lower achieving learners can consolidate their knowledge of the names and positions of body organs by completing Exercise 1.1 in the Activity Book.
- Higher achieving learners can do some research to find out about the functions and positions in the body of other organs, such as the pancreas and gall bladder.

Talk about it!

Learners should be able to recall from Stage 5 that the skeleton is important in protecting vital body organs. Ask them to think about the role of the skeleton in protection. They should know that the skull protects the brain and the ribs protect the heart and lungs.

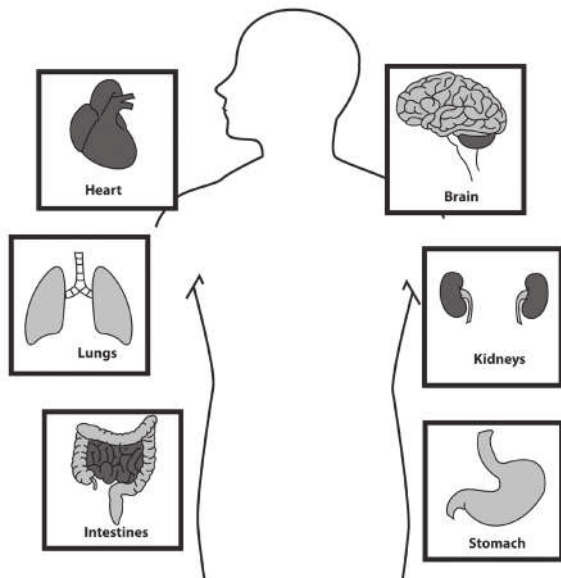
Homework ideas

- Worksheet 1.1. Discuss answers in class and allow learners to check their own work for self-assessment purposes.

Answers to Learner's Book questions

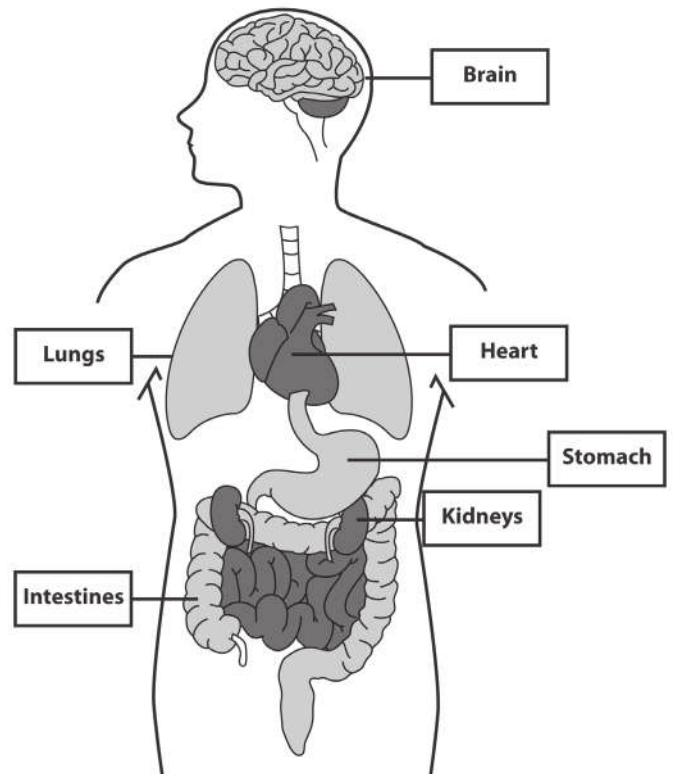
- 1 brain
- 2 heart, lungs
- 3 lungs, kidneys
- 4 stomach, intestines, kidneys
- 5 Answers will depend on learner's existing knowledge. Correct answers are:
 brain – control of body functions and allows us to think, talk and have feelings
 lungs – breathing
 heart – circulation of blood
 kidneys – excretion
 stomach and intestines – digestion

Answers to Activity Book exercise



Answers to Worksheets

Worksheet 1.1



Topic 1.2 The heart

The key concepts explored in this topic is that the heart is a muscle found in the chest that pumps blood through the blood vessels to all parts of the body. Blood supplies the body with food and oxygen and picks up waste products from body cells. The heart, blood vessels and blood make up the circulatory system.

Learning objectives

- Use scientific names for some major organs of body systems.
- Identify the position of major organs in the body.
- Describe the main functions of the major organs of the body.
- Explain how the functions of the major organs are essential.
- Consider how scientists have combined evidence from observation and measurement with creative thinking to suggest new ideas and explanations for phenomena.

Curriculum links

- In Stage 4, learners found out that muscles work by contracting and relaxing. The heart is a muscle which contracts and relaxes continuously.

Unit 1 Teaching notes

Ideas for the lesson

- Begin the lesson by asking the class to draw what they think their heart looks like. Does it really look like the hearts we see on greeting cards? What does the heart do? Is it responsible for feelings of love?
- Then show the class a poster or video clip that shows the external structure of the heart. Get learners to feel where their heart is and see how big it is by clenching their fists.
- Have learners work in same gender pairs and put the inner cardboard tube of a roll of kitchen paper towel (or toilet paper roll or a paper cup with the bottom cut out) on the chest of their partner and listen. Tell them that they may move the tube around until they hear something. Ask learners what they hear and where they think the sound is coming from. Explain that the sound is their hearts beating.
- Tell students that the heart is a muscle that pumps blood around the body in a system called the circulatory system. Talk about what the heart does and how it does it. The heart works like a pump to push the blood all the way round the body. Emphasise that blood only moves in 'tubes' called blood vessels: arteries, veins and capillaries. Also mention why the blood needs to be pumped around the body – to carry materials the body needs like oxygen and food to the rest of the body, and to carry waste material away from the body so it can be removed by other organs such as the lungs and kidneys.
- Make a simple model from a plastic washing up liquid bottle filled with water, which you squeeze to simulate the pumping action of the heart. You could also use a water bottle that has a narrow drinking nozzle as you need to build up pressure to squeeze the water through a narrow opening. Learners will observe that the water is pushed out of the bottle with force. Explain that by squeezing the bottle you put pressure on the water which makes it squirt out of the bottle. The heart works in the same way.
- Explain that the heart is a special type of muscle that contracts and relaxes on its own, constantly. It pumps blood to the lungs to pick up oxygen, returns the blood to the heart and then pumps it to the rest of the body in the arteries. Blood returning to the heart from body organs is de-oxygenated (with the exception of blood coming from the lungs) and contains carbon dioxide.

- Talk about earlier ideas about how the heart and circulation worked, such as the ancient Greeks' beliefs that the lungs pumped blood to other body organs and that blood was used up when it circulated around the body and the liver made new blood each time. Explain that we now know these ideas are incorrect due to the work of scientists who studied the human body. Then get learners to read about William Harvey's work and answer the questions in Worksheet 1.2.
- Discuss the functions of the heart and why we die when our heart stops beating. You could also talk about diseases and medical conditions that affect the heart. See the *Internet and ICT* section.
- Round off the lesson by getting learners to answer questions 1–3 in the Learner's Book.

Internet and ICT

- <http://www.fi.edu/learn/heart/index.html> is a good website for background information for teachers.
- http://www.bbc.co.uk/schools/gcsebitesize/pe/appliedanatomy/0_anatomy_circulatorysys_rev1.shtml gives comprehensive background for teachers on the heart and the circulatory system. It also includes an animation on circulation which can be shown to learners.
- http://www.bbc.co.uk/schools/gcsebitesize/science/21c/keeping_healthy/heartdiseaserev4.shtml has an animation on heart beat.

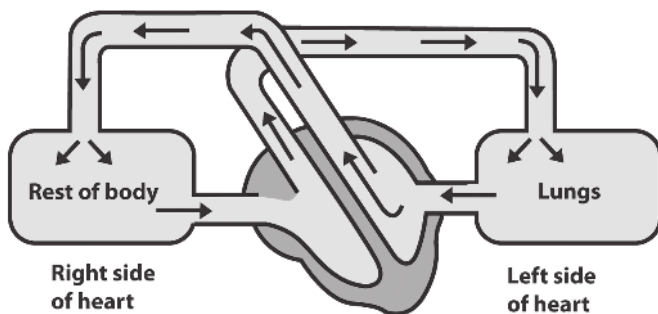
Assessment

- Can learners name the parts of the circulatory system and their functions?
- Can learners explain why the blood must be pumped to the lungs before it goes to the rest of the body?

Differentiation

- Lower achieving learners may struggle to understand the pathway of blood through the body. Use a simple schematic diagram such as the example given here to explain that the blood flows through two circuits in the body – to the lungs to drop off carbon dioxide and pick up oxygen and then to the rest of the body to supply food and oxygen and take away carbon dioxide.

- A more visual and interactive way to show the pathway of blood through the body is to make a large labelled outline of the drawing below on newsprint or newspaper or even in chalk on the floor. It should be large enough for learners to walk through. Place a container of red balls, marbles or balloons and an empty container on the part labelled 'lungs'. Place a container of blue balls, marbles or balloons and an empty container on the part labelled 'rest of the body'. The red balls represent oxygenated blood and the blue balls represent carbon dioxide. Get the learners to act the part of the blood by picking up red balls and carrying them to the heart and then moving faster to take them to the rest of the body. Here they drop the red balls into the empty container and pick up blue balls which they carry back to the heart and then to the lungs. At the lungs they drop the blue balls into the empty container and pick up more red balls to take to the body. You can label the containers 'oxygen' (red balls) and carbon dioxide (blue balls).



- Higher achieving learners can discuss the Challenge question and do some research to find the answer. They could look at these websites: www.medikidz.com/medipedia/heart-attack; encyclopedia.kids.net.au/page/he/Heart_attack; kidshealth.org/kid/grownup/conditions/heart_disease.html. A heart attack is when the supply of blood to the heart muscle is interrupted. This means that the muscle does not get enough oxygen so it cannot work properly.

Common misunderstandings and misconceptions

- A common misconception at this level is that the blood in the veins is blue. This is due to the fact that in diagrams of the circulatory system we show the veins in blue and the arteries in red. Venous blood is red, but darker red than arterial blood as the veins carry deoxygenated blood which is darker in colour than oxygenated blood. The exception to this is the pulmonary vein which carries oxygenated blood back to the heart.

Talk about it!

Ask learners for their ideas about this. They may have seen programmes on TV in which doctors or paramedics feel for the patient's pulse to see if they are still alive. Get them to find their own pulse by feeling their wrist or neck. Explain that the pulse is caused by the pressure of blood as the heart pumps it to the rest of the body.

Homework ideas

- Exercise 1.2 in the Activity Book. Discuss the answers in class and allow learners to check their own work for self-assessment purposes.

Answers to Learner's Book questions

- It pumps blood through your body.
 - To supply all parts of the body with food and oxygen carried in the blood and to remove waste products from the different parts of the body.
- The heart muscle contracting as it pumps the blood.
- To pick up oxygen that is then carried in the blood to the rest of the body.

Challenge

A heart attack is when the heart muscle itself does not receive enough oxygen and food, and stops beating or does not beat properly. It is caused by the blood vessels that supply the heart muscle with blood becoming blocked so that they cannot bring enough blood carrying oxygen and food to the heart.

Unit 1 Teaching notes

Answers to Activity Book exercise

- 1
 - a circulatory system
 - b blood
blood vessels
- 2
 - a The heart pumps **blood** through the body.
 - b The left side of the heart pumps **blood** that contains **oxygen**.
 - c The right side of the heart pumps **blood** without **oxygen** to the **lungs**.
 - d Blood is carried in the **blood vessels**.
 - e Blood carries **food** and **oxygen** to all parts of the body and takes away **waste products**.

Answers to Worksheets

Worksheet 1.2

- 1 They thought that: the lungs moved the blood around the body; the body used up the blood for energy as it flowed to the different organs; the heart's job was to control our feelings.
- 2 He observed water pumps in London.
- 3
 - a He studied the heart and blood vessels and carried out experiments.
 - b To make sure that his observations and results were reliable and correct.
- 4
 - a He observed that in one hour the heart pumps more than the body's weight in blood.
 - b The heart works by muscle contraction to pump blood to body organs. Blood is carried away from the heart by arteries and returns to the heart through veins. Gases enter and leave the blood in the lungs.

Topic 1.3 Heartbeat and pulse

The key concept explored in this topic is the beating of the heart – this causes a pulse which we can feel in our wrists or neck. Pulse rate increases as the heart beats faster, for example, during exercise.

Learning objectives

- Identify factors that are relevant to a particular situation.
- Decide when observations and measurements need to be checked by repeating to give more reliable data.
- Evaluate repeated results.
- Use tables, bar charts and line graphs to present results.

- Make comparisons.
- Identify patterns in results and results that do not appear to fit the pattern.
- Identify factors that are relevant to a particular situation.
- Collect evidence and data to test ideas including predictions.
- Make predictions using scientific knowledge and understanding.
- Choose which equipment to use.
- Make a variety of relevant observations and measurements using simple apparatus correctly.
- Use results to draw conclusions and to make further predictions.
- Say if and how evidence supports any prediction made.

Curriculum links

- Learners draw bar charts in Worksheets 1.3b, line graphs in Worksheet 1.3c and calculate averages in Exercise 1.3, which are all linked with Mathematics.

Ideas for the lesson

- Begin the lesson by handing out a piece of scrap paper to each learner. Tell them to crumple it into a ball and hold it in their hand. Watch the clock and count to 90 in one minute. You may want to try this yourself first to make sure you can fit 90 counts into a minute. Tell learners to squeeze the paper ball each time a number is said. This demonstrates how strong the heart is and how hard it works.
- If possible, bring a stethoscope to class so learners can listen to their heartbeats. You could try and borrow one from a local clinic or medical practitioner or ask a doctor or nurse to visit the school to demonstrate the use of the stethoscope.
- You can use a model to demonstrate the expansion and contraction of blood vessels as blood is pumped through them. You need a large container of water, a bulb syringe, a long balloon. Get a learner to assist you. Fill the bulb with water and secure the balloon over the tip of the bulb. Get the learner to hold the balloon. Gently squeeze and release the bulb so that the balloon repeatedly fills with water. The learner will feel the expansion and contraction as the bulb pumps water and then stops. This models the expansion and contraction of blood vessels as the heart beats.