

THE CIRCULATORY SYSTEM



THE CIRCULATORY SYSTEM - TEACHER NOTES

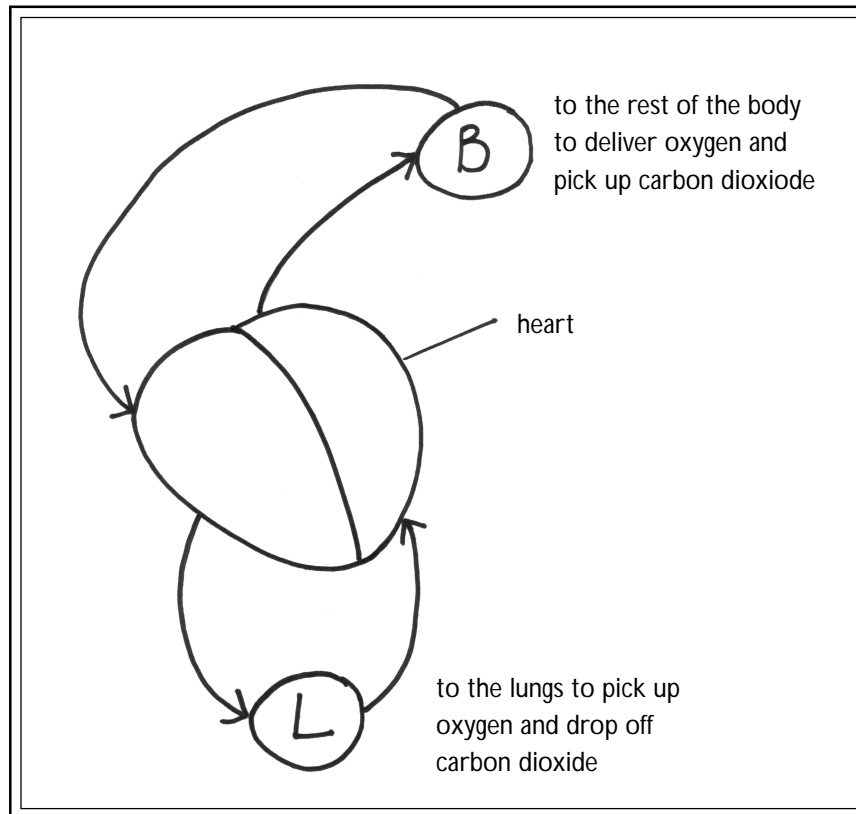
What it does:

- The body's transport system
- It carries oxygen and nutrients to the body
- Washes the waste away to the liver, kidney and lungs for disposal
- Is the transport system for the immune system

What body parts are involved:

- heart
- blood
- blood vessels - arteries, veins, capillaries

What it looks like:



How it works:

- The heart is the circulatory system's 'engine'. It is a strong muscle that contracts automatically and pushes blood around the body. The blood, driven by the heart, delivers food and nutrients to the body.
- The heart is actually a double pump with two pairs of pumping chambers (see diagram previous page). Specialised flap-like valves in the internal spaces of the organ mean that each side of the heart allows blood to move in only one direction.
- Each side of the heart has its own job to do. The left side receives oxygen rich blood from the lungs and pumps it to the body. The right side receives oxygen depleted and carbon dioxide rich blood which has come from the body, and pumps it to the lungs where the blood off-loads the carbon dioxide and picks up oxygen. This blood then returns to the left side of the heart to be pumped to the rest of the body and the cycle begins again.

Other facts to know:

- The tubes which blood passes through are all called blood vessels. Arteries are thick walled blood vessels that carry blood under high pressure away from the heart, and veins are thinner-walled blood vessels that carry blood, under much lower pressure, back to the heart again. Linking these large blood vessels are networks of increasingly fine blood vessels (arterioles and venules) which eventually join up in a mesh of the thinnest blood vessels - capillaries.
- Blood is the central transportation facility in our bodies. It flows past every living cell delivering essential supplies and removing waste. Adults have up to 6 litres of blood flowing through their bodies.
- Blood consists of billions of cells suspended in a watery liquid. As well as delivering oxygen and food and removing waste, blood carries heat around the body and helps it to fend off attack by invading organisms.
- There are 4 basic parts that make up blood; the watery plasma, red blood cells, white blood cells, and tiny platelets. Plasma is a watery, yellowish liquid that contains dissolved substances, such as the products of digestion. Red blood cells are the most numerous and are responsible for carrying oxygen. White blood cells are larger than red blood cells and much less numerous. There are many different types of white blood cells and these are key players in the body's defence system. Platelets are only about a third the size of red blood cells. Platelets help the blood to clot by sticking together to form a mass which blocks small blood vessel wounds.
- Blood cells are formed in either the bone marrow (a spongy substance in the centre of our bones), or in the tissues of the lymphatic system (eg the lymph nodes, tonsils and spleen).
- A drop of blood contains approximately 250,000,000 red blood cells, 375,000 white blood cells, and 16,000,000 platelets.
- Blood which is rich in oxygen (ie has just come from the lungs) is bright red, while blood which is oxygen depleted is bluish. People who aren't getting enough oxygen sometimes appear bluish.



- Many veins, particularly those in the leg, contain vein valves to stop blood flowing back in the direction of gravity. If a vein valve fails to close properly, a vein can fill up with blood and become stretched and twisted, or varicose.
- During an average lifetime, the heart will beat more than two billion times, and will pump enough blood to fill over 100 full-sized swimming pools. Despite this amazing workload, a healthy heart never stops to rest.
- During a heart attack, part of the heart muscle dies because its oxygen supply is cut off. It is usually caused by a blockage of a coronary (heart) artery.
- The left side of the heart is stronger than the right side. The left side needs to pump the blood all around the body, while the right side only pumps the blood to the lungs and back to the heart again.
- The sounds of the heartbeat are the one-way valves in the heart banging shut.



CIRCULATION ACTIVITIES

Activity Title: Cardboard tube stethoscopes
Starter activity

Level: All

Resources/Apparatus Required: Cardboard tubes

Specific learning outcome: Students will understand that our bodies make noises when our heart beats

Curriculum links: **Health and Physical Education**
Personal health and physical development

Science
Living world

Essential Skills
Communication, information, self-management and competitive skills, work and study.

Directions:

- 1 Give the students a cardboard tube each and explain to them that this is their stethoscope for listening to their heart beat.
- 2 In pairs, get the students to listen to each other's heart and discuss what they can hear. Use this as a lead in to a discussion of the circulatory system.
- 3 To extend, get the students to listen to each other's hearts at different times of the day (eg just before and just after playing at lunch time).



Activity Title: How exercise effects our heart rates

Level: Y4-Y6

Resources/Apparatus Required: Watches with second hands

Specific learning outcome: Students will understand that our hearts beat faster when we exercise

Curriculum links: **Health and Physical Education**
Personal health and physical development

Science
Living world

Essential Skills
Communication, information, self-management and competitive skills, work and study.

Directions:

- 1 Explain how to measure our heart rates.
- 2 Get the students to sit still for 1 minute and then have their partner measure their heart rate.
Explain to them that this is their resting pulse.
- 3 Now get the students to exercise for 1 minute and then measure the heart rate.
- 4 Use as a lead in to a discussion about why our hearts beat faster and the long-term effects of exercise on our hearts.



Activity Title: The volume of blood in our bodies

Level: Y3-Y6

Resources/Apparatus Required: A container large enough to hold 6 litres
Red food colouring

Specific learning outcome: Students will understand how much blood circulates through their body

Curriculum links: **Health and Physical Education**
Personal health and physical development

Science
Living world

Mathematics
Measurement

Essential Skills
Communication, information, social and co-operative skills,
work and study

Directions:

- 1** Explain to the students that they have around 6 litres of blood that circulates around their body.
- 2** To see what 6 litres looks like, get the students to measure out this amount and pour into a large container.
- 3** Add some red food colouring for effect and discuss whether this is more or less than they imagined.



Activity Title: How many times does your heart pump?

Level: Y5-Y6

Resources/Apparatus Required: Calculators

Specific learning outcome: Students will calculate the amount of times that the heart needs to pump to move blood around their bodies

Curriculum links: **Health and Physical Education**
Personal health and physical development

Science
Living world

Mathematics
Numbers

Essential Skills
Communication, information, work and study

Directions:

- 1 Explain how to measure the heart beat and calculate how many times the heart beats per minute.
- 2 Get the students to now calculate how many times their heart beats during an hour, a day, a week, a month, and a year.
- 3 Discuss what students can do to keep their hearts healthy and pumping blood around their bodies.



Activity Title: It's hard work being a heart

Level: Y3-Y6

Resources/Apparatus Required: Stopwatch

Specific learning outcome: Students will understand how much their heart pumps

Curriculum links: **Health and Physical Education**
Personal health and physical development

Science
Living world

Essential Skills
Communication, information, physical skills, work and study

Directions:

- 1 Get the students to make their hand into a fist.
- 2 Now get them to squeeze their fist, let go, and squeeze again (so that they're doing around 1 squeeze per second).
- 3 Explain to them that this is what their heart has to do right throughout their lives without stopping.
- 4 Time a minute and see if the students can continue to squeeze their hand for this long
- 5 How does it feel at the end of a minute?



Activity Title: **The blood train**
Revision activity

Level: Y4-Y6

Resources/Apparatus Required: Cardboard circles in two colours (one with Oxygen written on it, one with Carbon Dioxide written on it)

Specific learning outcome: Students will understand the role of blood in their bodies

Curriculum links: **Health and Physical Education**
Personal health and physical development

Science
Living world

Essential Skills
Communication, information, social and co-operative skills,
work and study

Directions:

- 1** Explain to the students that they are going to act out what blood does in the human body.
 - 2** Tell them to form a chain and that each of them represents a red blood cell. The teacher is going to be the heart and will set the pace for the blood rushing around the body. Set up two stations; one is the 'rest of the body', the other the 'lungs'.
 - 3** Get the students to move in a chain to the lungs and pick up Oxygen (cardboard circles) from the lungs and move to the 'rest of the body'. At the 'rest of the body' they will need to drop off their Oxygen and pick up Carbon Dioxide to take back to the 'lungs'. Get them to droop as they pick up the Carbon Dioxide and move to the lungs to drop it off. When they drop it off and pick up more Oxygen, get them to stand up straight again.
 - 4** Vary the game by telling them that the body is exercising so the heart is pumping faster to take more Oxygen to the rest of the body and get them to pick up the pace accordingly.
- To extend the game, add the digestive system and include the movement of nutrients around the body.

