Spring Block 3

# The circulatory system



White Rose SCIENCE

# Small steps

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| Step 1 | The circulatory system |
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| Step 3 | The heart |
| Step 4 | Blood flow in the heart |
| Step 5 | Oxygenated and deoxygenated blood |
| Step 6 | Dissection of the heart |

# The circulatory system

## Notes and guidance

In Year 4, children learnt about the digestive system. In this small step, children are introduced to the circulatory system for the first time. Children should understand that the circulatory system is another system within our bodies that has a different overall function.

In this step, children identify that the circulatory system is made up of the heart, blood vessels and blood, and that these work together to circulate blood around the body. Children should identify that there are three main types of blood vessel (arteries, veins and capillaries). Arteries take blood away from the heart, veins carry blood towards the heart and capillaries link arteries and veins together. The role of the heart and the difference between oxygenated and deoxygenated blood are concepts that are explored in later steps. Children are introduced to the enquiry question in this step and will carry out a research enquiry.

## Things to look out for

- Children may think that the circulatory system is one thing, rather than different parts working together.
- Children may confuse arteries, veins and capillaries.

## Key questions

- What is the function of the circulatory system?
- What are the three main parts of the circulatory system?
- What is the function of the heart?
- What is the function of the blood vessels?
- What is blood?
- What are the three main types of blood vessel called?
- What is the function of each of the main types of blood vessel?

## Enquiry question

- What is the circulatory system and how does it work?

## National curriculum links

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.
- **Working scientifically** – Explore ideas and raise different kinds of questions (non-statutory).

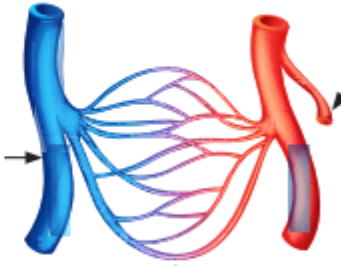
# The circulatory system

## Key vocabulary

- **circulatory system** – parts of the body that work together to move blood around the body

- **heart** – the organ responsible for pumping blood around the body

- **blood vessels** – tubes within the body that carry blood



**veins** – blood vessels that carry blood towards the heart

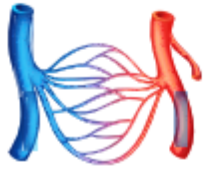
**arteries** – blood vessels that carry blood away from the heart

**capillaries** – blood vessels that connect veins and arteries

## Practical ideas

- Give the children three labels and a diagram of blood vessels.

arteries | veins | capillaries



Ask children to add the labels to the diagram of the blood vessels.

Encourage the children to describe the function of each type of blood vessel.

## Factual knowledge

- The circulatory system moves blood around the body.
- It is made up of the heart, blood vessels and blood.
- The blood vessels that move blood towards the heart are called veins.
- The blood vessels that move blood away from the heart are called arteries.
- Capillaries are small blood vessels that link veins and arteries together.

# Blood

## Notes and guidance

In the previous step, children have looked at an overview of what the circulatory system is and how the heart pumps blood around the body. In this small step, children look at the composition of blood more closely, and explore the other functions carried out by blood.

By the end of this step, children should identify that blood is made up of plasma, red blood cells and white blood cells. They should understand that the main function of red blood cells is to carry oxygen from the lungs to the rest of the body. They should also know that plasma carries nutrients, water and other substances around the body and that white blood cells attack viruses and bacteria. Children learnt about viruses and bacteria in the autumn term, so this step can be used to further their understanding of microorganisms.

## Things to look out for

- Children may think that blood only has one function.
- Children may think that blood is only made up of red blood cells, because it is red.

## Key questions

- What is the role of blood in the circulatory system?
- What do the cells in our body need to survive?
- What are the different parts of the blood called?
- What is the function of each part of the blood?
- Where do we get oxygen/nutrients from?
- Why do we need oxygen/nutrients?
- Why do we need white blood cells?

## Enquiry question

- What is the circulatory system and how does it work?

## National curriculum links

- Describe the ways in which nutrients and water are transported within animals, including humans.
- **Working scientifically** – Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas (non-statutory).

# Blood

## Key vocabulary

- **red blood cells** – part of the blood that carries oxygen and removes waste products

- **white blood cells** – part of the blood that fights viruses and bacteria

- **lungs** – organs that exchange gases during breathing

- **nutrients** – substances that provide the important nourishment we need for our bodies to grow and repair themselves
- **plasma** – part of the blood that carries nutrients
- **oxygen** – a gas in the air we breathe that all cells in our body need to survive

## Practical ideas

- Provide children with labels.

| | |
|---|---|
| nutrients | plasma |
| red blood cells | white blood cells |

Ask the children to draw and label a diagram showing the contents of the blood. Encourage them to use the words from the cards.

- Children could also make a model of blood using different materials to represent the red and white blood cells and plasma.

## Factual knowledge

- Blood transports nutrients and oxygen to all parts of the body, and takes waste, such as carbon dioxide, away.
- Nutrients are carried in the plasma to provide the nourishment cells need to repair themselves and grow.
- Oxygen is carried in red blood cells from the lungs to all cells in our body.
- White blood cells help to fight bacteria and viruses in our body to prevent illness.

# The heart

## Notes and guidance

In this small step, children look at the heart and its function within the circulatory system. In Year 3, children were introduced to the term "muscles" and looked at their function within the body. In this step, children learn that the heart is a muscle. Children should explain that the heart is a pump and should understand that when the heart contracts, it pumps blood around the circulatory system, through the blood vessels.

Show the children a cross-section of a heart, where they will see that it is made up of four chambers. They should identify that the heart is divided into two halves (right and left), each consisting of two chambers (atrium and ventricle). Children will already be familiar with a lot of the vocabulary of this block, but the terms "atria" and "ventricles" will be new to them, so allow time to learn these words and what they refer to. Children will investigate the effects of exercise on heart rate in the next block.

## Things to look out for

- Because children cannot control their heart, they may not realise it is a muscle.
- Children may think that the heart is one solid or empty vessel, rather than split into four different chambers.

## Key questions

- What is the circulatory system?
- What is the function of the circulatory system?
- What is the role of the heart in the circulatory system?
- What are the four chambers of the heart?
- How does the heart work?
- Why does the heart need to pump blood around the body?

## Enquiry question

- What is the circulatory system and how does it work?

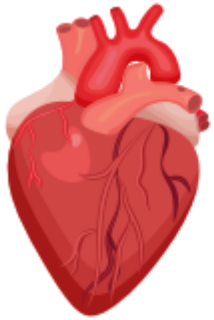
## National curriculum links

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.
- **Working scientifically** – Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas (non-statutory).

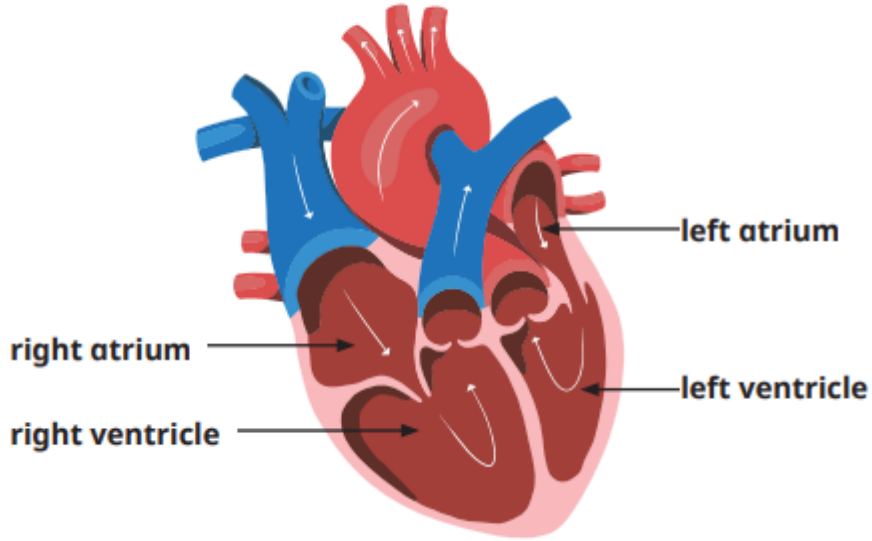
# The heart

## Key vocabulary

- **heart** – the organ responsible for pumping blood around the body



- **atria** – the top two chambers in the heart
- **ventricles** – the bottom two chambers in the heart




## Practical ideas

- Ask children for different ways that they can tell their heart is beating. Discuss that you can feel your heartbeat on your chest, but the more precise methods are using a stethoscope or taking a pulse.

  Show children how to take their own pulse in different places around the body.

  Children should explain that every heartbeat or pulse is the heart pumping blood around the body. They will explore how the heart beats faster during and after exercise in Spring Block 4

## Factual knowledge

- The heart is part of the circulatory system.
- The heart is a muscle which beats regularly.
- As the heart beats, it pumps blood around the body.
- The heart is split into four chambers. It has two atria and two ventricles.

# Blood flow in the heart

## Notes and guidance

In this small step, children look at blood flow in the heart. Use this step to recap that the heart is a muscle and that it is made up of four chambers. Children should identify that the role of the heart within the circulatory system is to pump blood around the body.

By the end of this step, children should understand that blood flows in one direction around the body and through the heart. They should be aware that there are valves within veins that stop blood from flowing backwards. Children should be able to explain that when blood flows into the heart, it flows into the atria at the top of the heart, then down into the ventricles, before leaving the heart again. Both the left and right sides of the heart pump at the same time, causing the heart to act as a double pump system.

## Things to look out for

- If children think of the heart as something that squeezes the blood, causing it to move, they may not understand why blood only moves in one direction.
- Children might think that blood flows from the top of the heart to the bottom of the heart purely due to gravity.

## Key questions

- What is the function of the circulatory system?
- What is the function of the heart within the circulatory system?
- What are the names of the different chambers of the heart?
- What do arteries and veins do?
- How do the veins make sure the blood only moves in one direction?
- Why is it important that blood only moves in one direction?

## Enquiry question

- What is the circulatory system and how does it work?

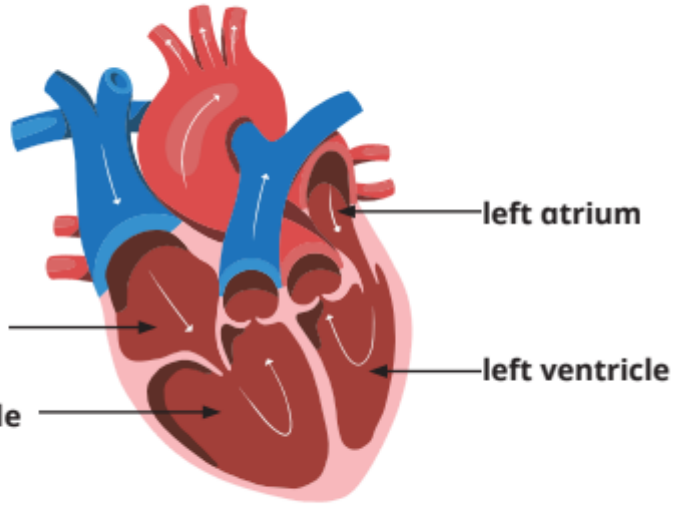
## National curriculum links

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.
- **Working scientifically** – Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas (non-statutory).

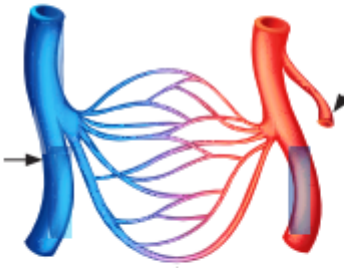
# Blood flow in the heart

## Key vocabulary

- **atria** – the top two chambers in the heart
- **ventricles** – the bottom two chambers in the heart




- **blood vessels** – tubes within the body that carry blood



**veins** – blood vessels that carry blood towards the heart

**arteries** – blood vessels that carry blood away from the heart

**capillaries** – blood vessels that connect veins and arteries

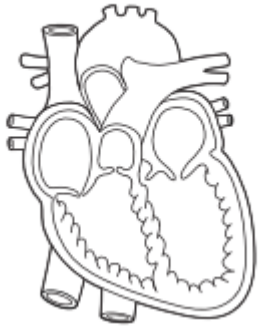
## Practical ideas

- Provide children with a blank heart template.

  Ask children to label the four chambers of the heart.

  Children should then draw and label blood flow through the heart.

  They should identify that blood flows into the right atrium, then out of the right ventricle to the lungs.



  Blood returning from the lungs flows into the left atrium and out of the left ventricle towards the rest of the body.

## Factual knowledge

- Blood flows through the heart as part of its journey through the circulatory system.
- Veins carry blood towards the heart. They have valves to stop the blood flowing in the wrong direction.
- Blood then flows through the right atrium, then out of the right ventricle to the lungs.
- Blood from the lungs then flows into the left atrium and out of the left ventricle towards the rest of the body.

# Oxygenated and deoxygenated blood

## Notes and guidance

In previous steps, children have learnt what the circulatory system is and the role of the heart within this system.

Children should know that one of the key roles of blood is to take oxygen to all parts of the body. Blood that has high levels of oxygen in it is known as "oxygenated blood". Once this oxygen has been taken to the parts of the body, the blood contains little oxygen and is now known as "deoxygenated blood". Blood continues to flow around the body so that oxygenated blood can reach the parts of the body, and deoxygenated blood can travel to the lungs to receive more oxygen.

Within this step, children should refer to the four chambers of the heart and should explain that the right side of the heart pumps deoxygenated blood to the lungs, while the left side of the heart pumps oxygenated blood to the rest of the body.

## Things to look out for

- Children may think that because deoxygenated blood travels to the heart, that is where it becomes oxygenated.
- Children may think that deoxygenated blood is blue.

## Key questions

- What is the function of the circulatory system?
- How are veins and arteries the same/different
- Why does blood flow through the heart?
- What is oxygenated blood?
- What is deoxygenated blood?
- Why do you think blood needs oxygen?
- What is the function of each side of the heart?

## Enquiry question

- What is the circulatory system and how does it work?

## National curriculum links

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.
- **Working scientifically** – Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas (non-statutory).

# Oxygenated and deoxygenated blood

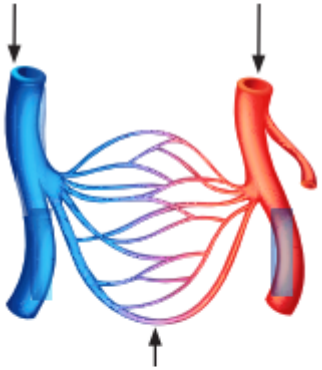
## Key vocabulary

- **lungs** – organs that exchange gases during breathing

- **blood vessels** – tubes within the body that carry blood

**veins** – blood vessels that carry blood towards the heart

**arteries** – blood vessels that carry blood away from the heart



**capillaries** – blood vessels that connect veins and arteries

- **oxygenated blood** – blood that is carrying lots of oxygen
- **deoxygenated blood** – blood that is carrying little oxygen

## Practical ideas

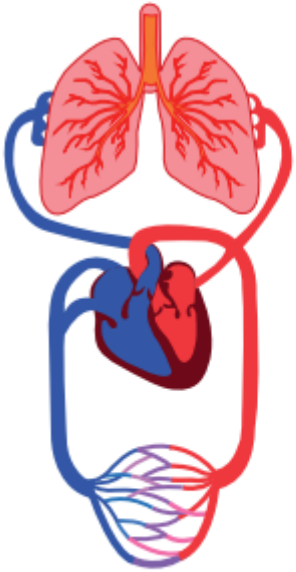
- Organise children into small groups.

  Give each group a large print out of the circulatory system and blue and red counters.

  The red counters represent oxygenated blood and the blue counters represent deoxygenated blood.

  Ask the children to show the pathway of oxygenated and deoxygenated blood throughout the circulatory system using the counters.

  Children can then provide a verbal explanation of this process.



## Factual knowledge

- Oxygenated blood is blood that carries lots of oxygen.
- Deoxygenated blood is blood that has little oxygen in it.
- Oxygenated blood mostly travels from the heart through the arteries.
- Deoxygenated blood mostly travels from the parts of the body back to the heart, through veins.

# Dissection of the heart

## Notes and guidance

Children carry out or observe a heart dissection to learn more about the physical structures of the heart and how they help with its function. Remind children that the heart is split into four chambers. The left side of the heart is thicker than the right, meaning it is a stronger muscle, because it must pump with greater force in order to move oxygenated blood around the whole body.

Note that some children may be sensitive about the dissection or may object on ethical, cultural or religious grounds. Also, it is essential to carry out a prior risk assessment. There are many ways in which you may show the children a dissection of the heart: either in person, at a workshop, in a video or simply through pictures. Children should be given the opportunity to form an answer to the enquiry question within this step.

## Things to look out for

- Children may confuse the roles of the left and right sides of the heart.
- Children may be confused about which sides of the heart we call the left and right sides.
- Children may not understand the significance of the left side of the heart being thicker than the right side.

## Key questions

- What is the circulatory system?
- What is the function of the heart within the circulatory system?
- What is the function of each side of the heart?
- What is the physical difference between the sides of the heart?
- Why do you think there is a difference between the left and right sides of the heart?

## Enquiry question

- What is the circulatory system and how does it work?

## National curriculum links

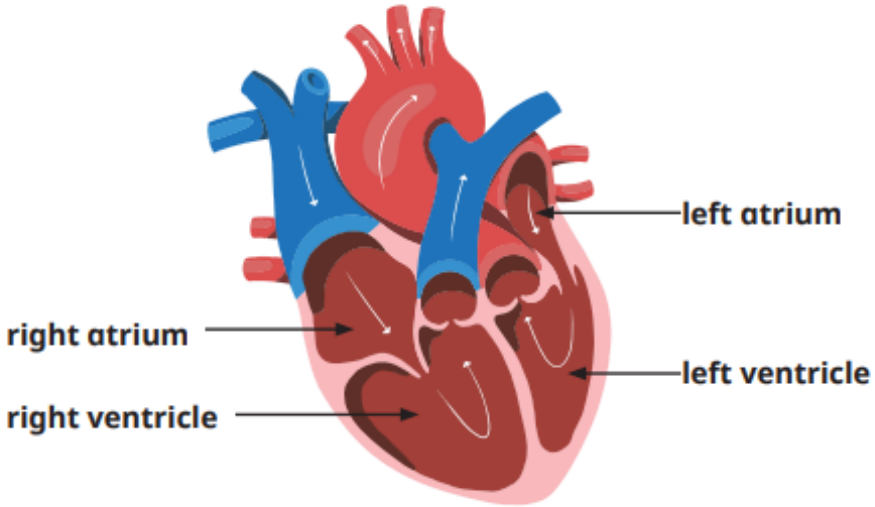
- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.
- **Working scientifically** – Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations.

# Dissection of the heart

## Key vocabulary

- **heart** – an organ that pumps blood around the body. It is split into four chambers

- **atria** – the top two chambers in the heart
- **ventricles** – the bottom two chambers in the heart




- **dissection** – the act of carefully cutting part of a body or plant to study it further

## Practical ideas

- Source a real heart from a local, licensed distributor and model dissecting it to the class.

  Place the heart on a flat surface with the large, diagonal fold facing towards you.

  Use the fold as a guide and begin to cut from the top to the bottom of the heart (away from your body). Do not cut deeply as this will damage the chambers inside the heart.

  Open the heart by gently pulling the edges of the cut/ opening.

  Observe the four chambers of the heart, ensuring the blood vessels are at the top to represent its position inside the body.

  Alternatively, show children an online video or book a dissection workshop to demonstrate a heart dissection.

Ensure children have been briefed fully beforehand and a proper risk assessment has been carried out.

## Factual knowledge

- The left ventricle is thicker than the right ventricle because moving blood around the whole body requires more force than moving blood to the lungs.