The heart and circulation

Teacher review edition. Ask your teacher if anything is unclear.

How does blood deliver oxygen and nutrients around the body?

What you will learn

- Describe the main blood components and their jobs.
- Compare arteries, veins and capillaries.
- Trace blood through the heart, lungs and body.
- Explain how circulation links digestion and respiration.

Why do we need a circulatory system?

Body cells need oxygen and nutrients. They also produce wastes, including carbon dioxide. The circulatory system transports these substances around the body.

The system consists of the heart, blood and blood vessels. The heart is a muscular pump that keeps blood moving.

What is in blood?

Red blood cell
A blood cell that carries oxygen using haemoglobin.

Plasma
The liquid part of blood that carries cells and dissolved substances.

Component	Job
Red blood cells	Carry oxygen using a substance called haemoglobin.
White blood cells	Help defend the body against infection.
Platelets	Help blood clot at a damaged blood vessel.
Plasma	The liquid that carries blood cells and dissolved substances, including nutrients and wastes.

Three types of blood vessel

Artery
A blood vessel that carries blood away from the heart.

Vein
A blood vessel that carries blood towards the heart.

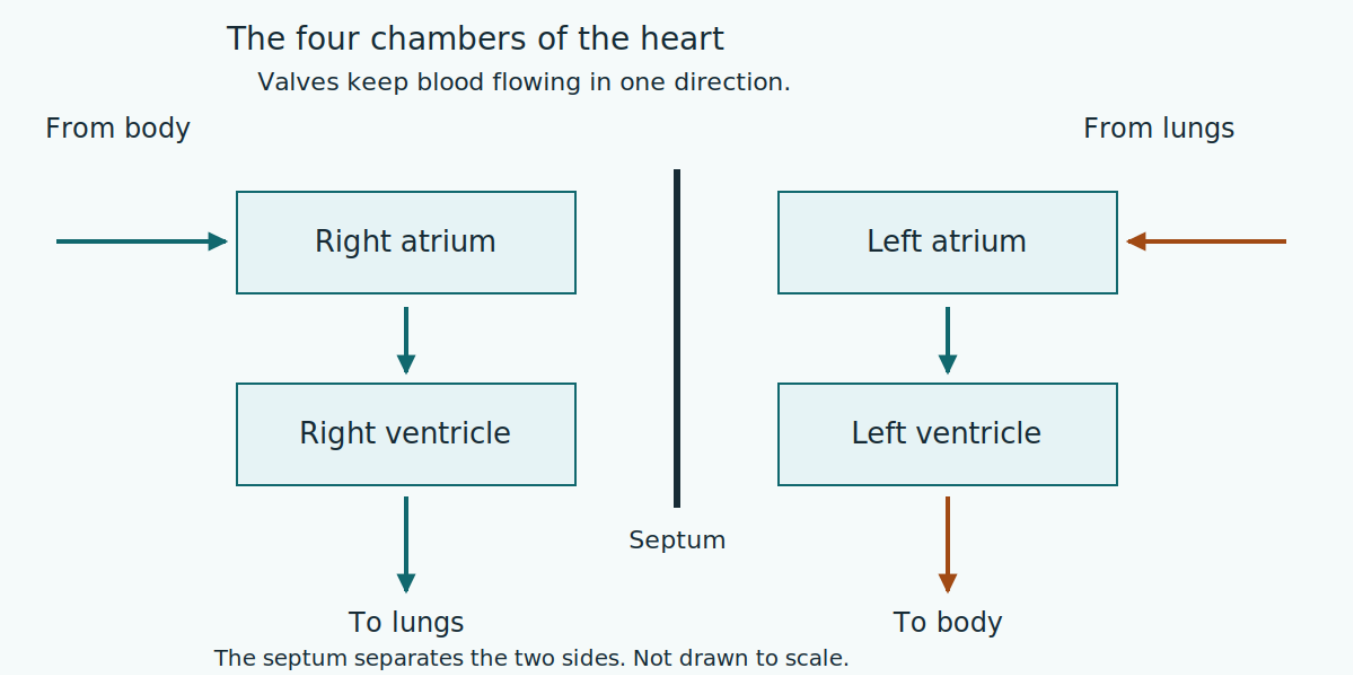
Capillary
A tiny, thin-walled blood vessel where substances pass between blood and cells.

Vessel	Direction and function
Artery	Carries blood away from the heart. Thick, strong walls withstand high pressure.
Vein	Carries blood towards the heart. Many veins have valves that prevent backflow.
Capillary	A tiny vessel with a very thin wall. Substances pass between blood and nearby cells.

The heart has four chambers

The heart has four chambers. Its structures keep blood moving along the correct routes.

- Atria: the two upper chambers receive blood.
- Ventricles: the two lower chambers pump blood away.
- Valves prevent blood flowing backwards.
- The septum separates the right and left sides.
- The left ventricle has a thicker muscular wall because it pumps blood around the body. The right ventricle pumps blood the shorter distance to the lungs.



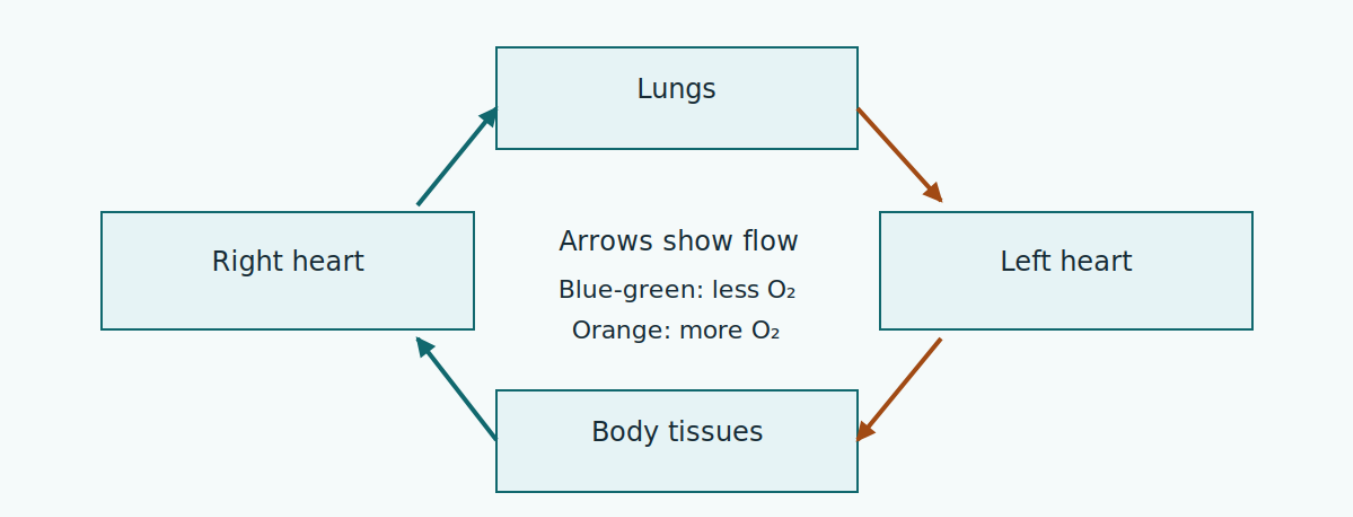
Follow the arrows through the four chambers. The right side pumps to the lungs; the left side pumps to the body. Blue and red distinguish oxygen levels; blood itself is red.

Follow the blood around the body

> **Double circulation**
> The two linked routes of blood: heart to lungs and heart to body.

Blood passes through the heart twice on a complete journey around the lungs and body. This is called double circulation.

- Body → vena cava → right atrium → right ventricle.
- Right ventricle → pulmonary artery → lungs.
- Lungs → pulmonary veins → left atrium → left ventricle.
- Left ventricle → aorta → body.



There are two linked circuits: heart → lungs → heart, then heart → body → heart. Follow the arrowheads to trace the route.

Picking up and delivering oxygen

Blood picks up substances in one place and delivers them elsewhere.

- At the lungs, oxygen enters the blood and carbon dioxide leaves it. Oxygen-rich blood returns to the left side of the heart.
- At body tissues, oxygen and nutrients move from blood to cells. Carbon dioxide moves into the blood, which returns to the right side of the heart.
- The pulmonary artery carries oxygen-poor blood away from the heart to the lungs. An artery is defined by flow direction, not oxygen content.
- Blue on a diagram marks oxygen-poor routes. Human blood is red.

Linking the body systems

The digestive, breathing and circulatory systems work together.

- The digestive system supplies absorbed nutrients.
- The lungs supply oxygen.
- The blood delivers both to cells, where respiration releases energy.
- A pulse is the pressure wave in arteries caused by the beating heart. Pulse rate usually rises during activity, but one reading does not show overall health or fitness.

Worked examples

Trace a red blood cell from the body to the lungs and back to the body. It passes through the right side of the heart before reaching the lungs and the left side afterwards.

Work through it

1. Blood returns from the body to the right atrium, then the right ventricle.
2. The right ventricle pumps it through the pulmonary artery to the lungs.
3. It picks up oxygen and returns through the pulmonary veins to the left atrium.
4. The left ventricle pumps it through the aorta to the body.

Common mistakes

Common mistake: All arteries carry oxygen-rich blood.

Remember: Arteries carry blood away from the heart. The pulmonary artery carries oxygen-poor blood to the lungs.

Common mistake: Blood shown in blue on a diagram is blue inside the body.

Remember: Human blood is red. Diagram colours distinguish routes with different oxygen levels.

Answering questions

- Trace a blood route one step at a time, using arrows and checking whether each vessel goes towards or away from the heart.
- Link vessel structure to function: for example, thin capillary walls give substances a short distance to cross.

Try an investigation

Use a heart model or labelled diagram to trace the direction of blood flow. Compare supplied pulse readings before and after gentle activity, without treating them as a medical test.

Plan, record and review

- Question and prediction: What are you testing, and what do you think will happen? Give a reason.
- Change, measure, keep the same: What will you deliberately change? What will you measure, and in what units? What stays the same to make it a fair test? For an observation, say what you will record consistently instead.
- Record and look for a pattern: Use a table with headings and units. Look for a pattern or a result that does not fit.
- Conclude from evidence: Answer your question using a result or observation. Say if the evidence is unclear.
- Improve the investigation: What would you repeat or change, and how would that make the evidence better?

Do practical work with your teacher and follow the laboratory safety instructions.