

Blood and blood vessels

Revision notes · How red blood cells, white blood cells, plasma, platelets and the three types of blood vessel are suited to their jobs.

For Edexcel GCSE Biology 1BI0 and Combined Science 1SC0. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

Blood and blood vessels Spec 8.6-8.7

The structure and function of blood Spec 8.6

Blood is a tissue made of **plasma** with red blood cells, white blood cells and platelets suspended in it.

Components of blood		
Component	Structure	Function
Red blood cells (erythrocytes)	Biconcave disc shape, no nucleus, full of haemoglobin	Carry oxygen from the lungs to the cells. Haemoglobin combines with oxygen to form oxyhaemoglobin
White blood cells: phagocytes	Flexible, so they can change shape to surround a pathogen	Engulf (take in) pathogens and digest them. This is phagocytosis
White blood cells: lymphocytes	Make and release antibodies into the blood	Antibodies attach to specific pathogens and help to destroy them
Plasma	Pale yellow liquid	Transports blood cells and dissolved substances: carbon dioxide, urea, digested food molecules, mineral ions and hormones
Platelets	Small fragments of cells, with no nucleus	Help the blood to clot at a wound

Red blood cells

- The **biconcave disc** shape gives a large surface area for oxygen to be absorbed.
- **Haemoglobin** binds to oxygen, so the cell can carry a lot of oxygen.
- There is **no nucleus**, which leaves more room for haemoglobin.

White blood cells

Phagocytes can change shape, so they can surround and **engulf** pathogens and then digest them. Lymphocytes make **antibodies** that attach to specific pathogens and help to destroy them.

Plasma and platelets

Plasma is the liquid part of blood and carries many dissolved substances around the body. **Platelets** make the blood clot where there is a cut. This stops blood loss and stops pathogens entering the body.

Higher tier

Standard form with blood cell counts

A sample of blood has 5×10^6 red blood cells in each mm^3 . How many red blood cells are there in 2 mm^3 ? Give your answer in standard form.

1. Multiply: $2 \times 5 \times 10^6 = 10 \times 10^6 = 10\,000\,000$.
2. Write as a number between 1 and 10 multiplied by a power of ten: 1×10^7 .

Answer: 1×10^7 red blood cells

Common mistake: Do not say red blood cells 'carry haemoglobin' as their job. They carry oxygen. Haemoglobin is the substance inside them that binds to oxygen.

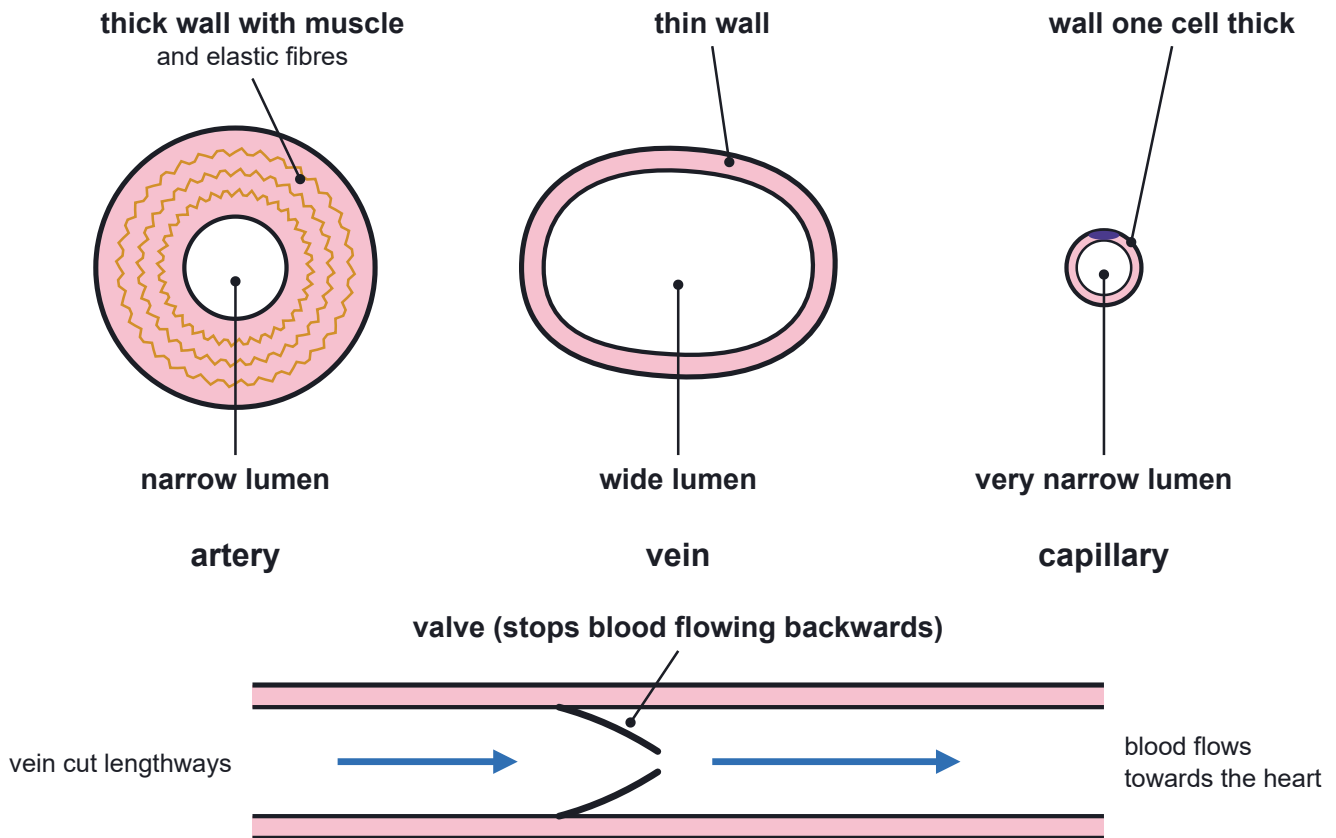
The structure and function of blood vessels Spec 8.7

There are three types of blood vessel. Each is adapted to its job.

Arteries, veins and capillaries			
	Artery	Vein	Capillary
Direction of blood	Away from the heart	Towards the heart	Between arteries and veins, through the tissues
Blood pressure	High	Low	Falls as blood passes through
Wall	Thick, muscular, with elastic fibres	Thinner wall	One cell thick
Lumen	Narrow	Wide	Very narrow
Valves	No	Yes	No
Function	Carry blood at high pressure to the organs	Carry blood back to the heart	Exchange substances with cells

- **Arteries** have thick, muscular walls and elastic fibres. The wall can stand the high pressure and stretches and springs back with each heartbeat.
- **Veins** carry blood at low pressure. They have a wide lumen to let blood flow easily, and **valves** to stop the blood flowing backwards.
- **Capillaries** have walls only one cell thick, giving a short diffusion distance. They form a huge network so there is a large surface area for exchange, and they are narrow so they can reach every cell.

Exam tip: Do not say that arteries always carry oxygenated blood and veins always carry deoxygenated blood. The pulmonary artery and pulmonary vein are the exceptions.



Arteries have **thick walls**, veins have a **wide lumen and valves**, capillaries have walls **one cell thick**. (The capillary is drawn much larger than its real size.)

Quick check

1. Which part of the blood carries oxygen, and what is the name of the substance that binds to it?
2. What is the job of phagocytes?
3. Which blood vessels have valves?
4. Why are capillary walls only one cell thick?

Quick check answers

Blood and blood vessels

1. Red blood cells; haemoglobin.
2. They engulf and digest pathogens.
3. Veins.
4. To give a short diffusion distance for exchange of substances.