Circulation
Circulation

Types of circulation
- Blood vessels
- Formation of tissue fluid
- Maintaining blood flow
- Summary activities
The exchange of substances

Single-celled organisms, such as bacteria and amoeba (below), do not need a circulatory system. This is because they can obtain nutrients and excrete waste by diffusion.

Multi-cellular organisms, such as insects, fish and mammals, require a more specialized transport system. Why is this?
A circulatory system consists of a group of organs that assist the movement of substances, such as oxygen and glucose, around the body.

Some organisms, such as insects, have an open circulatory system.

This type of system contains a heart, however the fluid is not confined to vessels – it moves around amongst the body cells.

The blood within an open system flows slowly and is at low pressure. There is also little control of distribution of blood within the body.
Closed circulatory systems

Some animals, including humans, have a closed circulatory system where blood is contained within a series of vessels.

A closed circulatory system has advantages including:

- the speed of blood flow can be controlled
- the pressure of the blood can be altered
- the distribution of the blood around the body can be controlled.
Closed circulatory systems

What are the different types of closed circulatory systems?
Press the two examples to find out.

- single circulatory system
- double circulatory system
The contribution of Galen and Harvey

The work of Galen and William Harvey contributed to the understanding of the human circulatory system.

Press "start" to find out more.

start
Let's see how much information has flowed in about the different types of circulatory system.

Press "start" to begin this multiple choice quiz.
Circulation

Types of circulation

Blood vessels

Formation of tissue fluid

Maintaining blood flow

Summary activities
In the closed circulatory system, the blood will flow in:

- arteries
- capillaries
- veins

Each time the heart muscle contracts, it pushes blood out of the chambers at high pressure. This causes the blood vessels to throb. This is called a pulse.

The pulse can be detected at various places around the body, including the wrist, at the temple and in the ear lobe.
Blood moves around the body in **arteries, veins and capillaries**. Each blood vessel is adapted to its function.

Press on each blood vessel to learn more about its structure and function.
Blood flow in arteries

Blood pressure is the main force that drives blood from the heart around the body.

When the heart contracts (systole), blood is pumped through the arteries at high pressure. The **elasticity** of the fibres in the arteries means they can expand and allow blood through.

When the heart relaxes (diastole), the blood in the arteries is at a much lower pressure. The **elastic recoil** of the arteries means they can help force the blood along to the arterioles.
Changes in blood pressure

The blood pressure drops continuously as the blood flows from the **arteries**, into smaller **arterioles**, through the **capillaries**, through the **venules** and into the **veins**.

![Graph showing changes in blood pressure](https://example.com/graph.png)
Blood flow in veins

How does blood flow through veins?

The blood in veins is at low pressure. A series of valves and the contraction of skeletal muscle ensures that blood flows towards the heart.

Press "contract" to see what happens.
Which type of blood vessels?

Which blood vessels do these statements relate to?

- artery
- vein
- capillary

contains valves

solve
Identifying blood vessels

Blood vessels
Which of the two larger vessels is an artery and which is a vein?

What parts of the vessels can you identify?

micrograph

Diagram
### Arteries, capillaries and veins

**Complete the table about blood vessels**

<table>
<thead>
<tr>
<th></th>
<th>arteries</th>
<th>capillaries</th>
<th>veins</th>
</tr>
</thead>
<tbody>
<tr>
<td>smooth muscle</td>
<td>A ▼</td>
<td>B ▼</td>
<td>C ▼</td>
</tr>
<tr>
<td>elastic fibres</td>
<td>D ▼</td>
<td>E ▼</td>
<td>F ▼</td>
</tr>
<tr>
<td>lumen</td>
<td>G ▼</td>
<td>H ▼</td>
<td>I ▼</td>
</tr>
<tr>
<td>blood pressure</td>
<td>J ▼</td>
<td>K ▼</td>
<td>L ▼</td>
</tr>
</tbody>
</table>
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In the capillaries

How does oxygen reach the tissues of the body?

- red blood cell
- body cell

show labels  zoom in
Exchange in the capillaries

The capillary wall is permeable to allow the **diffusion** of nutrients from the blood into the tissues, and the exchange of waste products from the cells into the capillaries.

Examples of nutrients for the cells include **oxygen** and **glucose**.

Examples of the waste products include **urea** and **carbon dioxide**.

The balance between the hydrostatic pressure of blood (‘blood pressure’) and the osmotic pressure of blood is important in the formation of **tissue fluid**.
Formation of tissue fluid

How is tissue fluid formed?

All cells are bathed in tissue fluid, which enables substances to diffuse in and out. Press "start" to find out more about the relationship between tissue fluid and blood.
Reduced blood flow

Arteries can become blocked when fatty deposits build up. This reduces blood flow and increases the pressure.

A reduced blood flow is especially dangerous in the **coronary arteries**, which supply the heart with oxygen and glucose.

To restore normal blood flow, a small mesh tube called a **stent** is inserted into the narrow artery. The metal or fabric mesh of the stent is used to support the inner wall of the artery to keep it open artificially.
Stents restore blood flow

Using stents to keep arteries open

Arteries can narrow due to the build-up of fatty deposits on the artery wall.

An artificial tube, called a stent, can be used to keep them open.

Press "play" to find out more.
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Glossary of keywords: circulation

**aorta** – The major artery that carries oxygenated blood from the heart to the rest of the body.

**arteriole** – A vessel that branches from the arteries and carries the blood to the capillaries.

**artery** – A vessel that carries blood away from the heart.

**capillary** – A blood vessel that carries blood to body cells, linking arteries and veins.

**circulatory system** – A system of organs that
Can you circulate your way around this quiz on circulation?

Press "start" to begin.