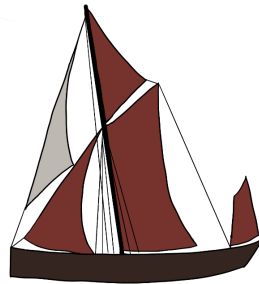

AQA

THE CIRCULATORY SYSTEM NOTES

Science Exams Sorted



2021

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AQA The Circulatory System Notes

This topic is regularly assessed in the exams, questions on this topic can range from short 1 mark/ multiple choice questions to 6 mark questions. Before we look at the blood vessels etc let's look at the blood itself.

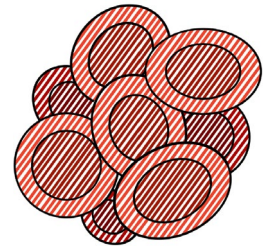
The Functions of Blood

Blood is essentially a transport medium. Blood transports the following:

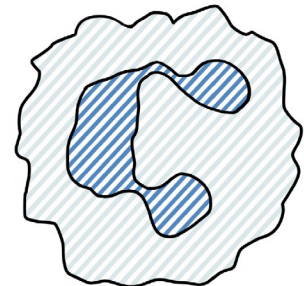
1. Oxygen from the lungs to all other parts of the body.
2. Carbon dioxide from all parts of the body to the lungs.
3. Nutrients such as glucose from the small intestine to all parts of the body.
4. Urea from the liver to the kidneys.
5. Hormones, antibodies and many other substances are also transported by the blood as well as it distributing heat around the body.

The Composition of the Blood

Red blood cells – contain haemoglobin to carry oxygen to the all cells in the body. When oxygen binds to haemoglobin it forms **oxyhaemoglobin**.



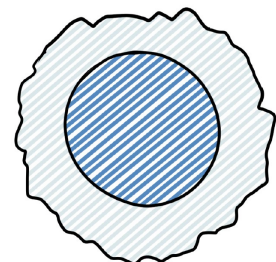
Phagocytes – are cells that protect the body by ingesting harmful foreign particles, bacteria, and dead or dying cells (a process known as phagocytosis).



Note: How can I tell phagocytes and lymphocytes apart?

Phagocytes have a multi lobbed nucleus. Lymphocytes have one large nucleus.

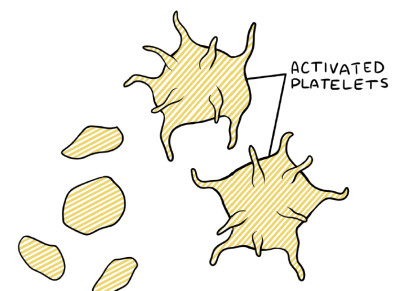
Lymphocytes – eliminate an antigen, by producing/releasing antibodies against that specific antigen. They do not ingest cells.



Platelets – clump together to form clots.

These protect the body by stopping bleeding preventing loss of blood.

Plasma: Fluid part of blood. It carries **carbon dioxide**, hormones and waste e.g. Urea.



Blood Vessels

Blood vessels are **tubes** which carry the blood around the body. There are different types of blood vessels.

Arteries carry blood away from the heart. These vessels split up into smaller ones called **arterioles**, which in turn split up into tiny blood vessels called **capillaries**.

Capillaries are where **exchange of particles and gases takes place**. These then join together to form larger vessels called **venules** which join together to form **veins**.

Veins carry blood towards the heart (usually deoxygenated blood, except for the pulmonary vein).

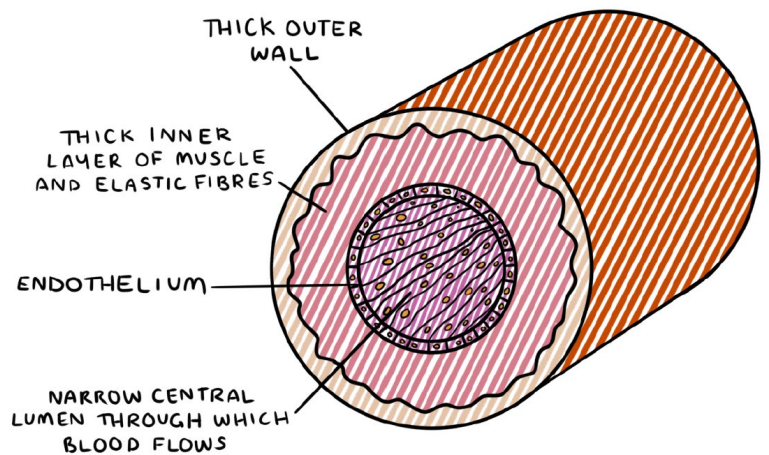
Arteries

Function: Carry blood away from the heart (always oxygenated apart from the pulmonary artery which goes to the lungs).

Structure: Have thick muscular walls.

Lumen: Have small passageways for blood (internal lumen).

Pressure: Contain blood under high pressure.



Veins

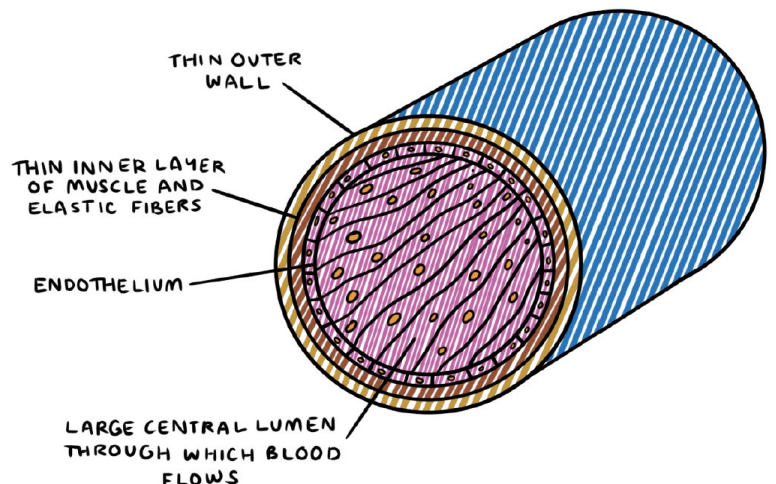
Function: Carry blood to the heart (always de-oxygenated apart from the pulmonary vein which goes from the lungs to the heart).

Structure: Have thin walls.

Lumen: Have larger internal lumen.

Pressure: Contain blood under low pressure.

Valves: Have valves to prevent blood flowing backwards. This is the function of valves 😊

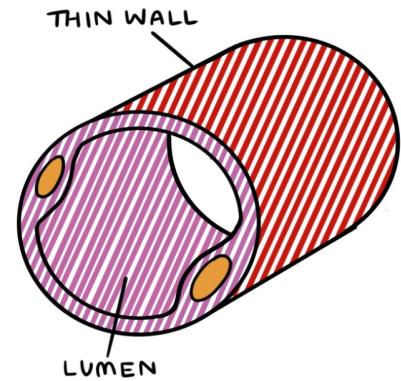


Capillaries

Function: Where exchange of substances takes place. Oxygen passes through the capillary wall and into the tissues, carbon dioxide passes from the tissues into the blood.

Structure: Microscopic – one cell thick.

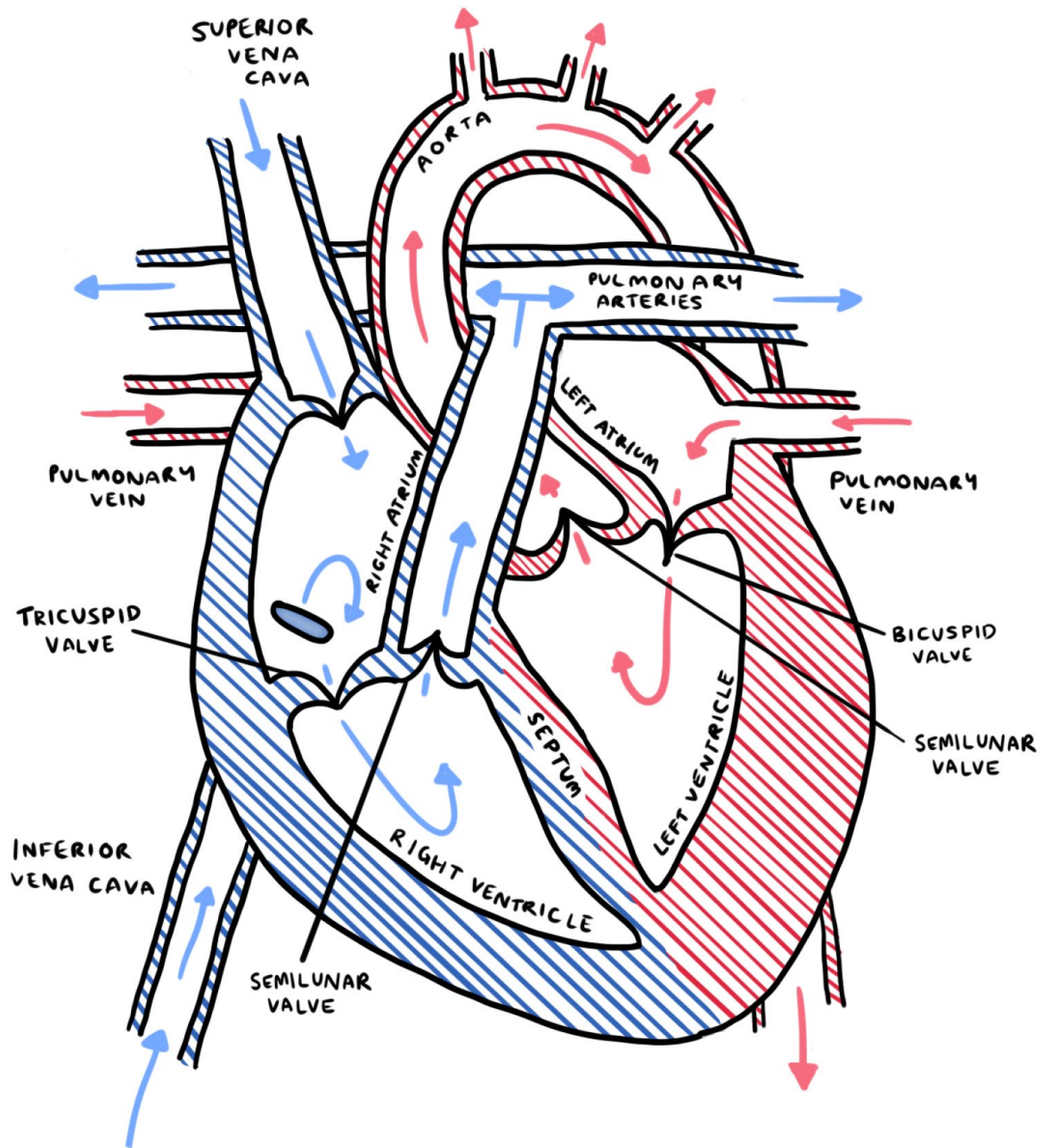
Pressure: Very low blood pressure. Found in the muscles and lungs.



Differences between arteries and veins

| What do I need to know? | |
|---|--|
| Arteries | Veins |
| Carries blood away from the heart | Blood travels to the heart |
| Have a narrow lumen | Have a wide lumen |
| Has a thick muscular wall with lots of elastic fibres | Has a thin wall with few elastic fibre |
| Has a thick muscular layer | Has a thin muscular layer |
| Does not have valves | Has valves |
| Blood travels in pulses | Blood travels constantly |
| Blood is under high pressure | Blood under lower pressure |

AQA The Circulatory System Notes
The Structure of the Heart



You will not be asked to draw a diagram of the heart. But you could be asked to label a pre-drawn diagram. Please be aware that when you're looking at a diagram of the heart the left-hand side of the heart is on the right side of the page and vice versa.

Different thicknesses of each side of the heart

"Why is the left hand side of the heart much thicker than the wall of the right?"

Ideal answer 😊: This is because the left-hand side must pump to the entire body. The **thicker muscle** is able to generate **a greater force** to ensure a **higher pressure** to push blood around the body. The right-hand side only has to pump to the lungs, a much shorter distance.

AQA The Circulatory System Notes

Blood flow through the heart

I have seen this appear as questions ranging from four to six marks. I know it's a lot of information but break it up and use flashcards they will really help to learn and retain this. 😊

Key:  = oxygenated blood  = deoxygenated blood

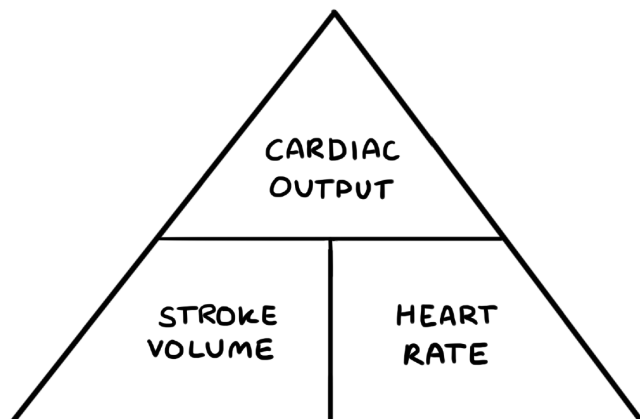
1. Blood enters the **right atrium from the vena cava.**
2. From **right atrium, it passes the tricuspid valve to the right ventricle.**
3. From the right ventricle, it is forced through the **pulmonary (semilunar) valve to the pulmonary artery.**
4. From the pulmonary artery it moves into the right and left pulmonary arteries to the lungs.
5. From the lungs, oxygenated **blood is returned to the heart through the pulmonary veins.**
6. **From the pulmonary veins, blood is forced into the left atrium.**
7. From the left atrium, **blood is forced through the bicuspid valve into the left ventricle.**
8. From the left ventricle, the **blood passes the aortic (semilunar) valve into the aorta.**
9. Blood is distributed to the rest of the body from the aorta.

Stroke volume

You can be asked to complete a calculation to determine stroke volume.

Stroke volume: the volume of blood pumped out of the heart with every beat. The average amount of blood per beat is 0.07 litres.

The equation for this calculation is:



$$\text{Stroke volume} = \frac{\text{Cardiac Output}}{\text{Heart rate}}$$

AQA The Circulatory System Notes

Blood pressure

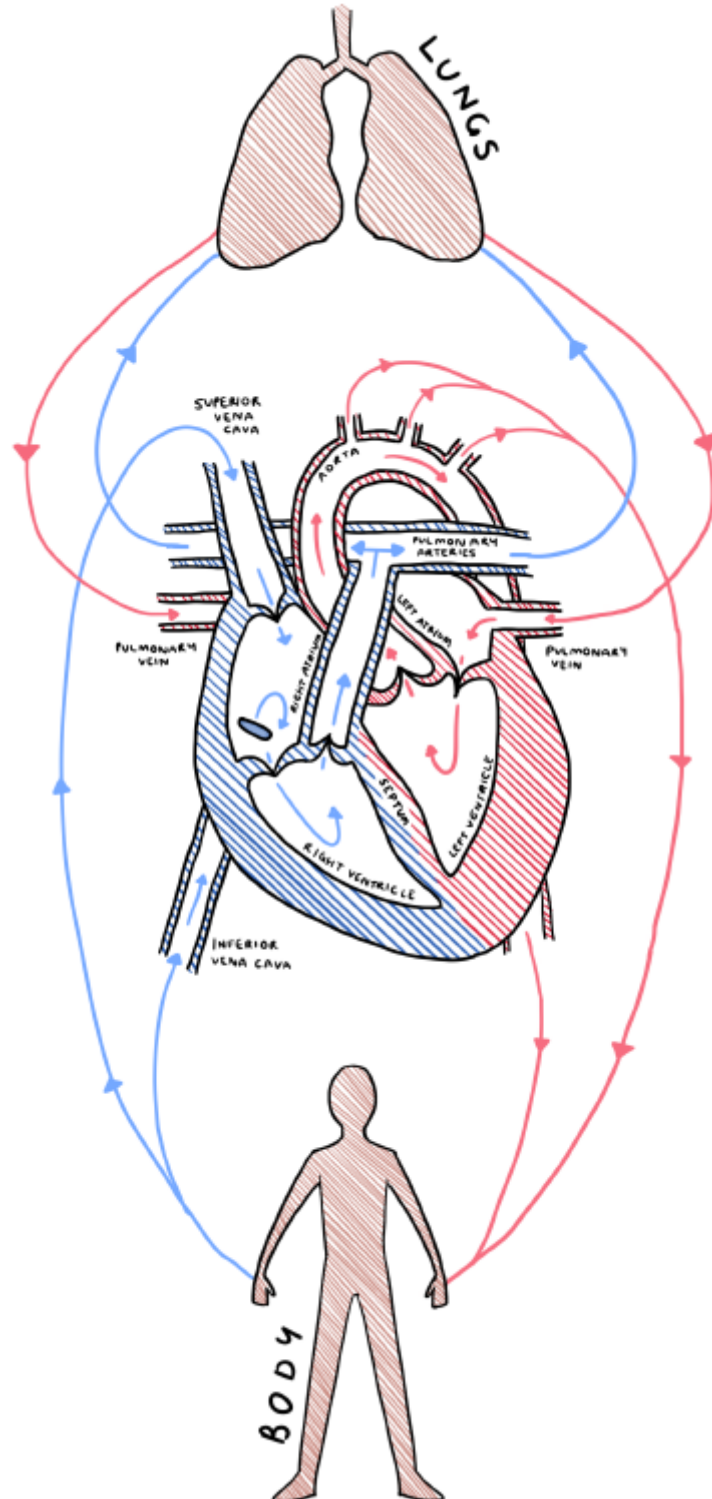
When the heart contracts it pushes blood into blood vessels which creates blood pressure.

A blood pressure reading consists of two values:

- **Systolic value** – blood pressure while the heart is squeezing.
- **Diastolic value** – blood pressure while the heart is relaxing.

The average blood pressure for an adult is 120/80 mmHg. The first number is the systolic value and the second number is the diastolic value.

Overview of the cardiovascular system



Cardiovascular Disease

Cardiovascular disease: a disease in which the heart or circulatory system do not function correctly.

What factors can contribute to cause cardiovascular disease?

- Unhealthy diet – high in fats and carbohydrates.
- Smoking.
- Regular, excessive consumption of alcohol – this can lead to liver damage/ liver failure.
- Lack of exercise.

Which factor do I need to know in detail for GCSE?

Smoking

Tobacco smoke contains over 400 harmful chemicals, some of these substances can damage blood vessels, increase blood pressure and can narrow the blood vessels over time. All of these effects can increase the risk of blood clots forming, these can be fatal.

How is Cardiovascular Disease Treated?

There are **three** common ways of treating cardiovascular disease.

1. Surgical procedures.

Stents – these are a small tube like object which is inserted in to a partially blocked blood vessel. This helps to keep the blood vessel open and blood to flow.

2. Heart transplant.

A donor heart is placed into the patient to replace their heart. It is a complex procedure and carries a number of risks.

3. Medication.

Drugs called **Statins** are given to patients. These lower the amount of cholesterol in the blood by causing the liver to produce less cholesterol. The patient must continue taking the drugs for them to keep working.

But as always, prevention is better than cure. Changes in lifestyle such as diet and exercise level can have a great and lasting effect on cardiovascular health.