

# 2.2.2 The heart and blood vessels

## AQA GCSE Biology (Higher)

### Question and answer notes

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#### How to use these notes

These notes cover everything you need to know for this part of the specification. They have been written in question-answer format to make them easier for you to study from.

In order to study successfully, I recommend you do the following for each question and answer:

- Read it carefully and make sure you **understand** it.
- **Memorise** the answer.
- **Practice** applying your understanding to past exam questions.

A good way to memorise information is to use **retrieval practice**. This is when you practise retrieving information from your memory. You could do this by making a flashcard for each question with the question on one side and the answer on the other. Or you could use a flashcard app. Alternatively, use a sheet of paper to cover up the answer so you can only see the question. Try to answer the question and then check how you did.

You should practise retrieving each answer from your memory until you can do it perfectly. Even once you can retrieve the answer perfectly, your ability to retrieve it will probably fade as time passes without practising. Therefore you will need to keep going back to the questions that you have previously mastered and practising them again. However, each time you re-learn the answer, the memory will be stronger and will last longer than the time before.

#### What is the function of the human heart?

The function of the human heart is to pump blood around the body. This supplies the tissues with useful substances like oxygen and glucose and removes waste products like carbon dioxide and urea.

#### What is oxygenated blood? What is deoxygenated blood?

Oxygenated blood is blood with oxygen in it. Deoxygenated blood is blood with no oxygen in it.

#### How does blood become oxygenated?

Blood becomes oxygenated when it passes through the lungs. Air is breathed into the lungs and the oxygen from this air then diffuses into the blood.

**How does blood become deoxygenated?**

Blood becomes deoxygenated as it passes through the tissues of the body. Oxygen diffuses out of the blood into the surrounding cells where it is used in aerobic respiration.

**How are the two sides of the heart named?**

The heart is divided into the left side and right side. They are named according to the left and right of the person whose heart it is. Therefore, on a diagram drawn from the front, the left side of the heart is on the right side of the diagram and the right side of the heart is on the left side of the diagram.

**How is the human circulatory system organised?**

The human circulatory system is a double circulatory system. This means that it has two separate circuits.

One circuit carries deoxygenated blood from the heart to the lungs, where it becomes oxygenated, and then carries this oxygenated blood back to the heart.

The other circuit carries oxygenated blood from the heart to the rest of the body, where it becomes deoxygenated, and then carries this blood back to the heart.

**What are the roles of the two sides of the human heart?**

The right side of the human heart pumps deoxygenated blood to the lungs where it becomes oxygenated. The oxygenated blood then comes into the left side of the heart. The left side of the heart then pumps the oxygenated blood to the rest of the body where it becomes deoxygenated. The deoxygenated blood then returns to the right side of the heart.

**What are the chambers of the human heart called?**

The human heart has four chambers.

They are called the left atrium, the right atrium, the left ventricle and the right ventricle.

The plural of atrium is *atria* and the plural of ventricle is *ventricles*.

**Where are the chambers of the human heart located and how are they connected?**

The atria are located at the top of the heart and the ventricles are located below them.

The left atrium is located above the left ventricle (on the left side of the heart). These two chambers are connected so that blood can flow from the left atrium down into the left ventricle.

The right atrium is located above the right ventricle (on the right side of the heart). These two chambers are also connected, so that blood can flow from the right atrium down into the right ventricle.

There are no connections between the left and right sides of the heart.

**What is the function of the atria?**

The atria are where blood enters the heart. They then pump this blood into the ventricles.

The left atrium receives oxygenated blood from the lungs, which it then pumps into the left ventricle.

The right atrium receives deoxygenated blood from the rest of the body, which it then pumps into the right ventricle.

**What is the function of the ventricles?**

The ventricles pump blood out of the heart.

The right ventricle pumps deoxygenated blood to the lungs.

The left ventricle pumps oxygenated blood to the rest of the body.

**What are the three types of blood vessels and their functions?**

Arteries - Carry blood away from the heart.

Capillaries - Exchange substances with the tissues of the body.

Veins - Carry blood towards the heart.

**Where in the heart are blood vessels located?**

Each of the four chambers of the heart has a blood vessel connected to it.

The atria each have a vein bringing blood into them and the ventricles each have an artery carrying blood away from them.

**What is the name of the blood vessel connected to the right atrium? What is its role?**

The vein connected to the right atrium is called the vena cava. It brings deoxygenated blood from the body into the right atrium.

**What is the name of the blood vessel connected to the right ventricle? What is its role?**

The artery connected to the right ventricle is called the pulmonary artery. It carries deoxygenated blood from the right ventricle to the lungs (the word *pulmonary* means 'to do with the lungs').

**What is the name of the blood vessel connected to the left atrium? What is its role?**

The vein connected to the left atrium is called the pulmonary vein. It brings oxygenated blood from the lungs into the left atrium.

**What is the name of the blood vessel connected to the left ventricle? What is its role?**

The artery connected to the left ventricle is called the aorta. It carries oxygenated blood from the left ventricle to the rest of the body.

**What route does blood take as it moves through the circulatory system?**

OXYGENATED BLOOD:

Capillaries in lungs > Pulmonary vein > Left atrium > Left ventricle > Aorta > Capillaries in the rest of the body

DEOXYGENATED BLOOD:

Capillaries in the rest of the body > Vena cava > Right atrium > Right ventricle > Pulmonary artery > Capillaries in lungs

**What are valves?**

Valves are structures within the heart and the veins which prevent the backflow of blood.

Blood can only flow through a valve in one direction, which ensures that blood always follows the correct route through the circulatory system.

**What are the coronary arteries?**

The coronary arteries are arteries found on the outside of the heart. They supply blood to the cells in the walls of the heart - including the muscle cells which contract to cause the heart to pump.

**What is the pacemaker?**

The pacemaker is a group of cells in the wall of the right atrium which control the heart rate. The pacemaker sends out regular electrical impulses causing the heart muscle to contract.

**What is an artificial pacemaker?**

An artificial pacemaker is an electrical device which can be implanted into a patient's chest in order to correct irregularities in the heart rate. An artificial pacemaker sends regular electrical impulses into the heart muscle, causing it to contract. Therefore, an artificial pacemaker takes over the function of the natural pacemaker.

**What is the general structure of all blood vessels?**

All blood vessels consist of a hollow space, called a lumen, surrounded by walls. The lumen is the space that the blood moves through.

**What is the structure of arteries?**

Arteries have a narrow lumen surrounded by very thick walls. The walls contain muscle tissue and elastic fibres.

**How is the structure of arteries related to their function?**

The narrow lumen and thick walls of arteries allow them to withstand and maintain the high pressure of the blood which is coming directly from the heart. The elastic fibres in the walls of arteries allow them to stretch and recoil as the heart pumps blood into them, which helps to maintain a high pressure. The muscle tissue in the walls of arteries allow them to constrict and dilate in order to regulate blood flow.

**What is the structure of veins?**

Veins have a large lumen surrounded by relatively thin walls (compared to arteries). Veins often contain valves.

**How is the structure of veins related to their function?**

Veins carry blood which is at a low pressure, therefore they do not need to withstand or maintain high pressures. The large lumen of a vein allows a high rate of blood flow. The valves inside veins prevent the backflow of blood, ensuring that blood only flows in one direction - towards the heart. This is important because blood is not pushed through veins by the pumping of the heart. Instead, the contraction of surrounding muscles causes blood to flow through the veins.

**What is the structure of capillaries?**

Capillaries are very small.

The walls of a capillary are one cell thick and the cells that make up the walls are flattened, making them very thin.

The lumen of a capillary is very small.

**How is the structure of capillaries related to their function?**

The very thin walls of capillaries provide a short diffusion distance for substances that are being exchanged between the capillary and the surrounding cells (such as oxygen, carbon dioxide, glucose, urea, etc.).

**What is the overall structure of the human lungs?**

The human lungs have a tube called the trachea (windpipe), which carries air between the mouth/nose and the rest of the lungs.

The trachea splits into two branches called bronchi (singular: *bronchus*).

Each of the bronchi split into many smaller tubes called bronchioles.

The bronchioles end in many small air sacs called alveoli (singular: *alveolus*).

The alveoli are surrounded by a dense network of capillaries.

Gas exchange takes place between the air in the alveoli and the blood in the capillaries.