

USP41

Anatomy and Physiology for Sports Massage

Learning Outcome 8



Learning Outcome 8:

Know the structure and functions of the cardiovascular system

Learning Outcome 8:

Know the structure and functions of the cardiovascular system

At the end of this learning outcome, you will be able to:

- a) Describe the structure of the cardiovascular system
- b) Describe the function of the cardiovascular system
- c) Describe the flow of blood around the circulatory system
- d) Describe the composition of blood
- e) Describe blood pressure
- f) Describe factors that may affect blood pressure

The following slides are
presented by sections, a-f

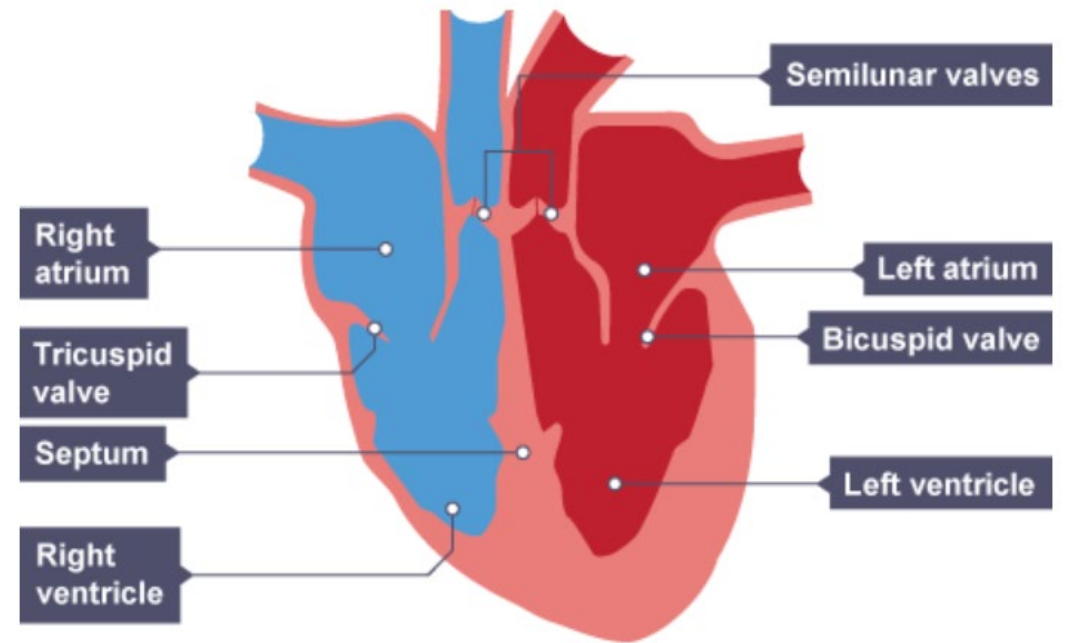
a. Describe the structure of the cardiovascular system



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a. Describe the structure of the cardiovascular system

The cardiovascular system is made up of three main parts - the heart, the blood vessels and the blood that flows through them.





a. Describe the structure of the cardiovascular system

The hearts performance as a pump

Heart rate

Heart rate (HR) is the number of times the heart beats (or the ventricles pump blood out) in one minute. The average resting HR is approximately 70 beats per minute (bpm).

Stroke volume

Stroke volume (SV) is the amount of blood pumped out of the ventricles each time they contract. The average resting SV is approximately 70 ml.

Cardiac values

Cardiac output (Q) is the amount of blood pumped from the heart every minute and can be calculated by multiplying heart rate (HR) by stroke volume (SV).



a. Describe the structure of the cardiovascular system

Structure of the heart



- If you clench your hand into a fist, this is approximately the same size as your heart.
- Located in the middle of the chest and slightly towards the left.
- It is a large muscular pump and is divided into two halves - the right-hand side and the left-hand side.
- The **right-hand side** of the heart is responsible for pumping deoxygenated blood to the lungs.
- The **left-hand side** pumps oxygenated blood around the body.
- Each side of the heart consists of an atrium and a ventricle which are two connected chambers.



a. Describe the structure of the cardiovascular system

Structure of the heart



The **atria** (plural of atrium) are where the blood collects when it enters the heart.

The **ventricles** pump the blood out of the heart to the lungs or around the body.

The **septum** separates the right-hand and left-hand side of the heart.

The **tricuspid valve** is located between the right atrium and right ventricle and opens due to a build-up of pressure in the right atrium.

The **bicuspid valve** is located between the left atrium and left ventricle and likewise opens due to a build-up of pressure, this time in the left atrium.

The **semilunar valves** stop the back flow of blood into the heart.

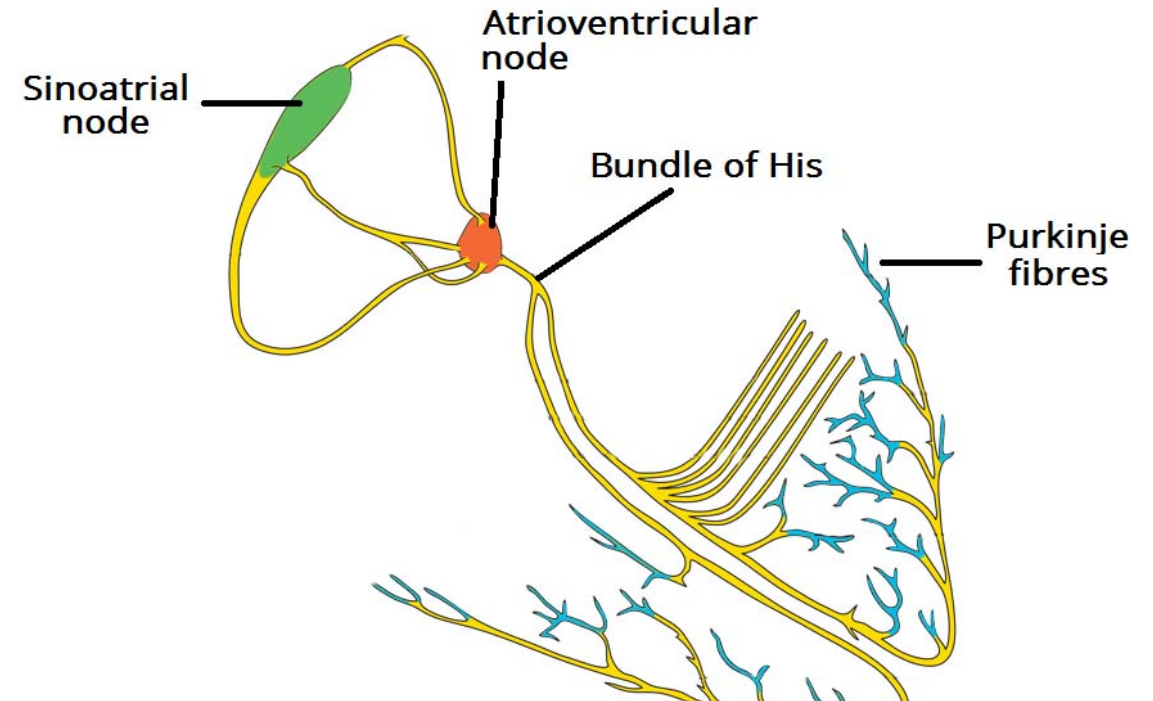


a. Describe the structure of the cardiovascular system

Bundle of His

The **cardiac conduction system** is a collection of nodes and specialised conduction cells that initiate and co-ordinate contraction of the heart muscle. It consists of:

- Sinoatrial node
- Atrioventricular node
- Atrioventricular bundle (bundle of His)
- Purkinje fibres



b. Describe the functions of the cardiovascular system



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b. Describe the functions of the cardiovascular system

Function

The cardiovascular system has several main functions being transportation, regulation, protection:

1. Deliver oxygen and nutrients to the body
2. Remove the waste products such as carbon dioxide and lactic acid
3. Protection against disease and infection
4. Maintain body temperature



c. Describe the flow of blood around the circulatory system



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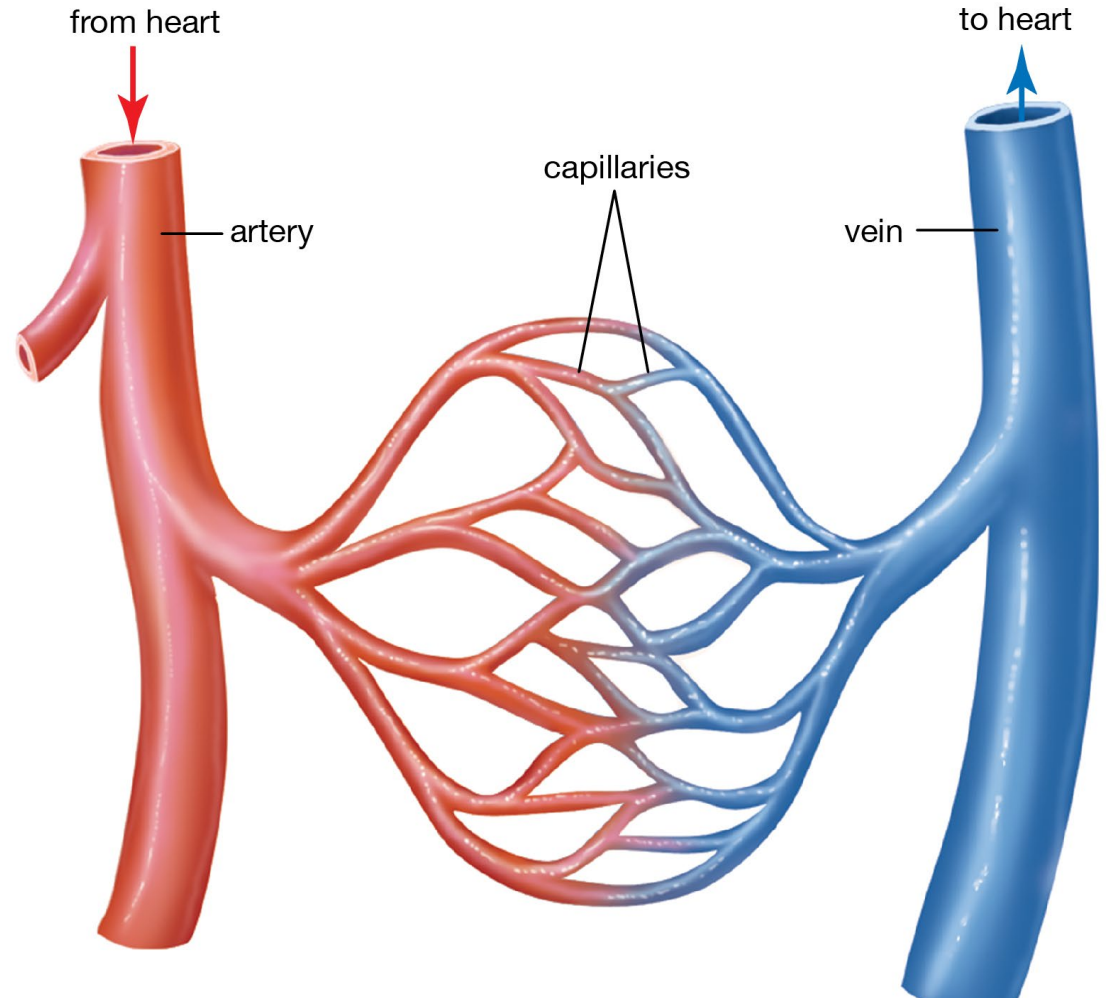
c. Describe the flow of blood around the circulatory system

Arteries, Veins and Capillaries

Arteries – carry blood away from your heart

Veins – carry blood back toward your heart

Capillaries – are the smallest blood vessels, connecting arteries and veins





c. Describe the flow of blood around the circulatory system

Blood Vessels

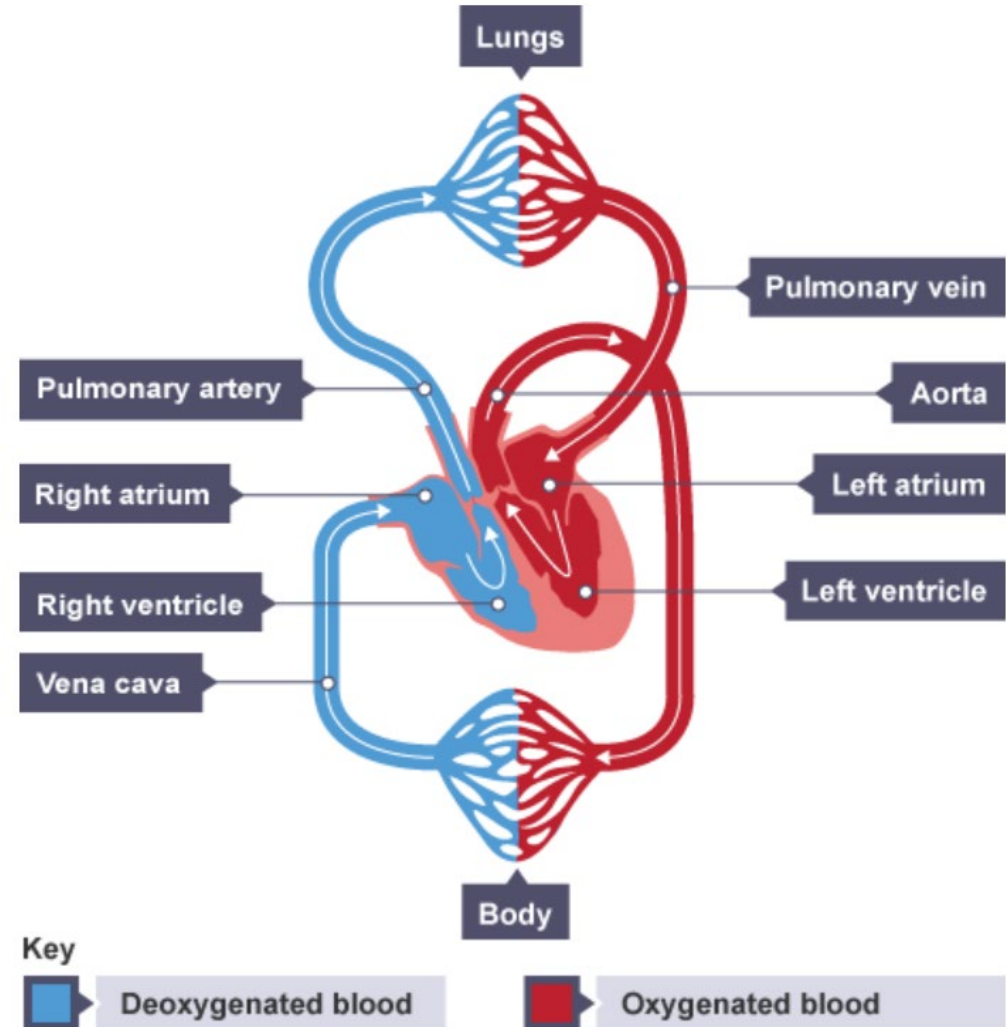
There are four main blood vessels that take blood into and out of the heart.

The aorta is the largest artery in the body. It carries oxygenated blood away from the left ventricle to the body.

The vena cava is the largest vein in the body. It carries deoxygenated blood from the body back to the heart.

The pulmonary artery **carries deoxygenated blood** away from the right ventricle to the lungs.

The pulmonary vein **returns oxygenated blood** from the lungs to the heart.





c. Describe the flow of blood around the circulatory system

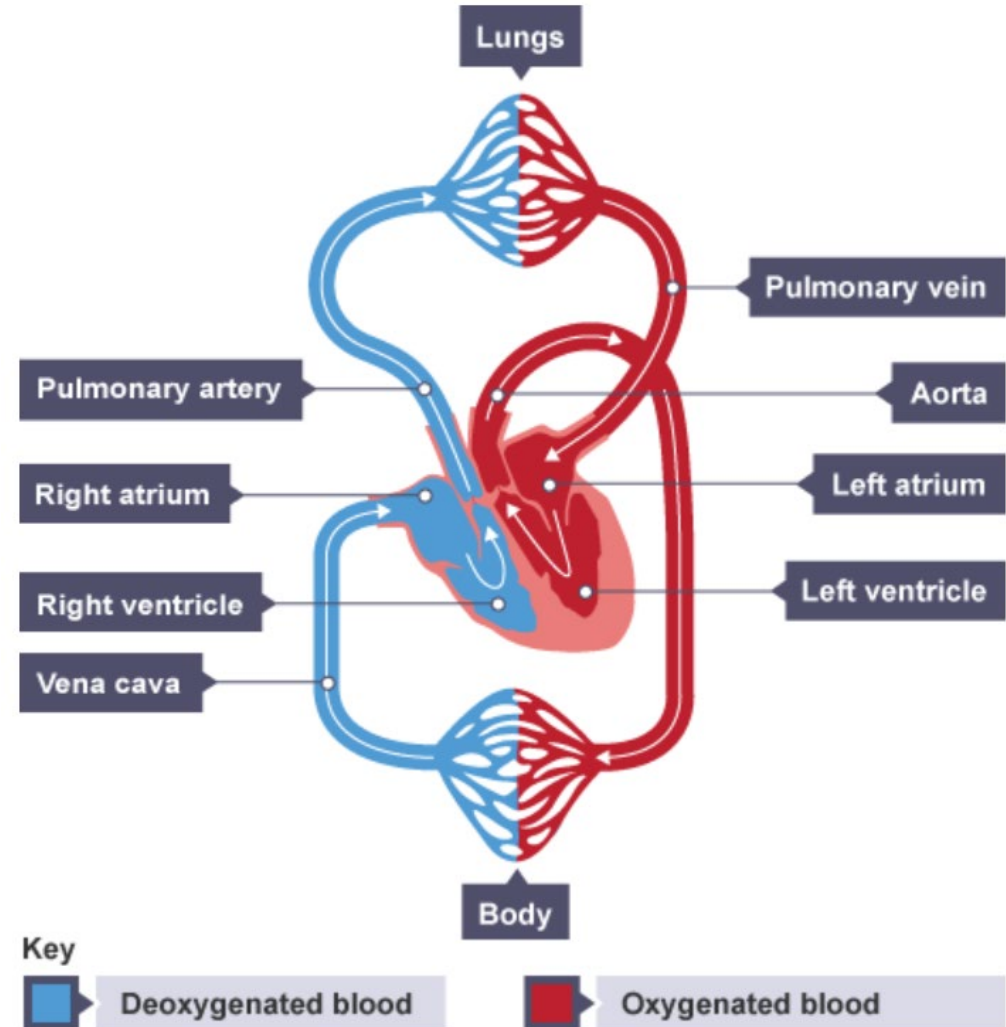
Arteries

Arteries:

Carry *oxygenated* blood away from the heart (except for the pulmonary artery which carries *deoxygenated* blood away from the right ventricle to the lungs).

The main artery is the **aorta**.

The main vein is the **vena cava**.



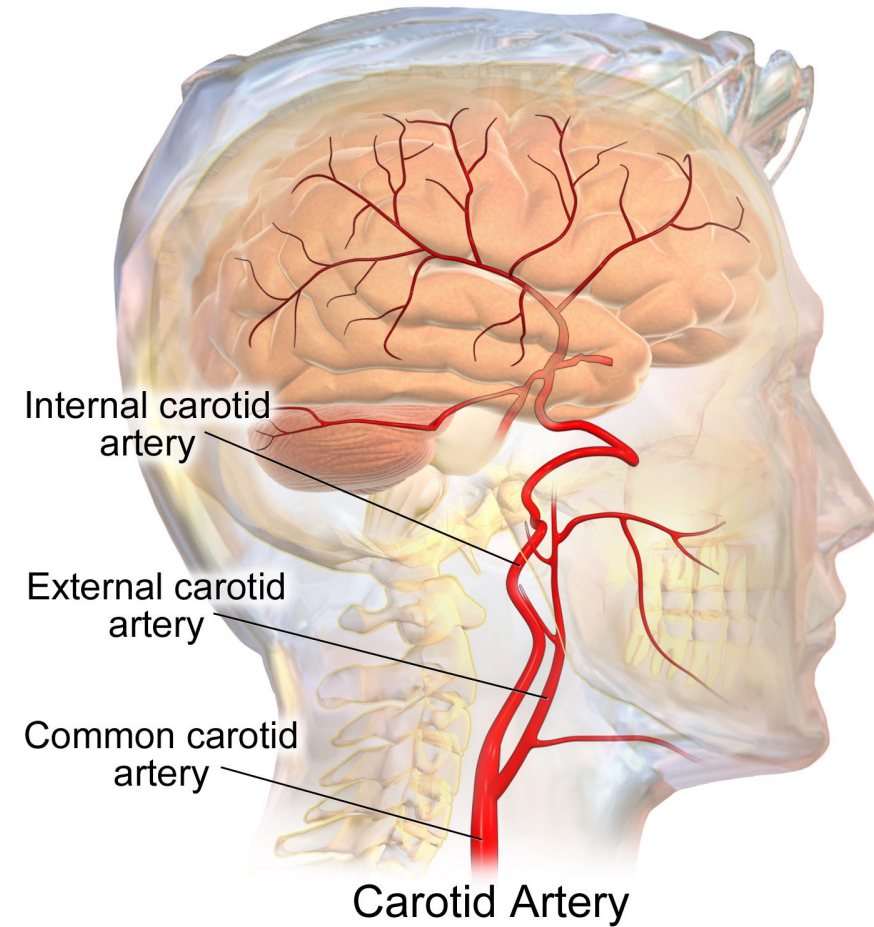


c. Describe the flow of blood around the circulatory system

Primary vessels

Common vessels in the head, face and neck include:

- common carotid artery
- external carotid artery
- internal carotid artery
- external jugular vein
- internal jugular vein



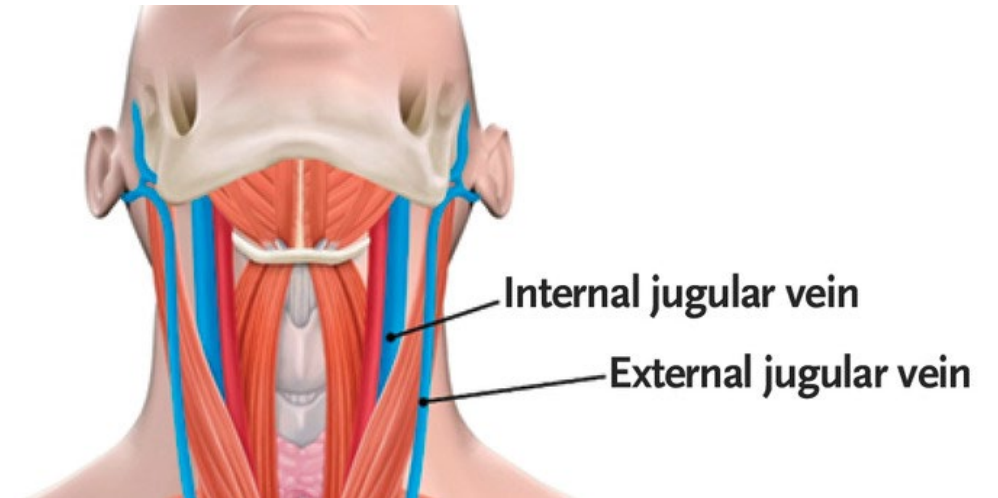


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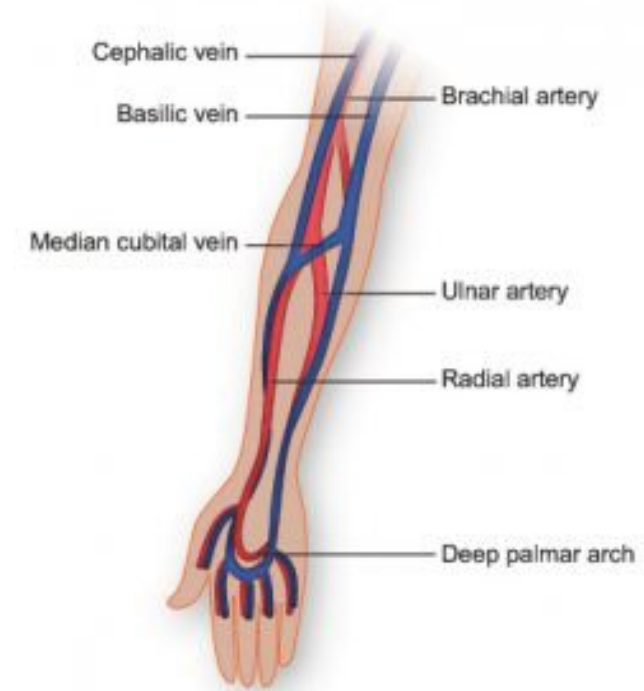


c. Describe the flow of blood around the circulatory system

Primary vessels

Common vessels in the hand, wrist and forearm include:

- Radial and ulnar arteries
- Basilica
- Cephalic veins



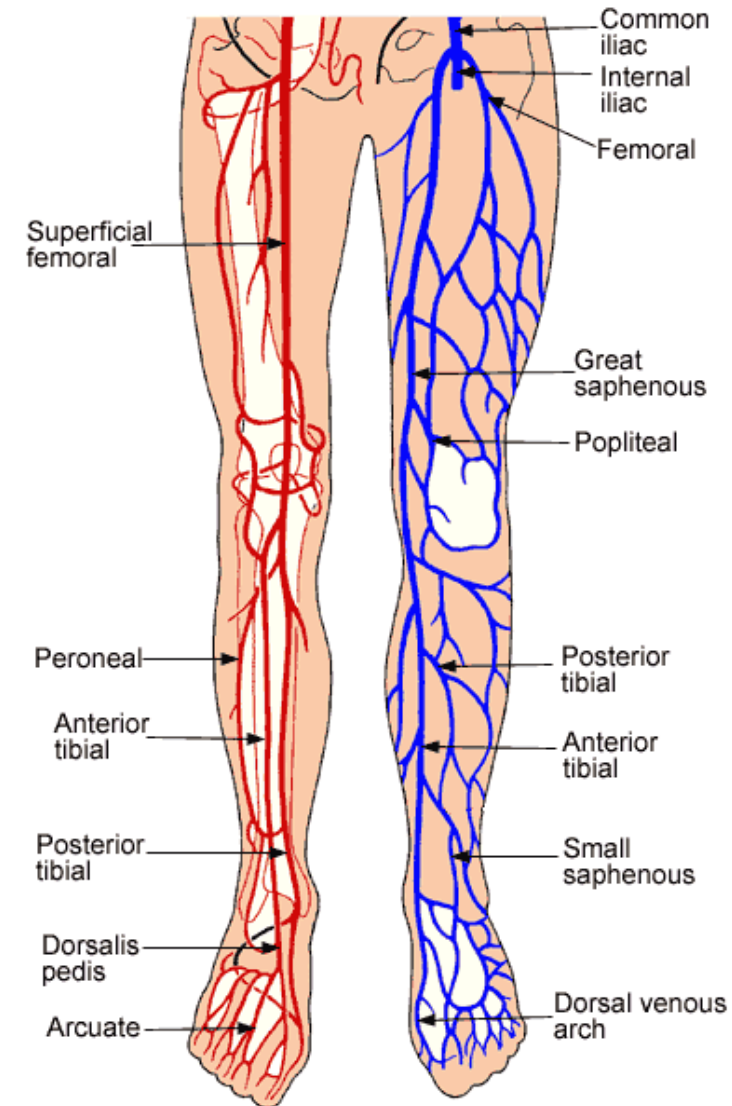


c. Describe the flow of blood around the circulatory system

Primary vessels

Common vessels in the foot, ankle and lower leg include:

- Anterior tibial artery/vein
- Posterior tibial artery/vein
- Saphenous vein
- Iliac vein
- Femoral vein



d. Describe the composition of blood



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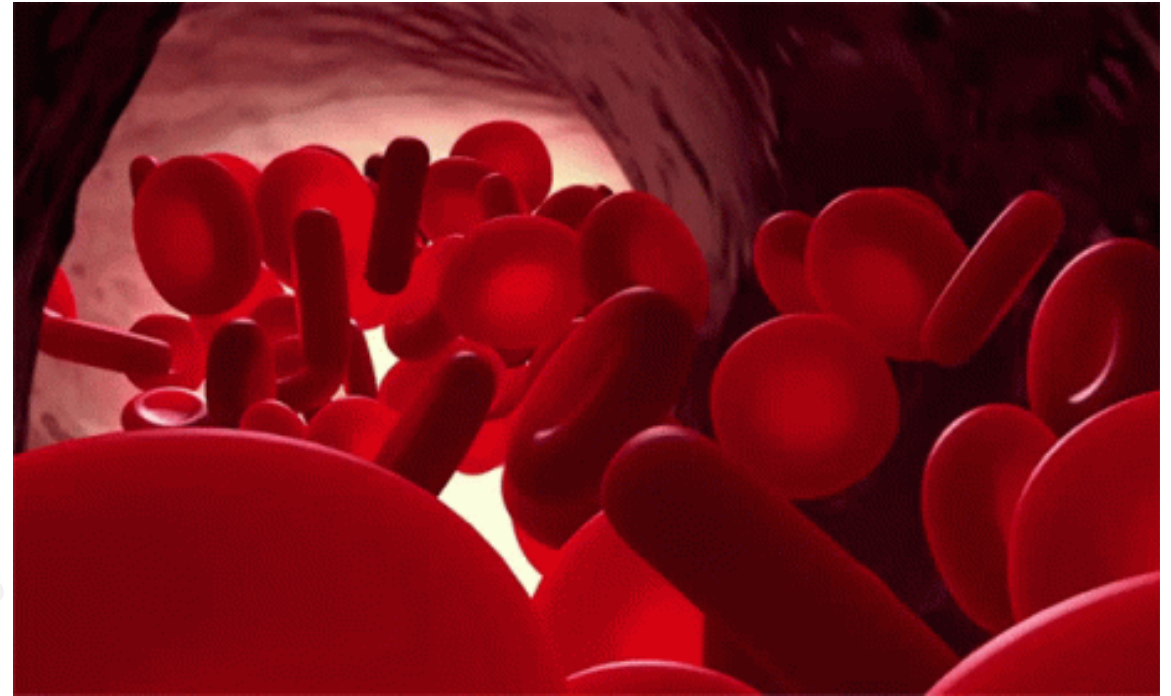


d. Describe the composition of blood

Function

The main functions of blood are:

- Transportation
- Protection
- Regulation of body temperature

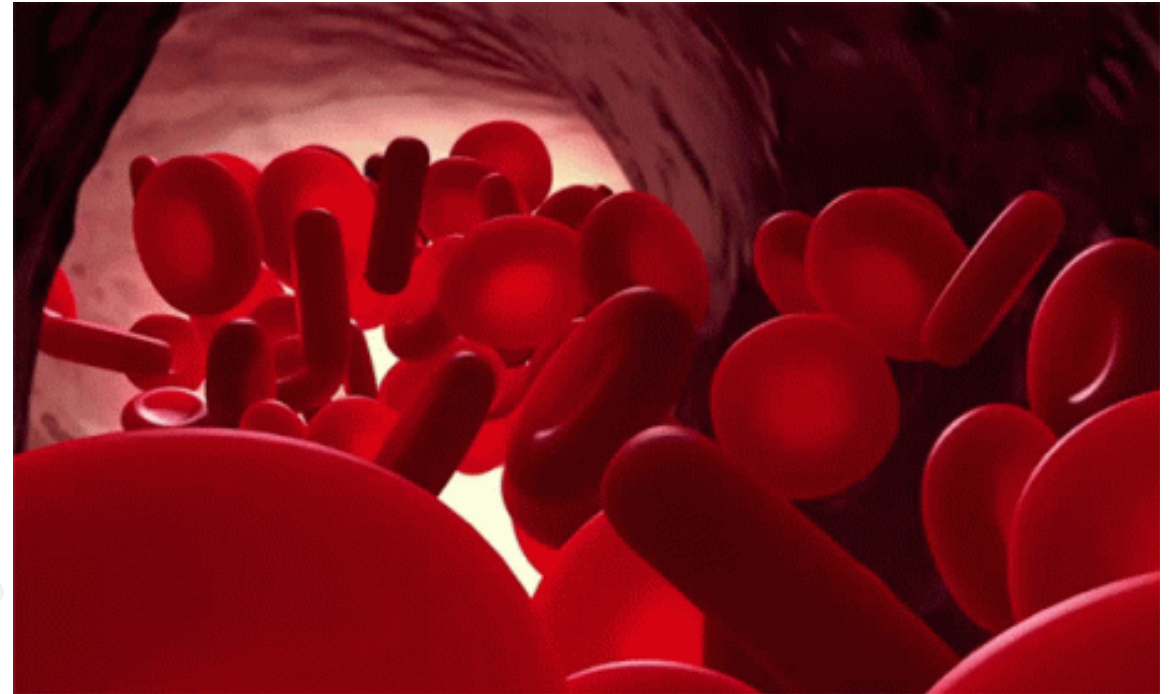




d. Describe the composition of blood

Transportation

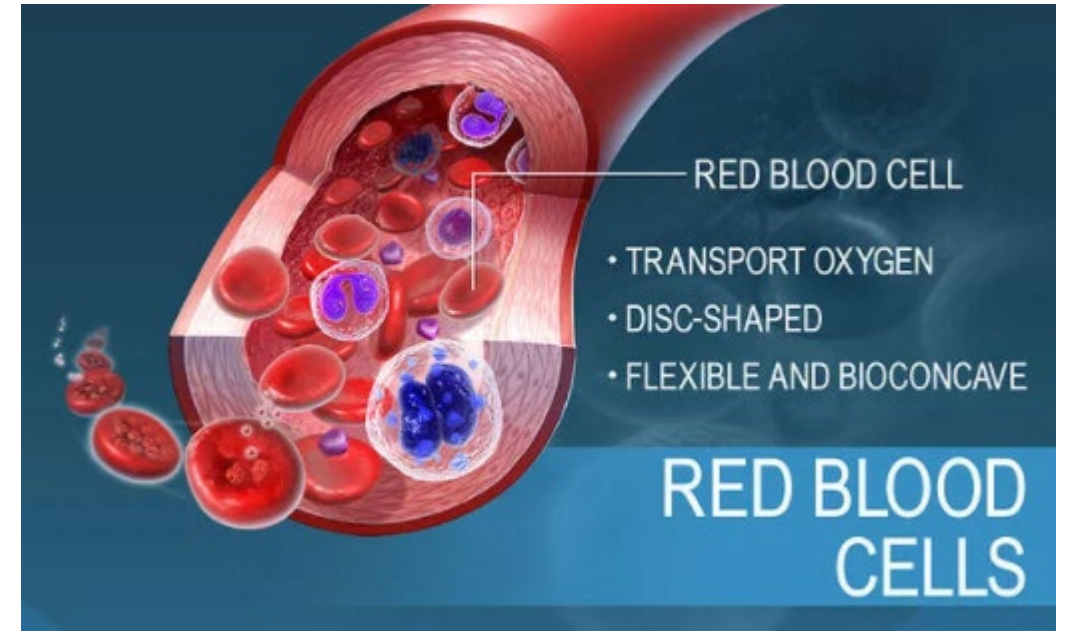
- Blood absorbs oxygen from air in the lungs.
- It transports the oxygen to cells throughout the body, and it removes waste carbon dioxide from the cells.
- In the lungs, the carbon dioxide moves from the blood to the air and is exhaled.
- Blood plays a large role in digestion and endocrine system functions.
- Digested nutrients are absorbed into the bloodstream through capillaries. These nutrients include glucose, amino acids, vitamins, minerals, and fatty acids.
- Blood also transports some hormones secreted by endocrine system glands to target organs and tissues.



d. Describe the composition of blood

Transportation – Red Blood Cells

- The primary function of red blood cells is to transport oxygen from the lungs to the cells of the body.
- Also called **erythrocytes**
- The most abundant living cells in blood
- Red blood cells are disc-shaped, flexible and bioconcave—flat and round with depressed centers.

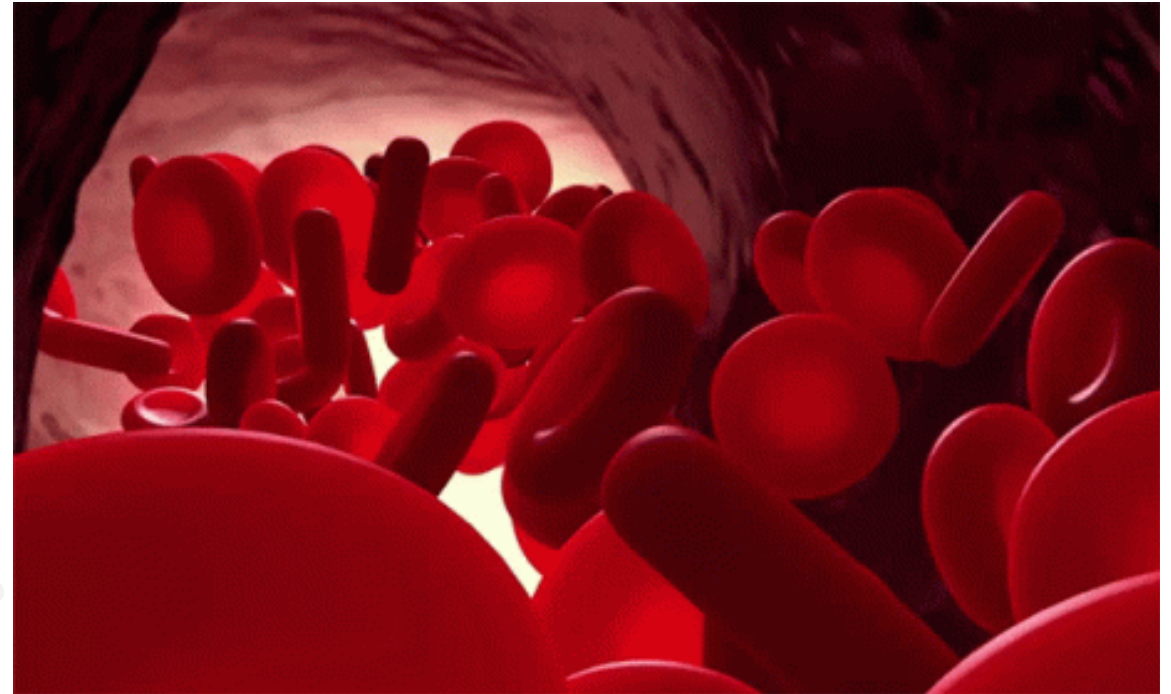




d. Describe the composition of blood

Protection – White Blood Cells

- White blood cells protect the body from pathogens “*disease-fighting components of blood*”
- Also called **leukocytes**.
- They account for just 1% of circulating blood but multiply during infection or inflammation.
- There are five types of white blood cells: neutrophils, eosinophils, basophils, lymphocytes, and monocytes.

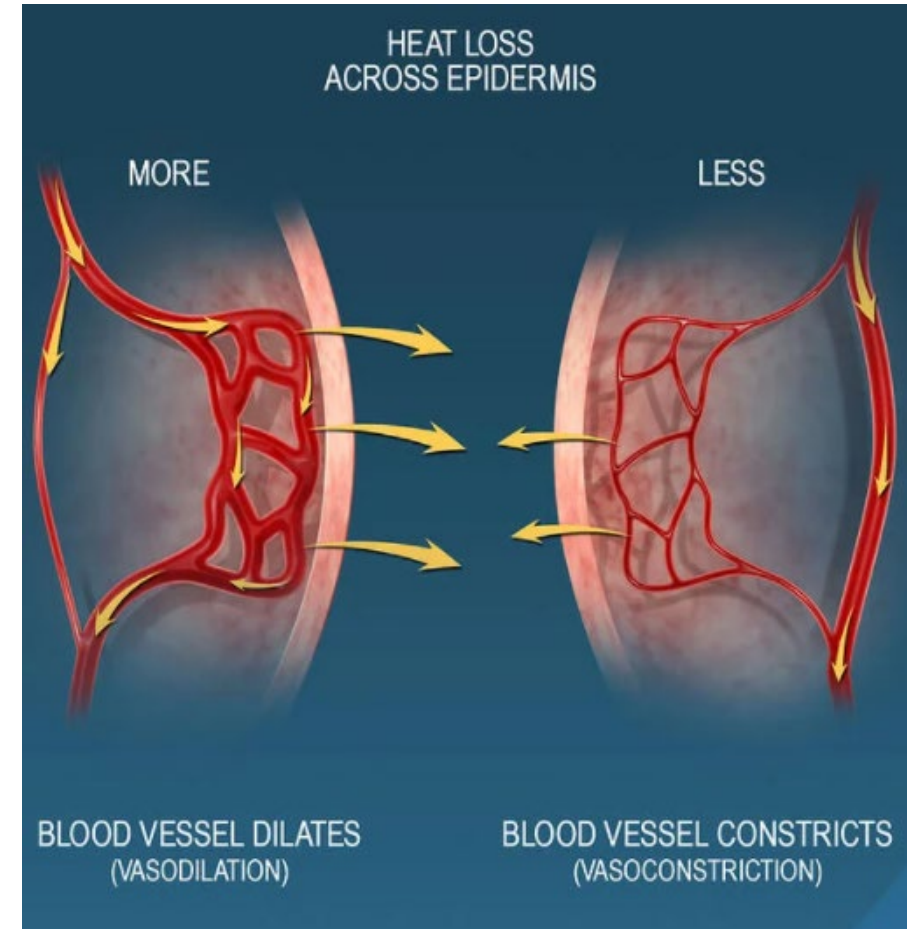




d. Describe the composition of blood

Regulation of Body Temperature

- Blood absorbs and distributes heat throughout the body.
- It helps to maintain homeostasis through the release or conservation of warmth.
- Blood vessels expand and contract when they react to outside organisms, such as bacteria, and to internal hormone and chemical changes.
- These actions move blood and heat closer to or farther from the skin surface, where heat is lost.



e. Describe blood pressure



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e. Describe blood pressure

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.



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e. Describe blood pressure

Blood Pressure Classifications

Hypotension

- Normal
- High Normal
- Mild

Hypertension

- Moderate Hypertension
- Sever Hypertension

Blood Pressure Category	Upper Number (Systolic Pressure)	Lower Number (Diastolic Pressure)
NORMAL	120 mm Hg or less	80 mm Hg or less
PREHYPERHENSION	120 - 139 mm Hg	80 - 89 mm Hg
HYPERTENSION STAGE 1	140 - 159 mm Hg	90 - 99 mm Hg
HYPERTENSION STAGE 2	160 mm Hg or higher	100 mm Hg or higher
HYPERTENSIVE CRISIS	180 mm Hg or higher	110 mm Hg or higher

f. Describe factors that may affect blood pressure



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f. Describe factors that may affect blood pressure

Blood pressure

- Cardiac output.
- Peripheral vascular resistance.
- Volume of circulating blood.
- Viscosity of blood.
- Elasticity of vessels walls.
- Aging
- Smoking
- Anxiety
- Alcohol
- Nutrition
- Fitness
- Genetics
- Medical Conditions



What next?

- Have a go at the practice examination questions for Learning Outcome 8.
- These can be found on the website in the learners link for each learning outcome.
- **All sections** of learning outcome 8 will be assessed in the end of course examination paper.



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