KS3 Theory Assessment

Cardiovascular/Respiratory System

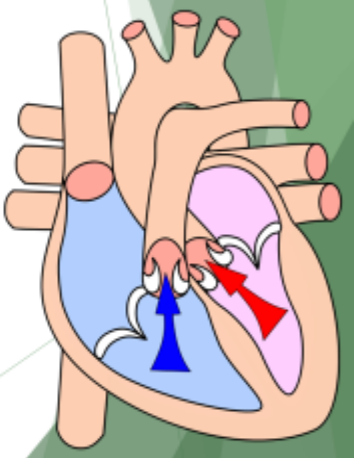
YEAR 7/8/9

Unit 1.1.d - The Cardiovascular and Respiratory System

The Cardiovascular System

The heart operates a double circulatory system in which blood flows through the heart twice.

- **Pulmonary Circulation** - This is blood flow between the heart and the lungs. The pulmonary artery takes the blood to the lungs where it is oxygenated.
- **Systemic Circulation** - This is blood flow from the heart to the rest of the body (excluding the lungs) and then back to the heart.

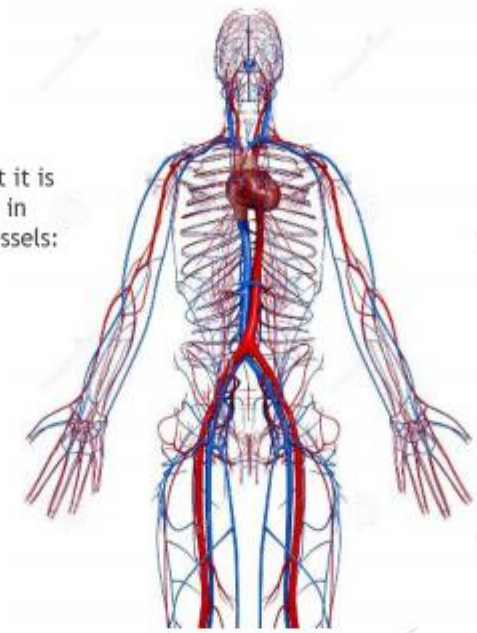


Unit 1.1.d - The Cardiovascular and Respiratory System

Blood Vessels

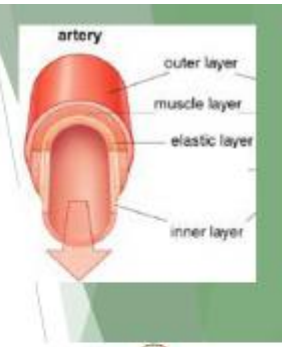
When the blood leaves the heart it is transported around the body in three main types of blood vessels:

- Arteries
- Veins
- Capillaries



Arteries

Type:	Role:	Characteristics:
Arteries	To carry **oxygenated** blood at high pressure **away** from the heart through the aorta.	Contain blood under high pressure Thick muscular walls



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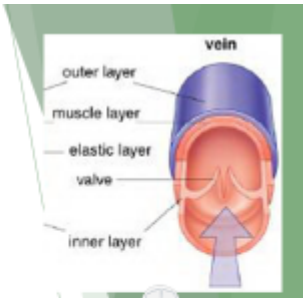
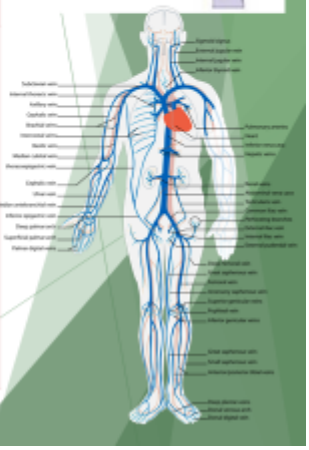
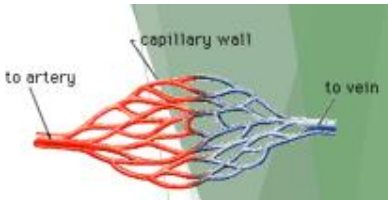
Veins

Type:	Role:	Characteristics:
Veins	To carry **deoxygenated** blood **back** to the heart from all over the body.	Contain blood under low pressure which contains waste products Thinner walls than arteries They have valves to prevent a backflow of blood





Capillaries



Type:	Role:	Characteristics:
Capillaries	Small blood vessels that link the arteries to the veins and allow oxygen and carbon dioxide to pass through their walls.	Only one cell thick They are exchange points where oxygen and carbon dioxide cross into the tissue cells

The structure of the heart

- **Task:** Label the heart in your workbook. Write the information on this page into the **GREEN** boxes.

Right Atrium
An upper chamber receiving de-oxygenated blood from the body.

Left Atrium
An upper chamber receiving oxygenated blood from the lungs.

Right Ventricle
A lower chamber containing de-oxygenated blood.

Left Ventricle
A lower chamber containing oxygenated blood.

The structure of the heart

- **Task:** Label the heart in your workbook. Write the information on this page into the **BLUE** boxes.

Aorta
Carries oxygenated blood which is pumped through at high pressure from the heart to the body.

Pulmonary Artery
Carries de-oxygenated blood from the heart to the lungs.

Pulmonary Vein
Returns oxygenated blood to the heart.

Vena Cava
Returns de-oxygenated blood to the heart.

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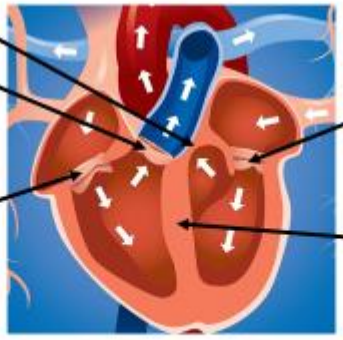
The structure of the heart

- **Task:** Label the heart in your workbook. Write the information on this page into the **RED** boxes.

Semi-lunar Valves
Prevent expelled blood flowing back into the heart.

Bicuspid Valve
Prevent blood flowing back into the left atrium.



Septum
The wall dividing the left and right sides of the heart.

Tricuspid Valve
Prevent blood flowing back into the right atrium.

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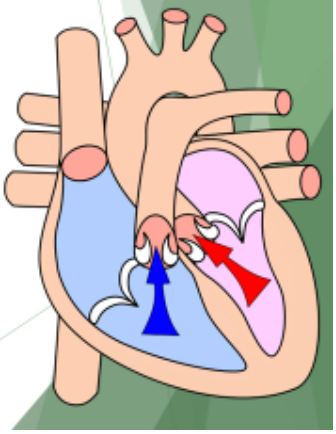
The Cardiac Cycle

The filling of the heart follows a particular sequence. There are two stages to each heart beat.

1. Diastole - The heart filling with blood. The heart is relaxing.
2. Systole - The heart is emptying. The heart contracts.

This process starts in the right side of the heart.



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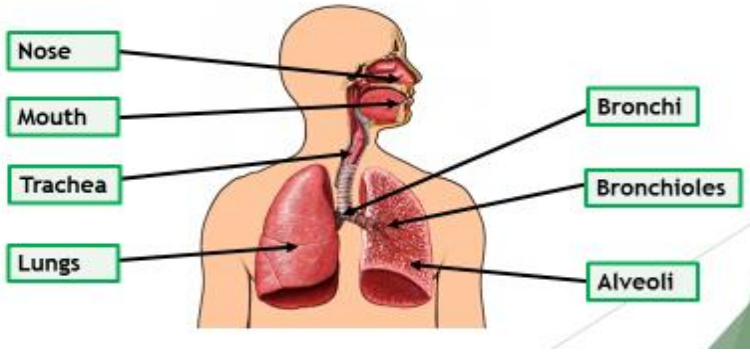
The role of red blood cells

- Red blood cells carry oxygen from the lungs to the muscles and removes carbon dioxide from the muscles to the lungs.
- They contain **haemoglobin** which bonds with oxygen to form oxyhaemoglobin. These cells carry oxygen to the working muscles. Without these cells performers would fatigue and stop.
- **Task:** How do red blood cells help a sports performer? Choose one of the sporting examples to the right and explain.

The pathway of air

- Oxygen travels along the following pathway from the mouth and nose to the alveoli.
- **Task:** Label the respiratory system in your workbook.



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Aerobic Respiration

- Aerobic exercise can be maintained for long periods of time.
- It includes activities like walking, jogging, cycling and swimming.
- The **intensity of exercise is moderate** and **duration long.**

glucose + ***oxygen*** → ***energy*** + ***carbon dioxide*** + ***water***

- **Task:** Can you think of your own sporting examples?

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Anaerobic Respiration

- When you exercise at a high intensity, the respiratory system cannot supply enough oxygen to the muscles.
- With no oxygen available, glucose is still used but produces energy and lactic acid *(this causes fatigue)*.
- It includes activities like sprinting, weightlifting, jumping and throwing.
- The **intensity of exercise is high** and **duration short**.

glucose ➡ ***energy*** + ***lactic acid***

- **Task:** Can you think of your own sporting examples?

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Unit 1.1.d - The Cardiovascular and Respiratory System

Cardiovascular Terms

- **Heart Rate:** The number of beats per minute. *What is your resting heart rate?*
- **Stroke Volume:** The amount of blood pumped out of the left ventricle per beat.
- **Cardiac Output:** The amount of blood pumped out of the left ventricle per minute.

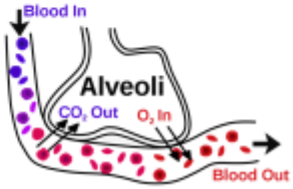
Heart Rate x Stroke Volume = Cardiac Output

Gaseous Exchange

- Gaseous exchange takes place at the alveoli. These are tiny air sacs in the lungs. When you breathe in they fill with air. This is where oxygen is transferred into the blood stream and carbon dioxide is removed from the blood.

- To help this process the body has the following features:

1. The alveoli are covered in capillaries. Gases pass through the thin walls and into the bloodstream.
2. A large blood supply. Increased red blood cell content increases the amount of oxygen supplied to the muscles and tissues.



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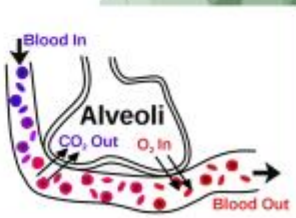
Gaseous Exchange

3. Capillaries are close to the alveoli to the diffusion distance is short.
4. Alveoli have a large surface area to allow diffusion to take place.
5. Thin walls (one cell thick) allows quick diffusion.
6. Gases move from areas of high concentration to areas of low concentration.



The mechanics of breathing

- The process of breathing is aided by the diaphragm and intercostal muscles. The lungs can expand more during inspiration due to the use of the diaphragm and assisted by the intercostal muscles.

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The mechanics of breathing - Inspiration

The intercostal muscles contract, lifting the ribs upwards and outwards causing the to chest expand.

The diaphragm contracts. It pulls down and flattens out the floor of the rib cage.

The lungs increase in size as the chest expands.

The pressure inside our lungs falls as they expand. The higher pressure of air outside means air is now sucked into the lungs through the nose and mouth.

The mechanics of breathing - expiration

The intercostal muscles relax. The ribs move downwards and inwards under their own weight. The cheat gets smaller.

The diaphragm relaxes. It is pushed back into a domed position by the organs underneath it.

The lungs decrease in size as the chest gets smaller. They are squeezed by the ribs and diaphragm.

The pressure inside the lungs increases as they get smaller. The air pressure outside is now lower than in our lungs. Air is forced out of the lungs through the nose and mouth.

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Respiratory Terms

- **Tidal Volume:** The volume of air inspired or expired per breath. This increases during exercise.
- **Breathing Rate:** The number of breaths per minute. This is typically 12-20 breaths per minute for a healthy adult at rest.
- **Minute Ventilation:** The amount of air a person breathes out in a minute.

Breathing Rate x Tidal Volume = Minute Ventilation