



1 Living organisms obtain the **substances they require for life** and get rid of waste products by diffusion e.g **Oxygen, minerals, dissolved food, carbon dioxide and urea.**

2 **Single celled organisms** do not need transport systems as they have a **large surface area to volume ration**

3 **Multi-cellular organisms** need a mass transport system because they have a **small surface area.**

4 In humans, the **mass transport system** is the **blood** and the gas exchange surface is the lungs

5 The **heart** pumps low oxygen/high carbon dioxide containing blood to the lungs. In the lungs, oxygen and carbon dioxide are exchanged in the alveoli.

6 **Alveoli** have a very good blood supply, thin membranes and a large surface area to volume ratio for maximum diffusion

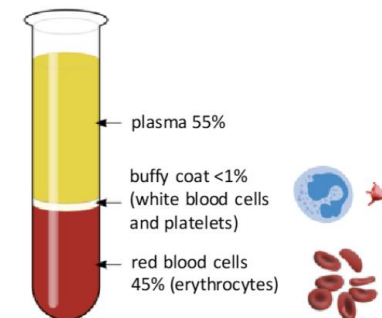
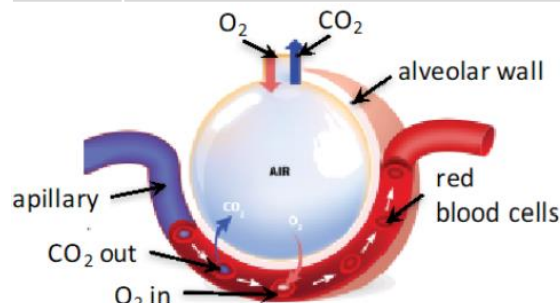
7 **Blood is a tissue** containing plasma in which red blood cells, white blood cells and platelets are suspended

8 There are three types of blood vessels
Arteries- Carry blood away from the heart
Veins- carry blood towards the heart
Capillaries connect arteries and veins

9 The heart is an organ that pumps blood around the body in a **double circulatory system**

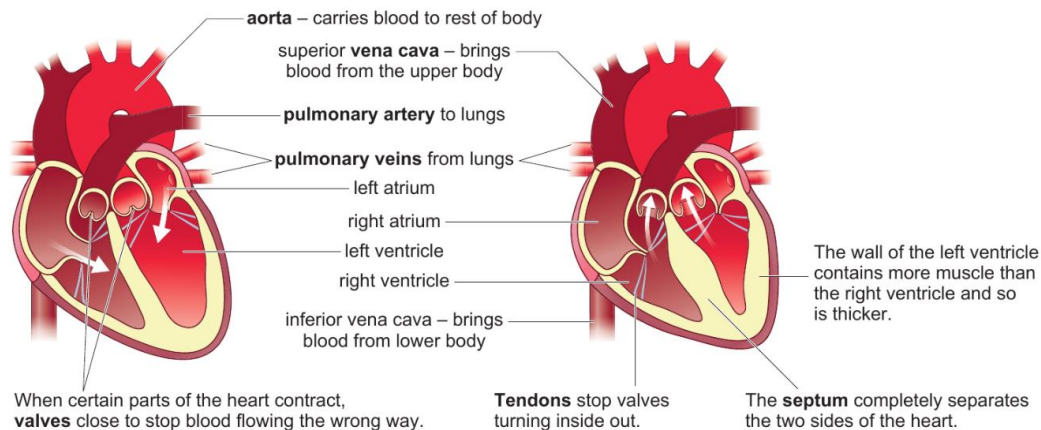
10 The **right ventricle** pumps blood the lungs where gas exchange takes place

11 The **left ventricle** pumps blood under high pressure around the rest of the body and back to the right side of the heart



Blood flows into the two **atria**, which then contract, pushing blood into the ventricles.

The **ventricles** then contract, pushing blood out of the heart.



rate of diffusion $\propto$ $\frac{\text{surface area} \times \text{concentration difference}}{\text{thickness of membrane}}$



1

Every living cell needs **energy**. This energy is released from **food (glucose)** by a series of chemical reactions called **respiration**

2

Cellular respiration (aerobic respiration) happens inside **mitochondria** and is an **exothermic** reaction. The energy released is used inside cells for metabolic processes

3

During hard exercise muscles switch to **anaerobic respiration** to transfer energy. **Lactic acid** is produced.

4

During long periods of vigorous exercise, muscles become **fatigued** and stop contracting efficiently

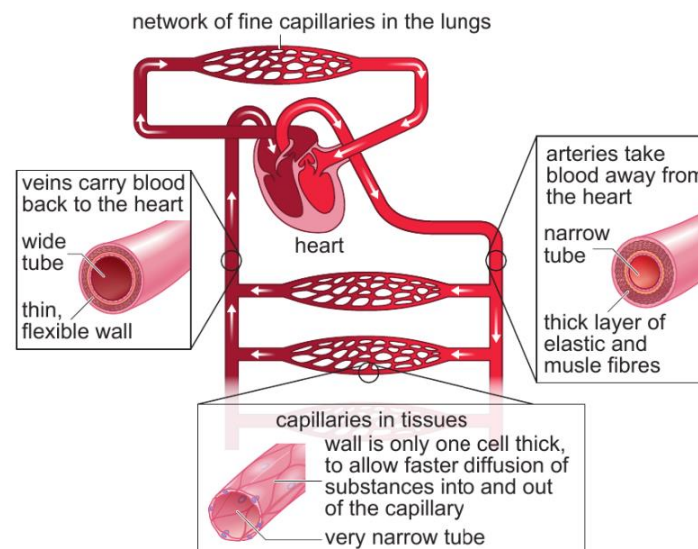
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After exercise the lactic acid must be combined with oxygen to convert it to carbon dioxide. The amount of oxygen needed is called the **oxygen debt**.

The **word equation** which represents aerobic respiration is:



The balanced **symbol equation** which represents aerobic respiration is:



	Aerobic respiration	Anaerobic respiration in animal cells
Oxygen	Required	Not required
End products	Carbon dioxide and water	Lactic acid
Oxidation of glucose	Complete	Incomplete
Efficiency of energy transfer	High	Low