

**Subject: Biology**  
**Year: 7 and 8**  
**Topic: B4 Photosynthesis, Respiration and Circulation**

**Lesson Sequence**

1. Photosynthesis
2. Leaf Adaptations
3. Plant Nutrients
4. Gas Exchange in Plants
5. Gas Exchange in Humans
6. Aerobic Respiration
7. Anaerobic Respiration
8. Impact of Smoking
9. Blood Vessels
10. The Heart

**Key Assessments**

EA Exam 1

**Core Texts**

Smart Science  
Textbook

BBC Bitesize KS3  
Science

**Key Words**

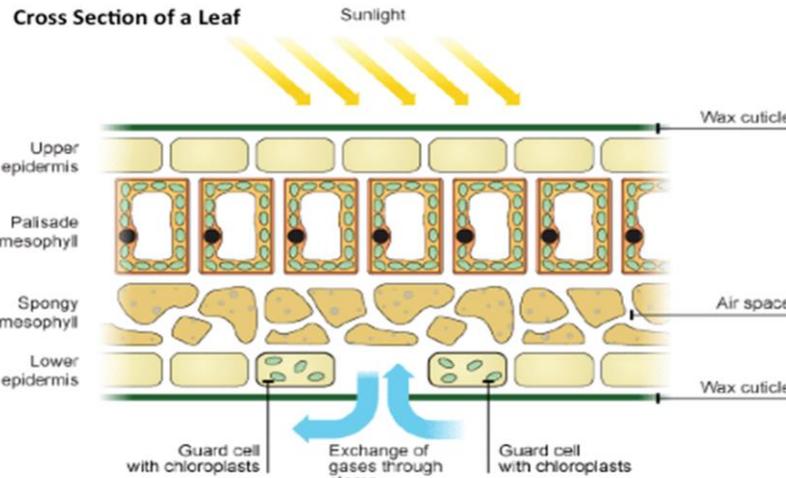
<b>Alveoli</b>	Air sacs in the lungs.	<b>Capillary</b>	Small blood vessels that join arteries to veins, they allow substances from the blood to enter and leave body cells.
<b>Aerobic Respiration</b>	Process in which energy is released from food when oxygen is available.	<b>Carbon dioxide</b>	Colourless gas, formula CO <sub>2</sub> , produced by <b>aerobic respiration</b> and used up by photosynthesis.
<b>Anaerobic respiration</b>	Process in which energy is released from food when oxygen is not available.	<b>Chlorophyll</b>	Green chemical found in plants, which collects light energy for <b>photosynthesis</b> .
<b>Artery</b>	Blood vessels that carry blood away from the heart to the rest of the body.	<b>Chloroplasts</b>	Organelles containing <b>chlorophyll</b> .
<b>Atrium</b>	Meaning 'open roof' - the top chambers of the heart.	<b>Diaphragm</b>	A thin muscle under the lungs used in breathing to pull air into and out of the lungs.
<b>Breathing</b>	The <b>mechanical action</b> of taking air into and pushing air out of the lungs.	<b>Emphysema</b>	A disease where the walls of the alveoli are destroyed, can be caused by smoking.

**Key Equations**

<b>Photosynthesis</b>					
<b>Word equation:</b>	Carbon dioxide	+	Water	$\xrightarrow[\text{Chlorophyll}]{\text{Light}}$	Glucose + Oxygen
<b>Symbol equation:</b>	6CO <sub>2</sub>		6H <sub>2</sub> O		C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> + 6O <sub>2</sub>
<b>Aerobic Respiration</b>					
<b>Word Equation:</b>	Oxygen	+	Glucose	$\longrightarrow$	Carbon dioxide + Water Vapour
<b>Symbol Equation:</b>	6O <sub>2</sub>		C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>		6CO <sub>2</sub> + 6H <sub>2</sub> O
<b>Anaerobic Respiration:</b>					
			Glucose	$\longrightarrow$	Lactic Acid + Energy released
<b>Recovery:</b>					
	Lactic Acid	+	Oxygen	$\longrightarrow$	Carbon dioxide + Water

**Plant Nutrients**

Nutrient	Use
<b>Nitrates</b>	Made of nitrogen and oxygen. Used in chlorophyll, needed for growth and seed production
<b>Phosphates</b>	Made of phosphorus and oxygen. Needed for root growth and in photosynthesis
<b>Potassium</b>	Protects plants from diseases, needed for fruit production and in photosynthesis.



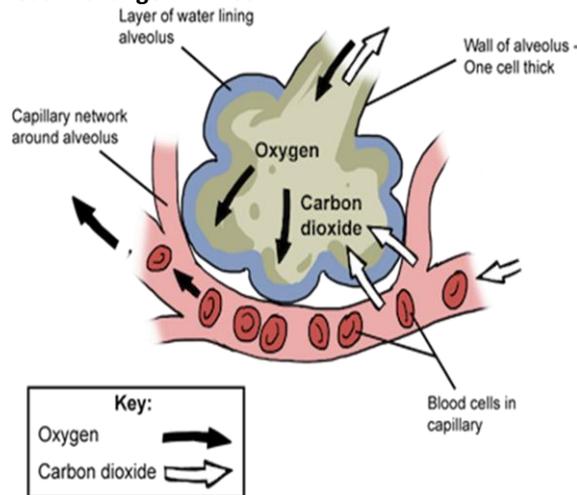
**Leaf Adaptations**

Adaptation	Reason
<b>Wax Cuticle</b>	Prevents water loss from top of leaf.
<b>Palisade Cells</b>	Contain many chloroplasts for maximum photosynthesis.
<b>Air Spaces</b>	Large surface area for gas exchange to occur.
<b>Stomata Have Guard Cells</b>	Open and close to prevent water loss. Allow carbon dioxide to diffuse into the leaf.
<b>Large Surface Area</b>	To absorb more light.
<b>Network of Veins</b>	To support the leaf and transport water and carbohydrates.
<b>Thin</b>	Short distance for carbon dioxide to diffuse.

## Key Words

<b>Fermentation</b>	A chemical reaction that happens anaerobically (in the absence of oxygen), it converts sugar to alcohol or carbon dioxide.	<b>Photosynthesis</b>	Process in which plants use light energy, carbon dioxide and water to make glucose.
<b>Fertiliser</b>	A mix of nutrients and chemicals added to soil to encourage plant growth.	<b>Smoking</b>	Breathing tobacco smoke into the lungs.
<b>Glucose</b>	A sugar made by plants in photosynthesis and used to generate energy.	<b>Starch</b>	A carbohydrate made of glucose molecules, used to store glucose in plants.
<b>Heart</b>	Muscular organ that pumps blood around the body.	<b>Stomata</b>	Small holes on the underside of leaves that allows gases (water vapour, carbon dioxide and oxygen) to move in and out.
<b>Lactic acid</b>	A chemical produced in muscles by anaerobic respiration, it causes cramp.	<b>Vein</b>	Blood vessels that carry blood from the body back to the heart (except the Pulmonary Vein which carries oxygenated blood from the lungs to the heart).
<b>Oxygenated</b>	Carrying a lot of oxygen (Opposite is deoxygenated - carrying little/no oxygen).	<b>Ventricle</b>	Meaning 'hollow cavity'- the bottom two chambers of the heart.

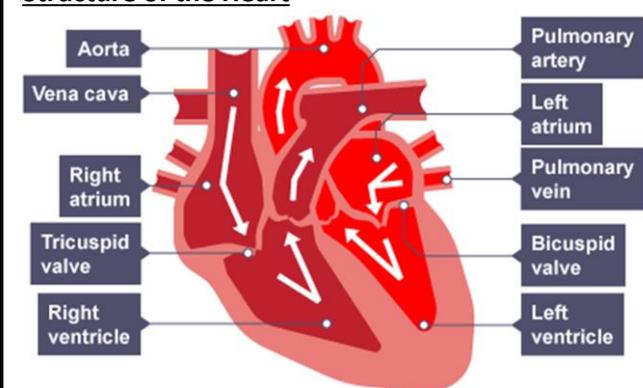
### Gas Exchange in Alveoli



### Journey of Blood Around the Body

- The left ventricle pumps oxygenated blood from the lungs, through the **aorta** to the body tissues (excluding the lungs).
- Deoxygenated blood returns from the body tissues to the right atrium, via the **vena cava**.
- Blood is then pushed into the right ventricle before being pumped to the lungs, via the **pulmonary artery** where it is oxygenated.
- Blood returns to the left atrium, via the **pulmonary vein** and is pushed it to the left ventricle where oxygenated blood is pumped to the body tissues again.

### Structure of the Heart



### Types of Blood Vessel

**Arteries:** Carry blood away from the heart, have thick, elastic walls that substances cannot pass through and blood is under high pressure.

**Veins:** Carry blood towards the heart, thin walls that are less elastic, blood is under lower pressure, do not allow substances to pass through their walls and they contain one-way valves which prevent blood flowing backwards.

**Capillaries:** Very thin walls that are only one cell thick, substances such as glucose, oxygen, water and carbon dioxide can diffuse between the blood and the tissues.

### Blood Components

- **Plasma:** Fluid, carries  $\text{CO}_2$
- **Red Blood Cells:** Contain haemoglobin which carries oxygen
- **White Blood Cells:** Fights infection
- **Platelets:** Clump together to form clots

### Stages of Breathing

**Inhalation** (Breathing in):

**Step 1:** The muscles between the ribs **contract**. The ribs rise **up**.

**Step 2:** At the same time, the diaphragm muscles pull the diaphragm **down**. This **increases** the volume of the thorax and decreases **pressure** in the lungs.

**Step 3:** Air rushes **into** the lungs down the pressure gradient to equalise the pressure.

**Exhalation** (Breathing out)

**Step 4:** The muscles between the ribs relax and the ribs fall.

**Step 5:** The diaphragm pushes upwards and the volume of the thorax goes down.

**Step 6:** Pressure in the lungs rises and air is pushed out.