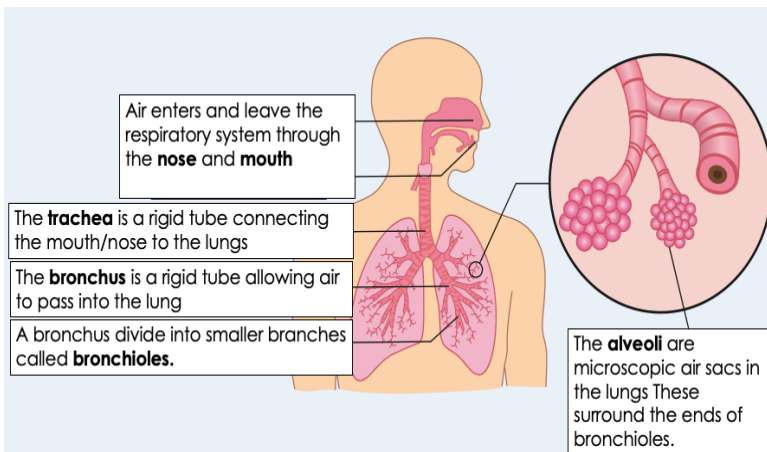


The Structure of the Lungs

1. The lungs consist of the **trachea**, **bronchi**, **alveoli** and the capillary network surrounding the alveoli
2. The lungs are surrounded by the **ribcage** which protects them and allows breathing to occur
3. The trachea is a rigid tube that allows air to pass from the atmosphere into the lungs
4. At the end of the trachea are two branches called bronchi (sing. bronchus). These allow air to pass in and out of each lung.
5. The bronchi then divide into bronchioles that carry air throughout the lung tissue

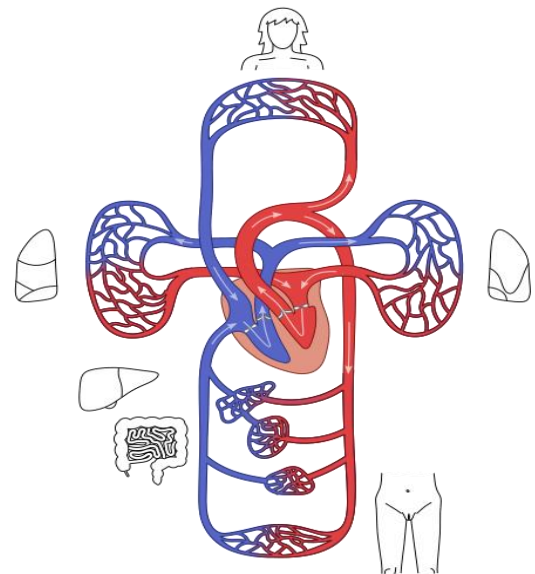


6. Lung tissue consists of millions of **alveoli** (sing. alveolus).
7. Alveoli have a **large surface area** and **thin walls** (just one cell thick).
8. Each alveolus is surrounded by many **capillaries** that ensure a good blood supply
9. Alveoli allow for the exchange of gases between air and the blood.
10. **Oxygen** diffuses out of the alveoli into the blood, to be circulated around the body for use in respiration.
11. **Carbon dioxide** diffuses out of the blood into the alveoli, to be expelled from the body during exhalation

The Circulatory System

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

13. The right ventricle pumps blood to the lungs where gas exchange takes place.
14. The left ventricle pumps blood around the rest of the body.
15. The wall of the left ventricle is thicker than the wall of the right ventricle because it contains more muscular tissue. This means that it can contract to produce a stronger beat so that blood can be transported around the whole body.
16. **Valves** of the heart ensure one-way flow of blood and prevent back-flow



17. The **aorta** transports oxygenated blood from the left ventricle to the body
18. The **vena cava** transports deoxygenated blood from the body to the right atrium
19. The **pulmonary artery** transports deoxygenated blood from the right ventricle to the lungs
20. The **pulmonary vein** transports oxygenated blood from the lungs to the left atrium
21. The natural resting heart rate is controlled by a group of cells located in the right atrium that act as a pacemaker. This group of cells sends electrical impulses across the heart to trigger contractions





22. Artificial pacemakers are electrical devices used to correct an irregular heart rate.

Blood

23. Blood is a **tissue** consisting of plasma, in which the red blood cells, white blood cells and platelets are suspended.
24. Each of these blood components has a different function. The structure of blood cells relates to their function.
25. **Red blood cells** are **biconcave** which increases their surface area. They have **no nucleus** and contain large amounts of **haemoglobin** so that they are able to transport large quantities of **oxygen** to respiring cells
26. A lack of red blood cells can result in tiredness, muscle fatigue and anaemia
27. **White blood cells** protect the body against **infection** by destroying pathogens (microorganisms)
28. **Plasma** is a **liquid** substance that transports dissolved substances around the body. These substances include glucose, carbon dioxide, amino acids, hormones, antibodies and urea.
29. **Platelets** begin the process of blood **clotting**. This prevents excessive bleeding when a blood vessel is damaged.
- Once a person starts on statins, they must take them for the rest of their life which is a disadvantage.
34. **Stents** are used to keep the coronary arteries **open**. Stents can also be used to keep other arteries open, as well as the trachea.
35. A **rapid heart rate** can be treated using a drug called **Digitalis**. This drug originates from foxglove plants and has been used for many years.
36. Cardiovascular diseases are treated by the use of drugs, mechanical devices or transplant. Each of these methods has advantages and disadvantages.
37. In some people heart **valves** may become faulty, preventing the valve from opening fully, or the heart valve might develop a leak.
38. Faulty heart valves can be replaced using **biological** or **mechanical** valves.
39. There are advantages and disadvantages to each type of valve. Patients and doctors must evaluate the different types of valves before making a decision about the best replacement.
40. In the case of **heart failure** a donor heart, or heart and lungs can be transplanted. **Artificial hearts** are occasionally used to keep patients alive whilst waiting for a heart transplant, or to allow the heart to rest as an aid to recovery.

Coronary Heart Disease and Heart Treatments

30. In **coronary heart disease** layers of **fatty** material build up inside the **coronary arteries**, narrowing them. This reduces the flow of blood through the coronary arteries, resulting in a lack of **oxygen** for the heart muscle.
31. **Cholesterol** is a fatty substance that can build up inside the coronary arteries
32. High blood cholesterol levels are treated using statins.
33. **Statins** are widely used to reduce blood **cholesterol** which **slows down** the rate of fatty material deposit.

Aerobic Respiration

41. **Respiration** is an **exothermic** reaction that is continuously occurring in living cells.
42. The **energy** transferred during respiration supplies all the energy needed for living processes, including:
- Synthesis of new molecules
 - Active transport
 - Keeping warm (in mammals and birds)
 - Movement (in animals)
43. Respiration in cells can take place **aerobically** (using oxygen) or



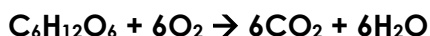


anaerobically (without oxygen), to transfer energy.

44. Aerobic respiration is represented by the equation:

glucose + oxygen → carbon dioxide + water

45. The balanced symbol equation for respiration is;



Anaerobic Respiration

46. **Anaerobic** respiration transfers **less energy** than aerobic respiration because the oxidation of glucose is incomplete
47. Anaerobic respiration in animal cells is represented by the equation:

glucose → lactic acid

48. Anaerobic respiration results in **oxygen debt**.
49. Anaerobic respiration in plant and yeast cells is represented by the equation:

glucose → ethanol + carbon dioxide

50. Anaerobic respiration in yeast cells is called **fermentation** and has economic importance in the manufacture of **bread** and **alcoholic drinks**

Response to Exercise

51. **Cardiovascular exercise** strengthens heart muscles, improves circulation and controls weight
52. During exercise the human body reacts to the **increased demand** for **energy**.
53. The **heart rate**, **breathing rate** and **breath volume** increase during exercise to supply the muscles with more oxygenated blood. Arteries also dilate to increase the rate of blood flow.
54. If **insufficient oxygen** is supplied **anaerobic respiration** takes place in

muscles. The incomplete oxidation of glucose causes a build-up of lactic acid and creates an oxygen debt. During long periods of vigorous activity muscles become fatigued and stop contracting efficiently.

55. If a heart **valve** develops a **leak**, **backflow** of blood can occur. This can result in less blood leaving the heart, meaning less oxygen is supplied to cells. This can result in less respiration so less energy is released. This can mean less efficient muscle contraction.
56. *Blood flowing through the muscles transports the lactic acid to the liver where it is converted back into glucose.*
57. **Oxygen debt** is the amount of extra **oxygen** the body needs after exercise to react with the accumulated **lactic acid** and remove it from the cells.

Metabolism

58. **Metabolism** is the **sum** of all of the **reactions** in a cell or body
59. A metabolic process is a chemical reaction that takes place inside a cell
60. The **energy transferred** by **respiration** in cells is used by the organism for the continual enzyme controlled processes of metabolism that synthesise new molecules.
61. Metabolism includes:
- conversion of glucose to starch, glycogen and cellulose
 - the formation of lipid molecules from a molecule of glycerol and three molecules of fatty acids
 - the use of glucose and nitrate ions to form amino acids which in turn are used to synthesise proteins
 - respiration
 - breakdown of excess proteins to form urea for excretion

