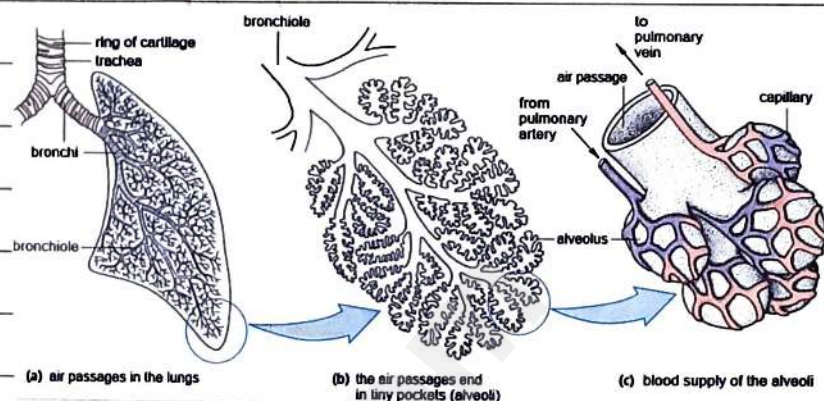




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Gas Exchange

- Inspired air passes
the larynx
the trachea
the bronchi
the bronchioles
the alveoli

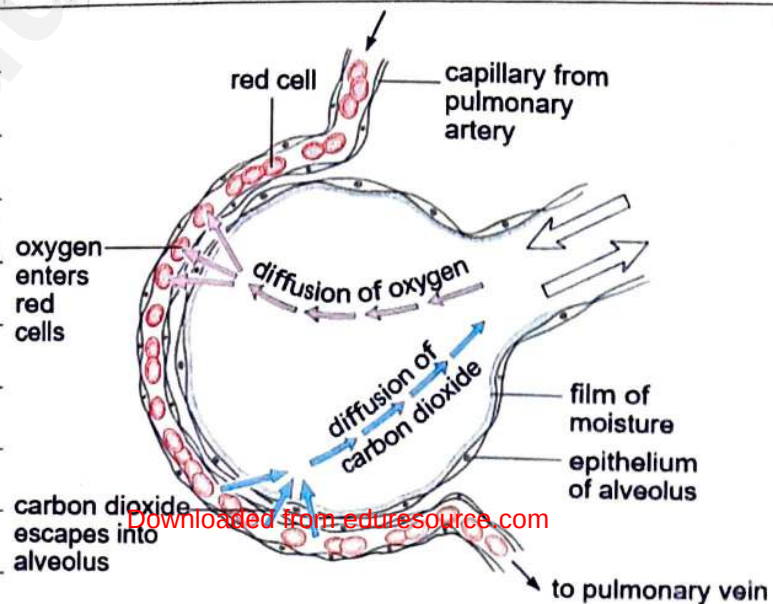
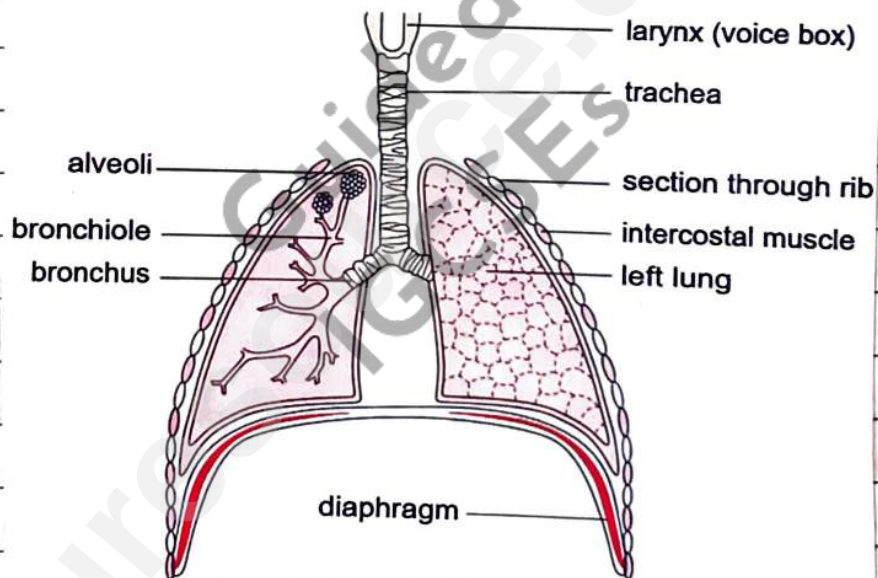
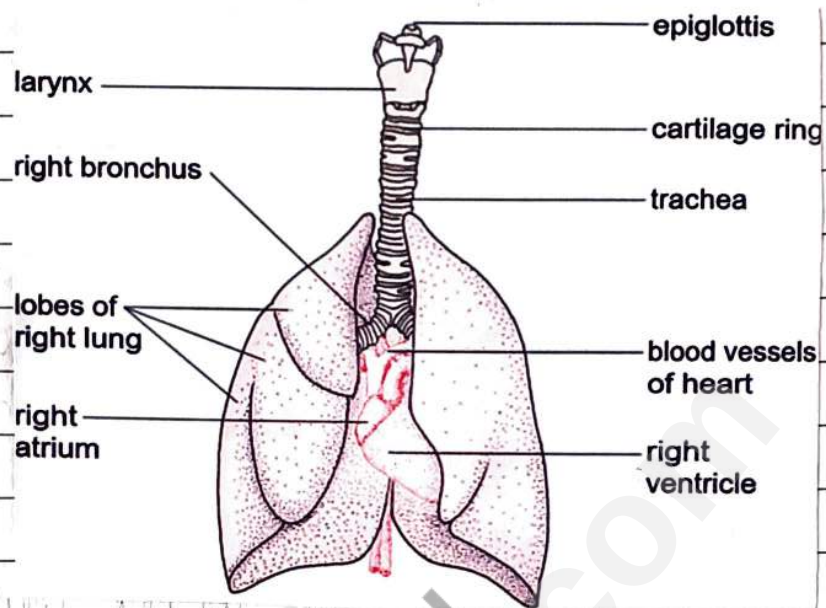


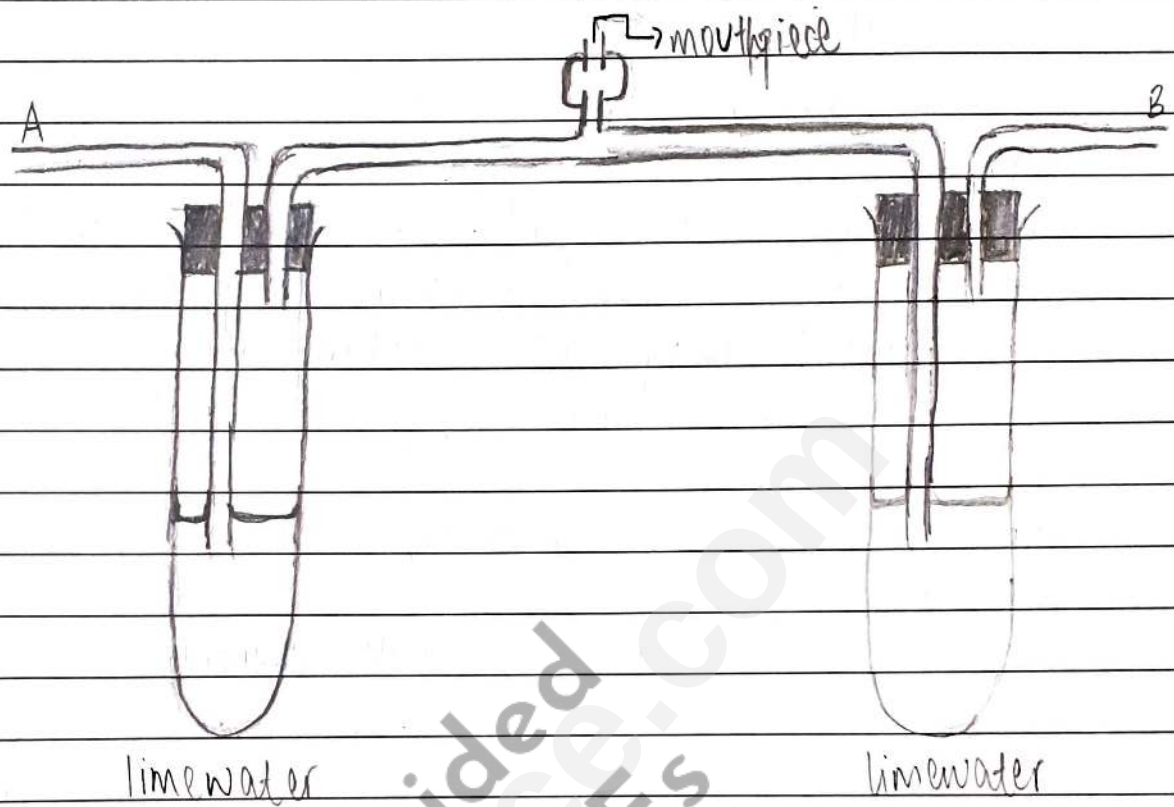
- The cartilage keeps the trachea open when air passes through it.
- Gas exchange occurs between the air in the alveoli and the blood in the surrounding capillaries.

Features of Gas Exchange surfaces:

- large surface area: for diffusion
- thin surface: do not have to diffuse very fast
- good blood supply: concentration gradient maintained
- good ventilation: concentration gradient between air in alveoli and that in blood are maintained

Gas	Composition / (%)	
	inspired air	expired air
oxygen	21	16
carbon dioxide	0.04	4
nitrogen	78	78
water vapour	variable	saturated





- Limewater as a test for CO_2 - inspired and expired air
- When we breath in, the air comes in through A.
 - When we breath out, the air goes through B.
 - The limewater turns cloudy in B first. This shows that there is more CO_2 in expired air than in inspired air.
 - The limewater in A will slowly become milky. This shows that there is lower concentration of CO_2 in inspired air.

Goblet cells

- produce mucus, which traps dust particles and pathogens in the air.
- cilia sweep mucus towards the back of throat.
- also mucus stops soot from reaching lungs, which if not stopped, may cause inflammation.

Effects of Physical Activity on rate and depth of breathing

- Rate and depth increases with exercise

Exercise $\rightarrow$ high rate of respiration $\rightarrow$ rate and depth increases

$\nearrow$ Oxygen delivered quickly
 $\searrow$ carbon dioxide removed quickly

- After some time, a limit is reached and the heart and lungs cannot supply oxygen any faster.

This extra energy is produced by anaerobic respiration.

glucose $\rightarrow$ lactic acid + energy

The lactic acid must be broken down by combining it with oxygen or else it could cause post-exercise soreness and a decrease in pH levels.

Thus, the heart beats faster, transporting the lactic acid to the liver.

Tobacco Smoking and its effects

- can cause
- chronic obstructive pulmonary disease (COPD) is the term given for the lung diseases, which include bronchitis and emphysema.
- Emphysema is a condition in which walls of the alveoli are broken down.
- Chronic bronchitis is when large amounts of phlegm (a mixture of mucus, bacteria and WBC) are produced, causing difficulty in movement of air as bronchi are partly blocked.
- lung cancer
- CHD

Nicotine

- absorbed quickly through alveoli to enter bloodstream.
- it is a stimulant (makes more high).
- makes heart beat faster as blood vessels get narrower. It increases blood pressure.
- high chance of developing CHD.
- interacts with nervous system.

Tar

- carcinogenic (can cause cancer)
- black sticky material
- does not pass into bloodstream
- goblet cells produce more mucus
- cilia gets damaged
- narrowing of airways

carbon monoxide

- permanent affinity with haemoglobin.
- reduces volume of oxygen that blood can carry to as much as 10%.
- strain on heart
- harmful for fetus - prevent it from growing properly.

B8 RESPIRATION AND GAS EXCHANGE

Respiration

Cells need energy for:

- contracting muscles
- making protein molecules
- making new cells
- cell division
- producing heat inside the body

All the energy comes from the food eat.

- Glucose is the main nutrient. It has a lot of chemical energy. Cells have to break the glucose molecules to release energy.

Respiration

- Chemical reactions in cells that break down nutrient molecules and release energy for metabolism.

Aerobic

- Chemical reactions in cells that use oxygen to break down nutrient molecules to release energy.



Anaerobic

- Chemical reactions in cells that break down nutrient molecules to release energy without using oxygen.

glucose $\longrightarrow$ lactic acid

- There is anaerobic respiration in muscles during vigorous exercise, causing oxygen debt.

Using yeast to make bread

- Amylase enzymes break down some of the starch in the dough to make maltose and glucose, which the yeast can use in anaerobic respiration.
- Bubbles of CO_2 get trapped in the dough. Gluten makes the dough stretchy.
- glucose $\longrightarrow$ alcohol + carbon dioxide
- Anaerobic respiration also makes alcohol, which is broken down when the bread is baked. Baking also kills the yeast.

Comparison of aerobic and anaerobic

Aerobic

- uses oxygen
- no alcohol or lactic acid is made
- large amount of energy released from each molecule of glucose
- CO_2 made

Anaerobic

- does not use oxygen
- alcohol (in yeast and plants) or lactic acid (in animals) is made
- much less energy released from each molecule of glucose
- CO_2 is made by yeast and plants, but not by animals