



TRINITY COLLEGE FOR WOMEN NAMAKKAL

DEPARTMENT OF NUTRITION AND DIETETICS

**HUMAN PHYSIOLOGY
EVEN SEMESTER**

Presented by

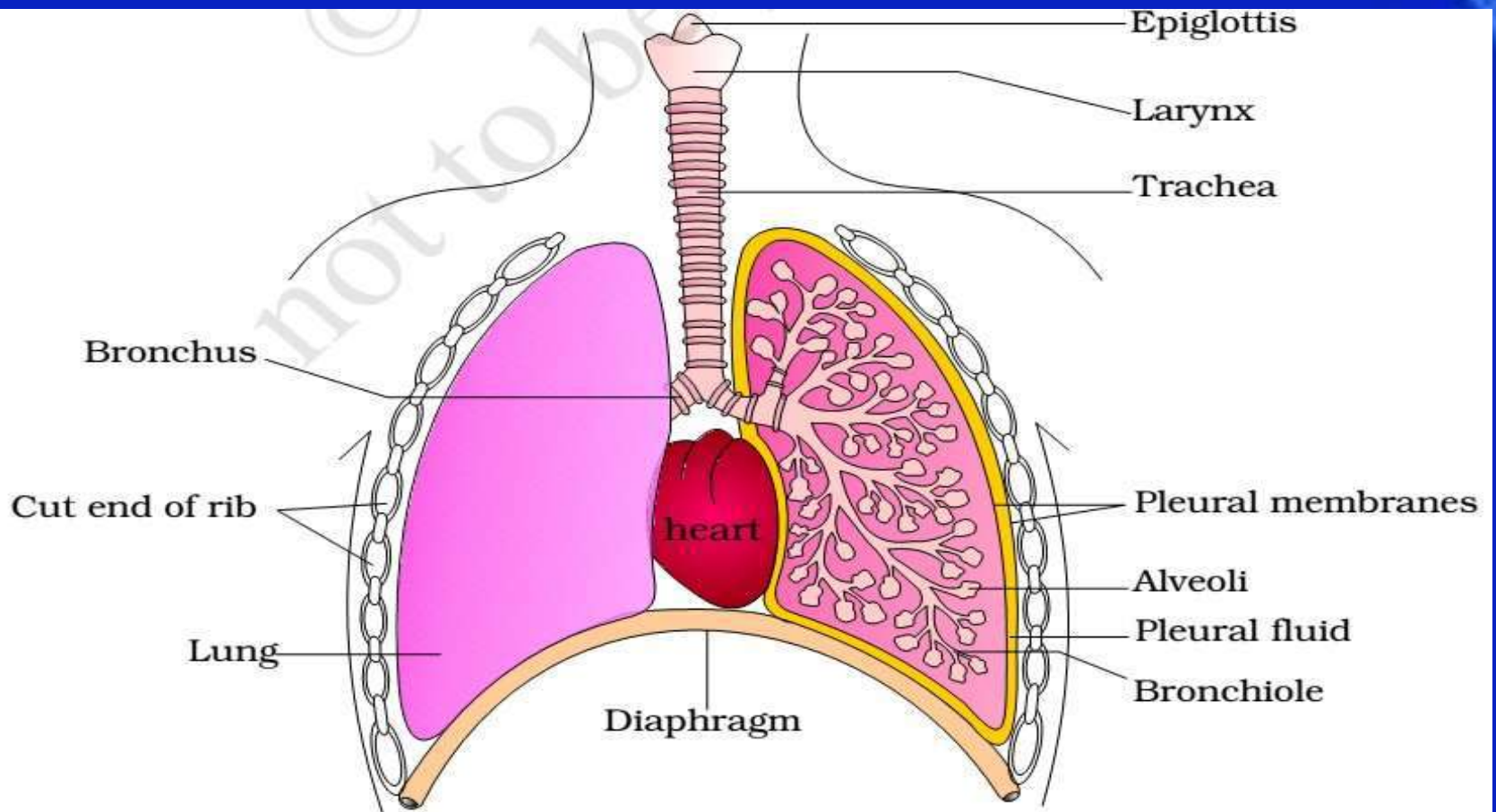
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Human Respiratory System



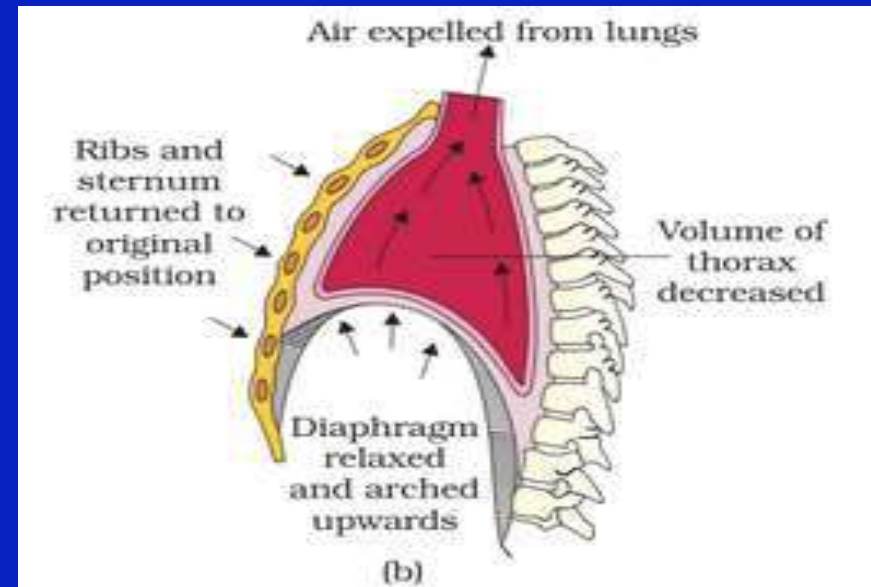
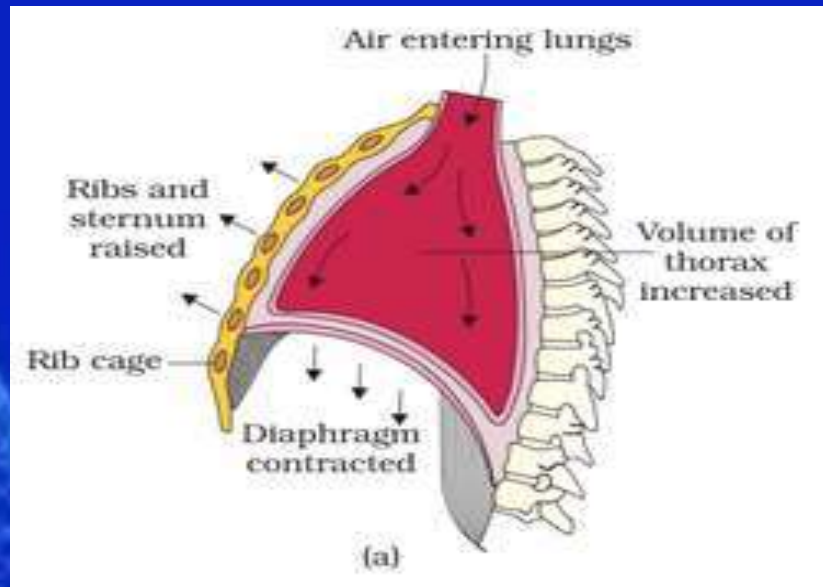
The 4 stages of Respiration:

- 1) Breathing-** inspiration/inhalation and expiration/exhalation
- 2) External Respiration-** exchange of gases between lungs and blood
- 3) Internal Respiration-** exchange of gases between blood and cells
- 4) Cellular Respiration-** energy-releasing reactions inside the cells

Breathing involves two stages:

Inspiration during which atmospheric air is drawn in and **expiration** by which the alveolar air is released out.

Mechanism of breathing



Exchange of Gases

- **Alveoli** are the primary sites of exchange of gases. Exchange of gases also occur between **blood and tissues**. O₂ and CO₂ are exchanged in these sites by simple **diffusion** mainly based on pressure/concentration gradient.
- **Partial pressure** of gasses, **Solubility** of the gases as well as the **thickness** of the membranes involved in diffusion are some important factors that can affect the rate of diffusion.
- Pressure contributed by an individual gas in a mixture of gases is called partial pressure.

TABLE 17.1 Partial Pressures (in mm Hg) of Oxygen and Carbon dioxide at Different Parts Involved in Diffusion in Comparison to those in Atmosphere

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
O ₂	159	104	40	95	40
CO ₂	0.3	40	45	40	45

TRANSPORT OF GASES

- ✓ **Blood** is the medium of transport for O₂ and CO₂.
- ✓ About **97 per cent** of O₂ is transported by **RBCs** in the blood. The remaining 3 per cent of O₂ is carried in a **dissolved state** through the plasma.
- ✓ Nearly 20-25 per cent of CO₂ is transported by **RBCs** whereas 70 per cent of it is carried as **bicarbonate**. About 7 per cent of CO₂ is carried in a **dissolved state** through plasma.

TRANSPORT OF OXYGEN

- **Haemoglobin** is a red coloured **iron** containing pigment present in the RBCs. O₂ can bind with **haemoglobin** in a reversible manner to form **oxyhaemoglobin**.
- Each haemoglobin molecule can carry a maximum of **four** molecules of O₂. Binding of oxygen with haemoglobin is primarily related to **partial pressure** of O₂.
- Partial pressure of CO₂, hydrogen ion concentration and temperature are the other factors which can interfere with this binding.

Transport of Carbon dioxide

- CO₂ is carried by haemoglobin as **carbamino-haemoglobin** (about 20-25 per cent). This binding is related to the partial pressure of CO₂. Partial pressure of O₂ is a major factor which could affect this binding. RBCs contain a very high concentration of the enzyme, **carbonic anhydrase** and minute quantities of the same is present in the plasma too. Nearly 70 per cent of carbon dioxide is transported as bicarbonate (HCO₃) with the help of the enzyme carbonic anhydrase.
- At the tissue site where partial pressure of CO₂ is high due to catabolism [the breakdown of complex molecules in living organisms to form simpler ones, together with the release of energy], CO₂ diffuses into blood (RBCs and plasma) and forms HCO₃ and H⁺.

➤ Thus, CO₂ trapped as bicarbonate at the tissue level and transported to the alveoli is released out as CO₂. Every 100 ml of deoxygenated blood delivers approximately 4 ml of CO₂ to the alveoli.

➤ At the alveolar site where pCO₂ is low, the reaction proceeds in the opposite direction leading to the formation of CO₂ and H₂O.

THANK YOU

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