

Physiology of respiration

B.Sc Second year Zoology (Subsidiary) Paper - 2

- Lecture-2

Dr. Mirza Imteyaz Baig

Assistant Professor

Department of Zoology

Raja Singh College, Siwan.

Mobile no: 09538245814

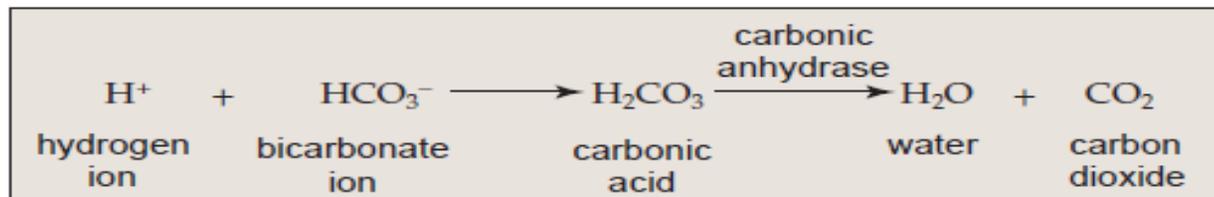
E- mail: bmirza7@gmail.com

➤ ***Gas Exchanges in the Body***

- Gas exchange is critical to homeostasis. Oxygen needed to produce energy must be supplied to all the cells, and carbon dioxide must be removed from the body during gas exchange.
- The principles (rules) of diffusion govern whether O_2 or CO_2 enters or leaves the blood in the lungs and in the tissues.
- Gases exert pressure, and the amount of pressure each gas exerts is called its partial pressure, symbolized as PO_2 and PCO_2 .
- If the partial pressure of oxygen differs across a membrane, oxygen will diffuse from the higher to lower partial pressure.

External Respiration

- **External respiration** refers to the exchange of gases between air in the alveoli and blood in the pulmonary capillaries.
- Blood in the pulmonary capillaries has a higher PCO_2 than atmospheric air. Therefore, CO_2 diffuses out of the plasma into (alveoli) the lungs.
- Most of the CO_2 is carried in plasma as **bicarbonate ions (HCO_3^-)**.
- In the low- PCO_2 environment of the lungs, the reaction proceeds to the right.

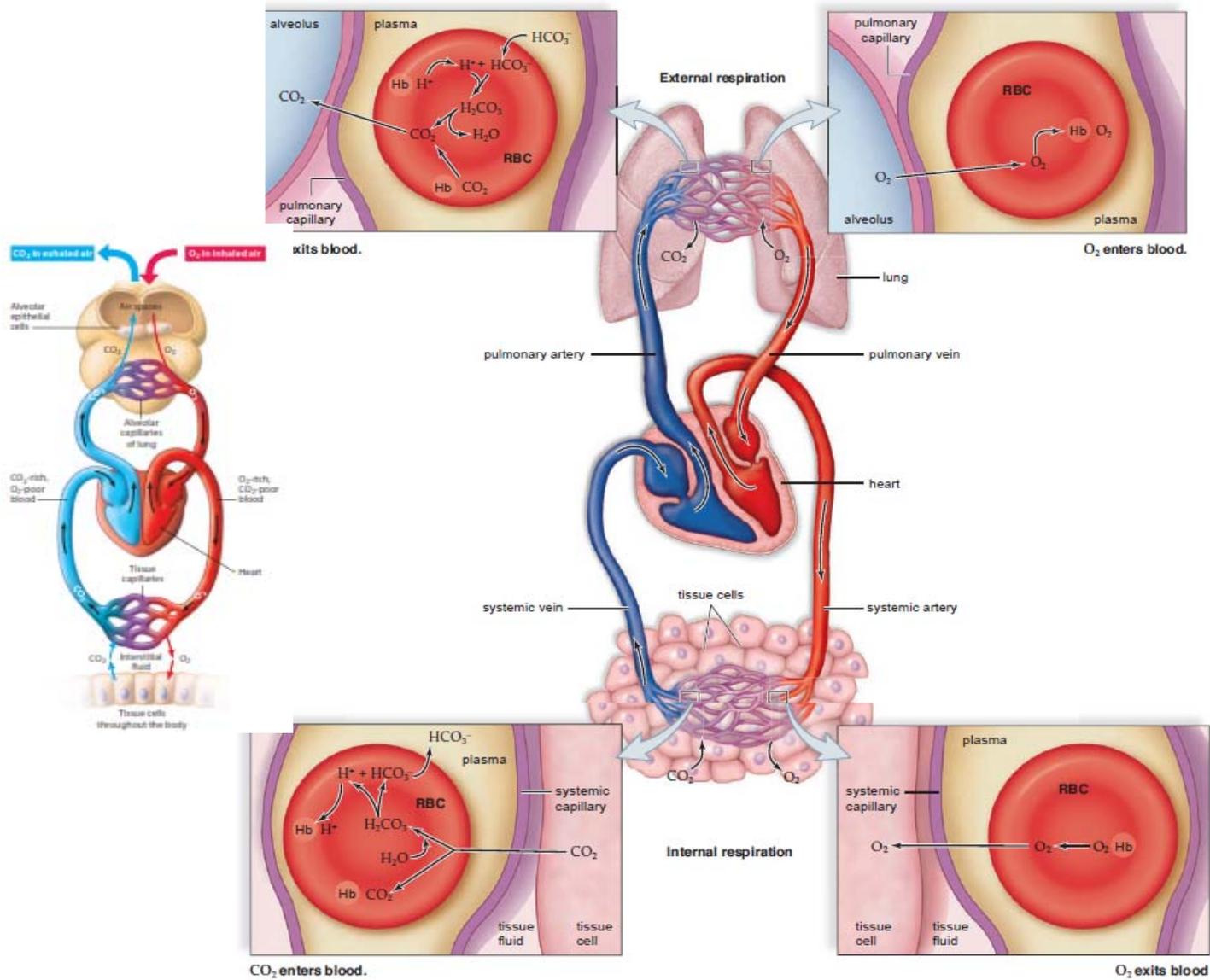


- The enzyme **carbonic anhydrase** speeds the breakdown of carbonic acid (H_2CO_3) in red blood cells.
- The pressure pattern for O_2 during external respiration is the

- reverse of that for CO₂. Blood in the pulmonary capillaries is low in oxygen, and alveolar air contains a higher partial pressure of oxygen.
- Therefore, O₂ *diffuses into plasma and then into red blood cells in the lungs.*
- Hemoglobin takes up this oxygen and becomes oxyhemoglobin (HbO₂).

Internal Respiration

- Internal respiration refers to the exchange of gases between the blood in systemic capillaries and the tissue cells.
- Blood entering systemic capillaries is a bright red color because red blood cells contain oxyhemoglobin.
- The temperature in the tissues is higher and the pH is slightly lower (more acidic), so oxyhemoglobin naturally gives up oxygen.
- After oxyhemoglobin gives up O₂ , it diffuses out of the blood into the tissues.



b.

- *Oxygen diffuses out of the blood into the tissues because the PO₂ of tissue fluid is lower than that of blood. The lower PO₂ is due to cells continuously using up oxygen in cellular respiration.*
- *Carbon dioxide diffuses into the blood from the tissues because the PCO₂ of tissue fluid is higher than that of blood.*
- Carbon dioxide is produced during cellular respiration and collects in tissue fluid. After CO₂ diffuses into the blood, most enters the red blood cells, where a small amount is taken up by hemoglobin, forming carbaminohemoglobin (HbCO₂).
- In plasma, CO₂ combines with water, forming carbonic acid (H₂CO₃), which dissociates to hydrogen ions (H⁺) and bicarbonate ions (HCO₃⁻). Bicarbonate ions (HCO₃⁻) diffuse out of red blood cells and are carried in the plasma.
- The globin portion of hemoglobin combines with excess hydrogen ions produced by the overall reaction, and Hb becomes HHb, called **reduced hemoglobin**. In this way, the pH of blood remains fairly constant.