PHYSIOLOGY

Q10 – Oxygen Transport in the Body

Ans : 10 – Answer

Introduction

Oxygen transport is a vital physiological process that ensures continuous delivery of oxygen from the lungs to body tissues for cellular respiration and energy production. Efficient oxygen transport depends on the respiratory system, cardiovascular system, and hemoglobin in blood, working together in a coordinated manner.

Definition

Oxygen transport in the body is defined as the process by which oxygen is taken up from the lungs, carried in the blood, and delivered to tissues for metabolic activities.

Forms of Oxygen Transport

Oxygen is transported in blood in two forms. About 97–98 percent of oxygen is transported bound to hemoglobin as oxyhemoglobin, which allows carriage of large amounts of oxygen without markedly increasing oxygen tension. The remaining 2–3 percent is transported dissolved in plasma, which determines the partial pressure of oxygen in blood.

Oxygen Uptake in Lungs

In the lungs, oxygen diffuses from alveoli into pulmonary capillaries due to a high partial pressure gradient. Oxygen rapidly binds with hemoglobin in red blood cells, forming oxyhemoglobin. Under normal conditions, arterial blood leaving the lungs is nearly fully saturated with oxygen.

Oxygen Delivery to Tissues

At the tissue level, partial pressure of oxygen is low, causing dissociation of oxygen from oxyhemoglobin. Oxygen diffuses from capillaries into interstitial fluid and cells, where it is utilized for oxidative metabolism.

Oxygen–Hemoglobin Dissociation Curve

The oxygen–hemoglobin dissociation curve is sigmoid in shape due to cooperative binding of oxygen to hemoglobin. This characteristic allows efficient loading of oxygen in the lungs and effective unloading in tissues.

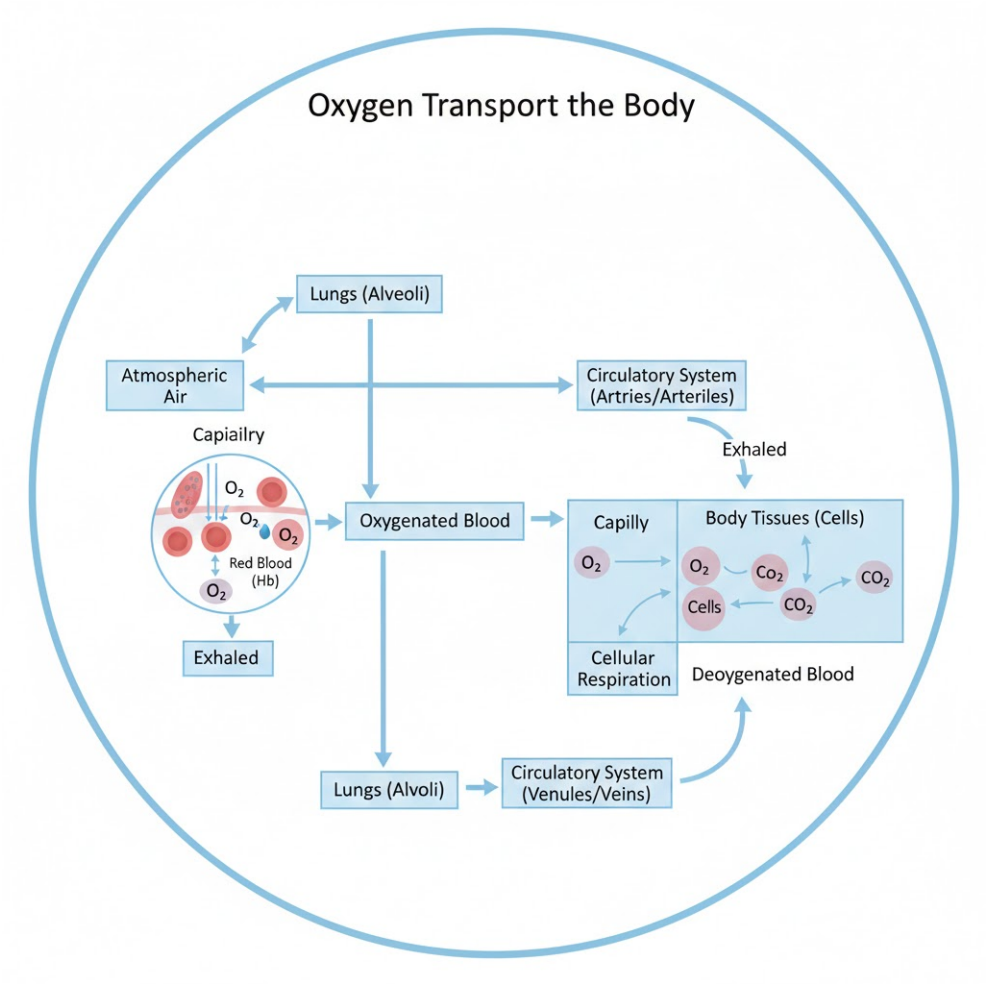
Factors Affecting Oxygen Transport

Oxygen transport and release are influenced by partial pressure of oxygen, partial pressure of carbon dioxide, hydrogen ion concentration, temperature, and levels of 2,3-diphosphoglycerate. An increase in carbon dioxide, hydrogen ions, temperature, or 2,3-DPG shifts the dissociation curve to the right, facilitating oxygen release to tissues.

Clinical Importance

Impaired oxygen transport occurs in conditions such as anemia, lung diseases, and carbon monoxide poisoning. Understanding oxygen transport is essential for oxygen therapy, high altitude physiology, and management of respiratory and cardiovascular disorders.

Diagram – Oxygen Transport in the Body



Conclusion

Oxygen transport in the body is a highly efficient and well-regulated process that ensures adequate oxygen supply for cellular metabolism. By transporting oxygen mainly in the form of oxyhemoglobin and releasing it appropriately at tissue level, the body maintains normal physiological function and energy production.