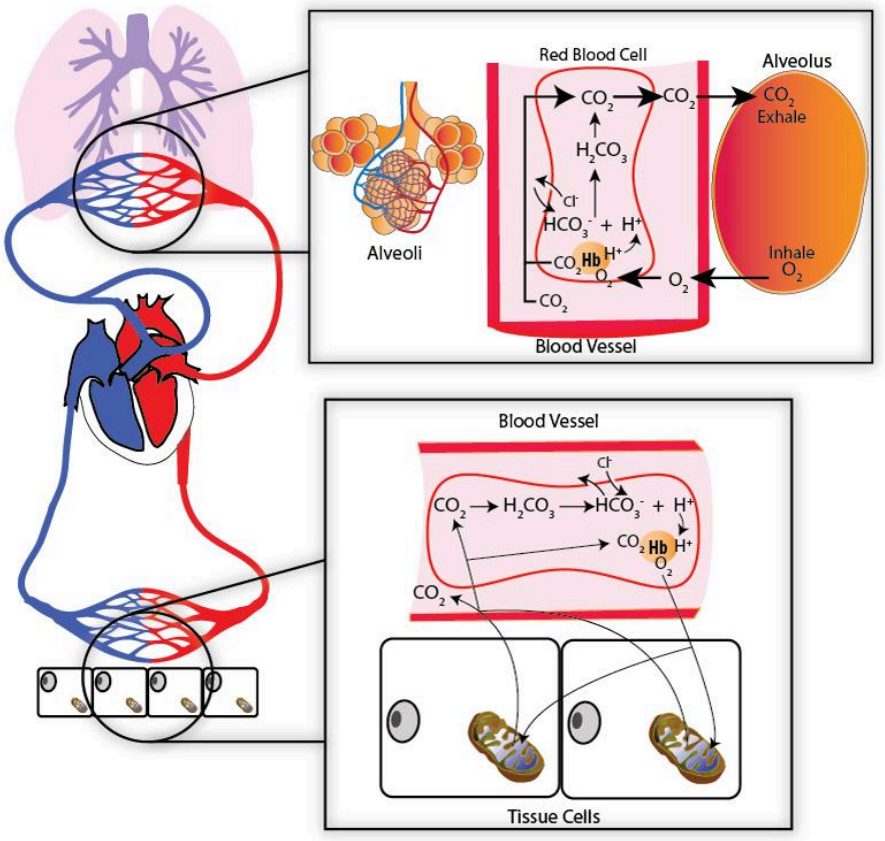
2.1.4

Red Blood Cells

The most abundant blood cell is the **red blood cell,** or **erythrocyte.** Erythrocytes possess a disk-like shape with a central indentation on both sides of the cell, making them biconcave. This shape is critical to the proper function of a red blood cell, as it provides greater surface area for the rapid exchange of oxygen and carbon dioxide. This biconcave shape also allows the red blood cells to bend which helps them flow through small vessels. The importance of this shape is contrasted starkly in individuals suffering from sickle cell anemia whose red blood cells take on a sickle shape, which greatly affects their function.

Red blood cells contain a specialized type of protein known as **hemoglobin,** which is responsible for binding to and transporting oxygen and carbon dioxide. It should be noted, however, that while hemoglobin is solely responsible for transporting oxygen, it is only minimally involved in carbon dioxide transport. Most carbon dioxide is located in the blood in the form of bicarbonate ions. The conversion of carbon dioxide to bicarbonate occurs through a process that is catalyzed by a protein enzyme known as **carbonic anhydrase,** which is also located within red blood cells. The next image depicts this reaction occurring in the red blood cells, but the carbonic anhydrase enzyme is not shown. It is assumed that it is there running the reaction.



Carbon Dioxide Transport.
Drawn at BYU-Idaho by J. Shaw Winter 2014

The image above shows the transportation of carbon dioxide collected from various cells in the body. The carbon dioxide is transported to the lungs where it is exhaled. Most of the Carbon Dioxide is transported as Bicarbonate, while a small amount is dissolved in the plasma or attached to hemoglobin. The red blood cells contain the enzymes necessary to convert Carbon Dioxide (CO_2) to Bicarbonate or HCO_3^-. H_2CO_3 is carbonic acid and exists only temporarily as it is changed into either CO_2 and water or HCO_3^- and H^+, depending on which way the reaction is moving at the moment.