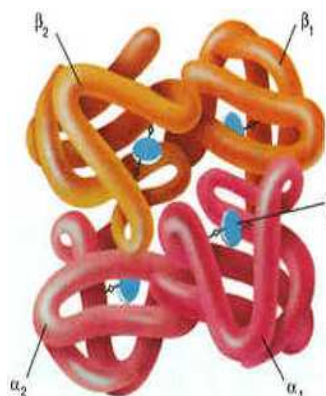


EXAMEN : BACCALAURÉAT GÉNÉRAL	SESSION 2011
ÉPREUVE : Évaluation spécifique de langue en section européenne	
PHYSIQUE-CHIMIE en langue ANGLAISE	SUJET N°7



Hemoglobin and dioxygen

Hemoglobin, a protein containing iron, is the material in red blood cells responsible for transporting dioxygen to the cells. Each hemoglobin molecule attaches to four oxygen atoms, and the equilibrium conditions of the hemoglobin-oxygen interaction can be expressed thus :

$\text{Hb}_{(\text{aq})} + 4 \text{O}_{2(\text{g})} = \text{Hb}(\text{O}_2)_{4(\text{aq})}$, where "Hb" stands for hemoglobin. As long as there is sufficient dioxygen in the air, a healthy equilibrium is maintained; but at high altitudes, considerable changes occur.

At significant elevations above sea level, the air pressure is lowered, and thus it is more difficult to obtain the dioxygen one needs. The result, in accordance with Le Châtelier's principle, is a shift in equilibrium to the left, away from the oxygenated hemoglobin. According to Le Chatelier's Principle , an increase in pressure may cause a change in the equilibrium advancement of a reaction, but only if there is a net change in the number of moles of gas in going from reactant to product. Without adequate dioxygen fed to the body's cells and tissues, a person tends to feel light-headed.

When someone not physically prepared for the change is exposed to high altitudes, it may be necessary to introduce pressurized dioxygen from an oxygen tank. This shifts the equilibrium to the right. For people born and raised at high altitudes, however, the body's chemistry performs the equilibrium shift—by producing more hemoglobin, which also shifts equilibrium to the right.

Adapted from www.scienceclarified.com

Questions :

1. Present and comment on this document
2. Do not forget to focus on at least one physics and/or chemistry topic as for example the equilibrium constant K for the transformation and the parameter that affects it. Do you know other examples of equilibria?
3. Comment on the different chemical reactions occurring in our body.