Answer on Question # 60259 - Chemistry - Physical Chemistry

One molecule of haemoglobin, Hb, can bind with four molecules of oxygen according to the following equation.

$Hb(aq) + 4O_2(aq) = Hb(O_2)_4(aq)$

When the equilibrium concentration of O_2 is 7.6×10^{-6}mol dm^{-3}, the equilibrium concentrations of Hb and $Hb(O_2)_4$ are equal.

What is the value of K_c for this equilibrium?

Solution

The equilibrium constant expression for the reaction given is

$$K_c = \frac{[Hb(O_2)_4]}{[Hb][O_2]^4};$$

As the equilibrium concentrations of Hb and $Hb(O_2)_4$ are equal, the equilibrium constant expression transforms to

$$K_c = \frac{1}{[O_2]^4};$$

$$K_c = \frac{1}{\left(7.6\times10^{-6}\right)^4} = 3.0\times10^{20}.$$

Answer: $K_c = 3.0\times10^{20}$.