REDOX Reactions Answer Key

Using Nernst equation to calculate the reduction potential of hydrogen peroxide at pH 2, 4, and 6. Explain why the results differ between each other or not.

$$\mathbf{H_2O_2 + 2\,H^+ + 2\,e \longrightarrow 2\,H_2O\ (E^\theta = 1.776V)}$$

$$\text{Nernst eqn : } E_{red} = E^\theta_{red} - \frac{RT}{nF}\log(Q)$$

$$Q = \frac{1}{[H_2O_2][H^+]^2} \Rightarrow \log(Q) = -\log([H_2O_2]) - 2\log([H^+])$$

Since

$$pH = -\log([H^+]),\ E_{red} = E^\theta_{red} + \frac{RT}{nF}(\log([H_2O_2] - 2\ pH)$$

E_{red} increases with higher concentration of H_2O_2 and lower pH.

A related question can be the influence of H_2O_2 on the reduction potential.
Students can get a quantitative experience about how chemical environment (pH and H_2O_2 con- centration) impacts the reduction potential.

Find an example in biological system in which redox reactions are involved and identify the reductants/oxidants for each step.

Find an example in Further Reading 1.
The purpose of this question is to encourage students to gain some experience about redox reactions in biological systems.

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