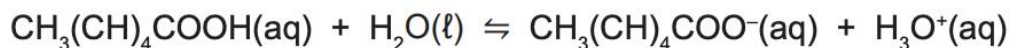


**Question 34****(9 marks)**

Sorbic acid is a monoprotic weak acid that occurs widely in nature and is used as a food preservative due to its antimicrobial properties. The ionisation of sorbic acid in water to the sorbate ion and hydronium ion is shown in the equation below:



- (a) Write the equilibrium constant  $K$  expression for the ionisation of sorbic acid in water. (2 marks)

- (b) Under certain conditions, a  $0.250 \text{ mol L}^{-1}$  aqueous solution of sorbic acid has a pH of 2.23. Calculate the concentration of  $\text{H}_3\text{O}^+$  to determine the percentage yield of the sorbate ion at equilibrium in 1.00 L of the solution. (4 marks)

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- (c) Explain the classification of sorbic acid as a weak acid with reference to **both** your answer to part (b) above and its acidity constant value  $K_a = 1.73 \times 10^{-5}$  (20 °C). (3 marks)

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