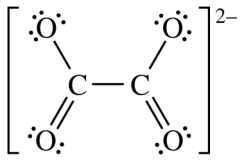
Begin your response to **QUESTION 7** on this page.



7. A Lewis electron-dot diagram of the oxalate ion, $C_2O_4^{2-}$, is shown.

(a) Identify the hybridization of the valence orbitals of either carbon atom in the oxalate ion.

(b) Silver oxalate, $Ag_2C_2O_4(s)$, is slightly soluble in water. The value of K_{sp} for $Ag_2C_2O_4$ is 5.40×10^{-12}.

(i) Write the expression for the solubility-product constant, K_{sp}, for $Ag_2C_2O_4$.

(ii) Calculate the molar solubility of $Ag_2C_2O_4$ in neutral distilled water.

(iii) The molar solubility of $Ag_2C_2O_4$ increases when it is dissolved in 0.5 M $HClO_4(aq)$ instead of neutral distilled water. Write a balanced, net-ionic equation for the process that occurs between species in solution that contributes to the increased solubility of $Ag_2C_2O_4(aq)$ in $HClO_4(aq)$.

GO ON TO THE NEXT PAGE.

Question 7: Short Answer — 4 points

(a) For the correct answer: **1 point**

sp^2

(b)(i) For the correct answer: **1 point**

$K_{sp} = [Ag^+]^2[C_2O_4{}^{2-}]$

(ii) For the correct calculated value: **1 point**

$5.40 \times 10^{-12} = (2s)^2(s)$

$5.40 \times 10^{-12} = 4s^3$

$s = 1.11 \times 10^{-4}\ M$

(iii) For a correct equation (state symbols not required): **1 point**

Accept one of the following:

- $C_2O_4{}^{2-}(aq) + H_3O^+(aq) \rightarrow HC_2O_4{}^-(aq) + H_2O(l)$
- $C_2O_4{}^{2-}(aq) + H^+(aq) \rightarrow HC_2O_4{}^-(aq)$
- $C_2O_4{}^{2-}(aq) + 2\ H_3O^+(aq) \rightarrow H_2C_2O_4(aq) + 2\ H_2O(l)$
- $C_2O_4{}^{2-}(aq) + 2\ H^+(aq) \rightarrow H_2C_2O_4(aq)$

Total for part (b) 3 points

Total for question 7 4 points