

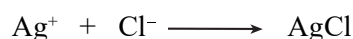
QUESTION 11

Compounds of chlorine are present in swimming-pool water.

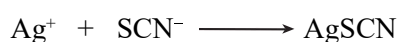
Credit will be given for the correct use of significant figures in part (a). (1 mark)

- (a) The following is a common method for determining the concentration of chloride ions in swimming-pool water:

Step 1 An excess quantity of standard AgNO_3 solution is added to a sample of swimming-pool water. This results in the removal of all the chloride ions by precipitation:



Step 2 The excess Ag^+ is titrated with standard KSCN solution in the presence of an indicator:



The appearance of a red colour indicates the end point of the titration.

In one analysis, 25.00 mL of 0.0116 mol L⁻¹ AgNO_3 solution was added to a 50.00 mL sample of swimming-pool water. Then 7.35 mL of 0.0143 mol L⁻¹ KSCN solution was added to produce the red colour.

- (i) Calculate the number of moles of Ag^+ in 25.00 mL of 0.0116 mol L⁻¹ AgNO_3 solution.

(2 marks)

- (ii) Calculate the number of moles of SCN^- that reacted in the titration at Step 2.

(2 marks)

- (iii) Calculate the number of moles of silver ions, and hence the number of moles of chloride ions, in the original sample of swimming-pool water.

(2 marks)

- (iv) Calculate the concentration of chloride ions, in $\mu\text{g mL}^{-1}$, in the original sample of swimming-pool water.

(3 marks)

- (b) Calcium hypochlorite, $\text{Ca}(\text{ClO})_2$, is commonly used for purifying swimming-pool water.

- (i) State the action of hypochlorite ions that kills bacteria.

_____ (1 mark)

- (ii) One equilibrium that is established when $\text{Ca}(\text{ClO})_2$ is added to swimming-pool water is shown in the equation below:



The addition of rainwater to swimming-pool water affects this equilibrium.

- (1) Explain why unpolluted rainwater is acidic.

_____ (2 marks)

- (2) Explain the effect that the addition of acidic rainwater will have on the concentration of ClO^- in the swimming-pool water.

_____ (3 marks)

TOTAL: 16 marks