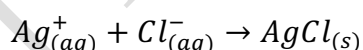


[2007 HSC] The diagrams represent equipment used in an investigation to determine the chloride ion concentration in a water sample.

- a) Describe how you could, using the equipment in the diagram, determine the chloride ion concentration in a water sample. Include a balanced equation. (3 marks)
- b) If the volume of the water sample being tested is 50.0 mL and the mass of the dried precipitate obtained is 3.65 g, calculate the chloride ion concentration in the water sample in ppm. (3 marks)
- c) Why is it important to determine the chloride ion concentration in water? (2 marks)
- a) Transfer a 25.0mL sample, using a volumetric pipette, of the water to be analysed to a beaker. Record the initial level of a burette and slowly add standardised silver nitrate solution to the beaker. Ag^+ and Cl^- form a white $AgCl$ precipitate:



Slowly add standardised silver nitrate solution to the beaker from a burette – record its initial level.

b)

$$\begin{aligned}
 MM(Cl) &= 35.5 \text{ g mol}^{-1} \\
 MM(AgCl) &= 143.4 \text{ g mol}^{-1} \\
 m(Cl \text{ in precipitate}) &= \frac{3.65 \times 35.5}{143.4} = 0.904g \\
 \therefore 0.904g \text{ of Cl in } 50g \text{ of } H_2O \\
 m(Cl \text{ in } 10^6g \text{ of water}) &= \frac{0.904 \times 10^6}{50} = 1.81 \times 10^4g \\
 \therefore [Cl] &= 1.81 \text{ ppm}
 \end{aligned}$$

- c) It is important to know the chloride ion concentration in water as a concentration that is too high can affect the irrigation of crops and be detrimental to plant health. The chloride ions can also affect the people drinking it if the concentration is too high. Hence, chloride has a detrimental effect on water quality and must be monitored as chlorine ions can come from various sources such as soil and seepage of sea water, very easily.

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