

Ksp, precipitation and the common ion effect

AP Chemistry · Lab answers

The sample data are used for every answer. Your own results will depend on the temperature and on how long the solution stood. Compare your value of Ksp with the accepted one and comment on the sources of error.

Level: AP Chemistry · **Curriculum:** AP Chem Unit 7

Question 1 Mean titre

$$(11.3 + 11.2 + 11.4) / 3 = \mathbf{11.3 \text{ cm}^3}.$$

Question 2 Amount of hydroxide

$$n(\text{HCl}) = 0.0113 \times 0.0500 = 5.650 \times 10^{-4} \text{ mol}, \text{ so } n(\text{OH}^-) = \mathbf{5.650 \times 10^{-4} \text{ mol}}.$$

Question 3 Hydroxide concentration

$$[\text{OH}^-] = 5.650 \times 10^{-4} / 0.0250 = \mathbf{0.0226 \text{ mol/dm}^3}.$$

Question 4 Molar solubility

$$\text{Each Ca(OH)}_2 \text{ releases two OH}^-, \text{ so } s = [\text{Ca}^{2+}] = 0.0226 / 2 = \mathbf{0.0113 \text{ mol/dm}^3}.$$

Question 5 Calculate Ksp

$$\text{Ksp} = [\text{Ca}^{2+}][\text{OH}^-]^2 = 0.0113 \times 0.0226^2 = \mathbf{5.77 \times 10^{-6}}.$$

Question 6 Percentage difference

$$\text{Difference} = (5.77 \times 10^{-6} - 5.0 \times 10^{-6}) / 5.0 \times 10^{-6} \times 100 = \mathbf{15 \%}, \text{ a reasonable agreement for a school lab.}$$

Question 7 Source of error

Carbon dioxide from the air reacts with dissolved Ca(OH)_2 to form insoluble CaCO_3 , lowering $[\text{OH}^-]$. **Keep the beaker covered and titrate soon after filtering.**

Question 8 Common ion prediction

Added Ca^{2+} is a common ion, so less Ca(OH)_2 dissolves. $[\text{OH}^-]$ falls, so **the titre is smaller.**