

Section 7.6: Solubility Equilibria and the Solubility Product Constant

Tutorial 1 Practice, page 462

1. **Solution:** $[\text{MgCO}_3(\text{s})]$ is constant, so it is not included in the equation. Therefore,
 $K_{\text{sp}} = [\text{Mg}^{2+}(\text{aq})][\text{CO}_3^{2-}(\text{aq})]$

Statement: The solubility product constant equation for the solubility equilibrium is
 $K_{\text{sp}} = [\text{Mg}^{2+}(\text{aq})][\text{CO}_3^{2-}(\text{aq})]$

2. **Given:** iron(III) hydroxide dissolves in water

Required: K_{sp} equation

Solution:

Step 1. Write a balanced equation for the dissolution of iron(III) hydroxide in water.



Step 2. $[\text{Fe}(\text{OH})_3(\text{s})]$ is constant, so it is not included in the equation. Therefore,

$$K_{\text{sp}} = [\text{Fe}^3+(\text{aq})][\text{OH}^-(\text{aq})]^3$$

Statement: The solubility product constant equation for iron(III) hydroxide is

$$K_{\text{sp}} = [\text{Fe}^3+(\text{aq})][\text{OH}^-(\text{aq})]^3$$

3. **Given:** At 25 °C: $[\text{Ca}^{2+}(\text{aq})] = 4.53 \times 10^{-7} \text{ mol/L}$; $[\text{PO}_4^{3-}(\text{aq})] = 3.02 \times 10^{-7} \text{ mol/L}$

Required: K_{sp} of calcium phosphate at 25 °C

Solution:

Step 1. Write a balanced equation for the solution equilibrium.



Step 2. Write the solubility constant equation for the equilibrium, omitting any solids.

$$K_{\text{sp}} = [\text{Ca}^{2+}(\text{aq})]^3[\text{PO}_4^{3-}(\text{aq})]^2$$

Step 3. Substitute the given ion concentrations into the K_{sp} equation and solve.

$$\begin{aligned} K_{\text{sp}} &= [\text{Ca}^{2+}(\text{aq})]^3[\text{PO}_4^{3-}(\text{aq})]^2 \\ &= (4.53 \times 10^{-7})^3(3.02 \times 10^{-7})^2 \\ K_{\text{sp}} &= 8.48 \times 10^{-33} \end{aligned}$$

Statement: The K_{sp} of calcium phosphate in a saturated solution at 25 °C is 8.48×10^{-33} .

Tutorial 2 Practice, page 464

1. **Given:** solubility of $\text{MgF}_2(\text{s}) = 1.72 \times 10^{-3} \text{ g/100 mL}$ at 25 °C

Required: K_{sp} of $\text{MgF}_2(\text{s})$ at 25 °C

Solution:

Step 1. Write the balanced equation.



Step 2. Write the solubility product constant equation.

$$K_{\text{sp}} = [\text{Mg}^{2+}(\text{aq})][\text{F}^-(\text{aq})]^2$$

Step 3. Determine the equilibrium concentrations in mol/L of the dissolved ions. Use an ICE table. Since the concentration of solid MgF_2 remains constant, it is not included.

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Murchison, 2021 First comprehensive survey of a major genre of medieval English texts its purpose characteristics and reception The bestseller list of medieval England would have included many manuals for penitents works that could teach the public about the process of confession and explain the abstract concept of sin through familiar situations Among these bestselling works were the Manuel des p ch s commonly known through its English translation Handlyng Synne The Speculum Vitae and Chaucer's Parson's Tale This book is the first full length overview of this body of writing and its material and social contexts It shows that while manuals for penitents developed under the Church's control they also became a site of the Church's concern Manuals such as the Compilacion which was addressed to a much broader audience than its English analogue Ancrene Wisse brought learning that had been controlled by the Church into the hands of layfolk and in so doing raised significant concerns over who should have access to knowledge Clerics worried that these manuals might accidentally

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