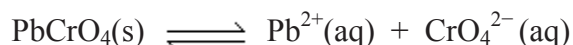


Practice exam questions for Chapter 10: Solubility equilibria (Paper-saver version)

Question 1 (Bursary 2001 Question 3)

Chrome yellow

Lead chromate is the pigment 'chrome yellow'. The equation for the equilibrium in a saturated solution of lead chromate is:



- a** Write the expression for the solubility product (K_s) for lead chromate. A
- b** Calculate the concentration of CrO_4^{2-} ions in a saturated solution of lead chromate. A M
 $K_s(\text{PbCrO}_4) = 1.8 \times 10^{-14}$

Lead chromate can be prepared using aqueous lead(II) nitrate and aqueous potassium chromate. In one preparation of lead chromate, 30 mL of 0.100 mol L^{-1} lead nitrate is mixed with 20 mL of 0.100 mol L^{-1} potassium chromate. (An excess of lead nitrate is used.)

- c i** Show that the concentration of Pb^{2+} ions remaining in solution after precipitation is $0.0200 \text{ mol L}^{-1}$. A M
- ii** Calculate the concentration of CrO_4^{2-} ions in this solution after the precipitation of lead chromate. A M

Question 2 (Bursary 2001 Question 8)

Photography

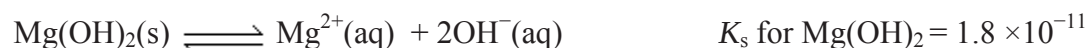
Silver compounds are used in the photographic industry. Water used to wash processed film contains silver ions at a concentration of $0.0018 \text{ mol L}^{-1}$.

Show that a precipitate of solid silver chloride would be formed from wash water if sodium chloride was added so that the total chloride concentration was $0.00020 \text{ mol L}^{-1}$. A M

$$K_s(\text{AgCl}) = 1.6 \times 10^{-10}$$

Question 3 (Bursary 2000 Question 3)

Milk of magnesia, a common antacid, is a saturated solution of $\text{Mg}(\text{OH})_2$ in water. It appears milky when shaken because the undissolved $\text{Mg}(\text{OH})_2$ becomes dispersed as fine particles. The following equilibrium exists.



- a** Write the K_s expression for $\text{Mg}(\text{OH})_2$. **A**
- b** Select the species in milk of magnesia below that has a concentration equal to the solubility of $\text{Mg}(\text{OH})_2$ in water. $\text{Mg}^{2+}(\text{aq})$ $\text{OH}^{-}(\text{aq})$ $\text{H}_3\text{O}^{+}(\text{aq})$ **A**

A saturated solution of $\text{Mg}(\text{OH})_2$ is prepared by stirring excess solid $\text{Mg}(\text{OH})_2$ with water.

- c** Show that the concentration of $\text{Mg}^{2+}(\text{aq})$ in this saturated solution is $1.7 \times 10^{-4} \text{ mol L}^{-1}$. **A M**
- d** Calculate the pH of the saturated solution in **a** above. **A M**

100 mL of freshly shaken milk of magnesia is mixed with 100 mL of water in beaker **A**. The mixture is stirred vigorously. After stirring, undissolved $\text{Mg}(\text{OH})_2$ settles at the bottom of the beaker.

- e i** Select the word or phrase below which correctly completes the following sentence:
Compared with the $[\text{Mg}^{2+}(\text{aq})]$ in beaker **A**, the $[\text{Mg}^{2+}(\text{aq})]$ in undiluted milk of magnesia is:
Higher lower the same **A**
- ii** Justify your answer. **M**

100 mL of the solution in part **(e)** above is removed from beaker **A** without taking any undissolved solid. On mixing this solution with 100 mL of $0.10 \text{ mol L}^{-1} \text{ KOH}$ in beaker **B**, a precipitate forms.

- f i** Write the equation for the reaction which results in the formation of the precipitate. **A**

Select the word or phrase which correctly completes the sentence in each of parts **ii** and **iii** below.

- ii** Compared with the solution in beaker **B**, the pH of the solution in beaker **A** is:
higher lower the same **A**
Justify your answer. **M**
- iii** Compared with the solution in beaker **B**, the $[\text{Mg}^{2+}(\text{aq})]$ in beaker **A** is:
higher lower the same **A**
Justify your answer. **M**