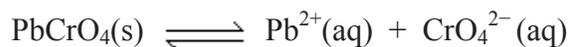


## Practice exam questions for Chapter 10: Solubility equilibria (Write-on version)

### 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**

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

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

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

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- ii** Calculate the concentration of  $\text{CrO}_4^{2-}$  ions in this solution after the precipitation of lead chromate.  
**A M**

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**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**

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

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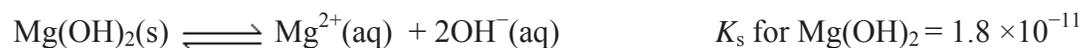
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**Question 3 (Bursary 2000 Question 3)**

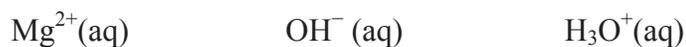
Milk of magnesia, a common antacid, is a saturated solution of  $\text{Mg}(\text{OH})_2$  in water. It appears milky when shaken because the undissolved  $\text{Mg}(\text{OH})_2$  becomes dispersed as fine particles. The following equilibrium exists.



**a** Write the  $K_s$  expression for  $\text{Mg}(\text{OH})_2$ . **A**

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**b** Circle the species in milk of magnesia below that has a concentration equal to the solubility of  $\text{Mg}(\text{OH})_2$  in water. **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**

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**d** Calculate the pH of the saturated solution in **a** above. **A M**

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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** Circle the word or phrase below which correctly completes the following sentence: **A**

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

**ii** Justify your answer. **M**

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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**

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Circle 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: **A**

higher

lower

the same

Justify your answer. **M**

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**iii** Compared with the solution in beaker **B**, the  $[\text{Mg}^{2+}(\text{aq})]$  in beaker **A** is: **A**

higher

lower

the same

Justify your answer. **M**

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