

SOLUBILITY EQUILIBRIUM PRACTICE PROBLEMS

Type A and B Ksp Calculations

- Write the Ksp expression for these equilibria.
 - $\text{BaCrO}_4(\text{s}) \rightleftharpoons \text{Ba}^{+2}(\text{aq}) + \text{CrO}_4^{-2}(\text{aq})$
 - $\text{Ag}_3\text{PO}_4(\text{s}) \rightleftharpoons 3\text{Ag}^{+1}(\text{aq}) + \text{PO}_4^{-3}(\text{aq})$
- Write the Ksp expression for these compounds.
 - AgI
 - PbCrO₄
 - Al(OH)₃
 - ZnCO₃
 - Zn(OH)₂
- One litre of water is able to dissolve 2.15×10^{-3} mol of lead (II) fluoride. What is the Ksp for lead (II) fluoride?
- What is the molar solubility of silver bromide in water?
- What is the molar solubility of silver carbonate in water?
- Magnesium hydroxide has a solubility of 0.00705 g/L at 25°C.
 - What is the solubility expressed in mol/L?
 - What are the magnesium and hydroxide ion concentrations in mol/L
 - Calculate Ksp for this salt
- At 25°C, the molar solubility of silver phosphate is 1.8×10^{-5} mol/L. Calculate Ksp.
- Gold (III) chloride has a $K_{\text{sp}} = 3.2 \times 10^{-25}$. Calculate its solubility in pure water.
- Barium sulfate is so insoluble that it can be swallowed without significant danger, even though the barium ion is toxic. At 25°C, 1 L of water dissolves only 0.00245 g of barium sulfate.
 - How many moles of barium sulfate dissolve per litre?
 - What are the molar concentrations of the barium ion and sulfate ion in a saturated solution?
 - Calculate its Ksp.
- A student prepared a saturated solution of calcium chromate and found that when 100 mL of this solution was evaporated, 0.416 g of calcium chromate was left behind. What is the value of Ksp for this salt?
- Chalk is calcium carbonate and at 25°C, its $K_{\text{sp}} = 4.5 \times 10^{-9}$. What is the molar solubility of calcium carbonate. How many grams of calcium carbonate will dissolve in 100 mL of water?

Common Ion Questions

12. The molar solubility of cobalt (II) carbonate in a 0.10 M sodium carbonate solution is 1.0×10^{-9} mol/L. What is the K_{sp} for cobalt (II) carbonate?
13. The molar solubility of lead (II) fluoride in a 0.10 M lead (II) nitrate solution is 3.1×10^{-4} mol/L. Calculate the K_{sp} of lead (II) fluoride.
14. What is the molar solubility of AgI in 0.20 M NaI solution?
15. What is the molar solubility of iron (III) hydroxide in a solution with a hydroxide ion concentration of 0.05 mol/L?
16. It was found that the molar solubility of BaSO_3 in 0.10 M BaCl_2 solution is 8.0×10^{-6} mol/L. What is the value of K_{sp} ?
17. Copper (I) chloride has a $K_{sp} = 1.9 \times 10^{-7}$. Calculate the molar solubility of CuCl in:
 - a. 0.01 M HCl solution
 - b. 0.1 M HCl solution
 - c. 0.1 M calcium chloride solution
18. What is the molar solubility of silver chromate in 0.1 mol/L silver nitrate solution at 25°C . For silver chromate at 25°C , $K_{sp} = 1.2 \times 10^{-12}$.

Will a Precipitate Form Questions

19. Will a precipitate of CaSO_4 form in a solution if the [calcium ion] is 0.0025 mol/L and the [sulfate ion] = 0.03 mol/L? For calcium sulfate, $K_{sp} = 2.4 \times 10^{-5}$.
20. Will a precipitate form in a solution containing 3.4×10^{-4} mol/l CrO_4^{2-} and 4.8×10^{-5} mol/L Ag^{+1} ?
21. Will a precipitate of lead (II) sulfate form if 100 mL of a 1.0×10^{-3} mol/L solution of lead (II) nitrate is added to 100 mL of 2.0×10^{-3} mol/L magnesium sulfate solution?
22. Will a precipitate of lead (II) chloride form if 50 mL of 0.1 M lead (II) nitrate is added to 20 mL of 0.04 M sodium chloride solution?
23. Would a precipitate of silver acetate form if 18 mL of 0.1 M silver nitrate were added to 40 mL of 0.024 M sodium acetate? K_{sp} for silver acetate = 4.0×10^{-3} .
24. Suppose that 50 mL of 0.1 M silver nitrate were added to 50 mL of 0.05 M sodium chloride solution.
 - a. What weight of AgCl would be formed?

- b. What would be the final concentrations of ALL the ions contributed by these salts?