

Marks
8

- A solution is prepared that contains sodium chloride and sodium chromate (both 0.10 M). When a concentrated solution of silver nitrate is added slowly, white AgCl(s) begins to precipitate. After most of the $\text{Cl}^{\text{-(aq)}}$ has been consumed, red $\text{Ag}_2\text{CrO}_4\text{(s)}$ starts to precipitate.

Ignoring dilution, what is the concentration of silver ions when silver chloride solid first starts to precipitate? $K_{\text{sp}}(\text{AgCl})$ is 1.8×10^{-10} .

Answer:

Ignoring dilution, what is the concentration of silver ions when silver chromate solid first starts to precipitate? $K_{\text{sp}}(\text{Ag}_2\text{CrO}_4)$ is 3.6×10^{-12} .

Answer:

What is the concentration of chloride ions when silver chromate solid first starts to precipitate?

Answer:

What percentage of the chloride ion is precipitated before any silver chromate is precipitated?

Answer:

Marks
9

- The salt calcium oxalate, $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$, is sparingly soluble. Write down the chemical equation for its dissolution in water and the expression for K_{sp} .

What is the molar solubility of calcium oxalate? $K_{\text{sp}} = 2.3 \times 10^{-9}$

Answer:

If additional calcium oxalate is added to a saturated solution, what is the effect on $[\text{Ca}^{2+}(\text{aq})]$?

Following blood donation, a solution of sodium oxalate is added to remove $\text{Ca}^{2+}(\text{aq})$ ions which cause the blood to clot. The concentration of $\text{Ca}^{2+}(\text{aq})$ ions in blood is $9.7 \times 10^{-5} \text{ g mL}^{-1}$. If 100.0 mL of 0.1550 M $\text{Na}_2\text{C}_2\text{O}_4$ is added to 100.0 mL of blood, what will be the concentration (in mol L^{-1}) of Ca^{2+} ions remaining in the blood?

Answer:

- The K_{sp} for $\text{Fe}(\text{OH})_3$ is 2.64×10^{-39} . What is its molar solubility in water?

Marks
2

Answer:

<ul style="list-style-type: none">• Give the equation for the dissolution of hydroxyapatite, $\text{Ca}_5(\text{PO}_4)_3(\text{OH})$, in water.	Marks 2
What is the formula for the solubility product constant for hydroxyapatite?	

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- What is the solubility of $\text{Cu}(\text{OH})_2$ in mol L^{-1} ? $K_{\text{sp}}(\text{Cu}(\text{OH})_2)$ is 1.6×10^{-19} at $25\text{ }^\circ\text{C}$.

Marks
2

Answer:

Marks
5

- BaSO_4 is used as a contrast agent in medical imaging. It has a K_{sp} of 1.1×10^{-10} . What is the molarity of Ba^{2+} ions in a saturated aqueous solution of BaSO_4 ?

Answer:

What is the molar solubility of BaSO_4 in the presence of a 0.1 M solution of Na_2SO_4 ?

Answer:

The lethal concentration of Ba^{2+} in humans is about 60 mg L^{-1} ($4 \times 10^{-4} \text{ M}$). Is there any advantage to administering BaSO_4 in the presence of 0.1 M Na_2SO_4 solution? Explain your reasoning.

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Marks
2

- What is the solubility of scandium hydroxide, $\text{Sc}(\text{OH})_3$, ($K_{\text{sp}} = 2 \times 10^{-30}$) in water? Give your answer in g per 100 mL.

Answer:

4

- How does the interplay of ΔH and ΔS affect the spontaneity of the phase change between solid and liquid water?

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- Following blood donation, a solution of sodium oxalate is added to remove Ca^{2+} ions (as calcium oxalate, $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$, $K_{\text{sp}} 2.3 \times 10^{-9}$), which cause the blood to clot. If the concentration of Ca^{2+} ions in blood is $9.7 \times 10^{-5} \text{ g mL}^{-1}$, and 100.0 mL of 0.1550 M $\text{Na}_2\text{C}_2\text{O}_4$ is added to a 104 mL sample of blood, what will be the concentration (in mol L^{-1}) of Ca^{2+} ions remaining in the blood?

Answer:

Marks
2

- Calculate the molar solubility of lead bromide given that its solubility product constant, K_{sp} , is 2.1×10^{-6} .

Answer:

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.

Marks
4

- Write a balanced chemical equation representing the dissolution of FeCO_3 in water at pH 7.

Ignoring any hydrolysis of the ions, calculate the solubility (in g L^{-1}) of FeCO_3 in water at pH 7. The solubility product constant, K_{sp} , for FeCO_3 is 2.1×10^{-11} .

Answer:

- The concentration of iron in the ocean is one of the primary factors limiting the growth rates of some basic life forms. The pH of the oceans before the Industrial Revolution was around 8.22. What was the maximum concentration of $\text{Fe}^{3+}(\text{aq})$ in the ocean at this pH? The K_{sp} of $\text{Fe}(\text{OH})_3$ is 1×10^{-39} .

4

Answer:

Industrialisation has led to an increase in atmospheric CO_2 . What effect has this had on the amount of $\text{Fe}^{3+}(\text{aq})$ in sea water?

Marks
4

A solution is prepared that is 0.10 M in potassium bromide and 0.10 M in potassium chromate. A concentrated aqueous solution of silver nitrate is added with stirring. What is the concentration of $\text{Ag}^+(\text{aq})$ ions when silver bromide first appears?
 K_{sp} of $\text{AgBr} = 5.0 \times 10^{-13}$

Answer:

What is the concentration of $\text{Ag}^+(\text{aq})$ ions when silver chromate first appears?
 K_{sp} of $\text{Ag}_2\text{CrO}_4 = 2.6 \times 10^{-12}$

Answer:

What is the concentration of $\text{Br}^-(\text{aq})$ ions when silver chromate first appears?

Answer:

- The K_{sp} of $\text{Al}(\text{OH})_3$ is $1.0 \times 10^{-33} \text{ M}^4$. What is the solubility of $\text{Al}(\text{OH})_3$ in g L^{-1} ?

6

Answer:

What is the solubility of $\text{Al}(\text{OH})_3$ in g L^{-1} at pH 4.00?

Answer:

- Barium sulfate is used as a contrast agent for X-ray images of intestines. What is the solubility product constant, K_{sp} , for BaSO_4 , given that a maximum of 1.167×10^{-8} g will dissolve in 500 mL of water?

Marks
4

Answer:

What advantage would there be in administering BaSO_4 as a slurry that also contains 0.5 M Na_2SO_4 ?

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Marks
4

- Magnesium hydroxide, $\text{Mg}(\text{OH})_2$, is used as treatment for excess acidity in the stomach. Its solubility product constant, K_{sp} , is $7.1 \times 10^{-12} \text{ M}^3$. Calculate the pH of a solution that is in equilibrium with $\text{Mg}(\text{OH})_2(\text{s})$.

Answer:

Determine whether 3.0 g of $\text{Mg}(\text{OH})_2$ will dissolve in 1.0 L of a solution buffered to a pH of 8.00.

YES / NO

Marks
2

- Oxalic acid, $\text{H}_2\text{C}_2\text{O}_4$, found in rhubarb, causes muscle spasms by precipitating Ca^{2+} ions from the blood as calcium oxalate, $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$. Given the solubility product constant for calcium oxalate is $2.3 \times 10^{-9} \text{ M}^2$, calculate the concentration of calcium ions in g L^{-1} formed by dissolving $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ in water at 25°C to give a saturated solution.

Answer:

Marks
2

- Calcium oxalate is a major constituent of kidney stones. Calculate the solubility product constant for calcium oxalate given that a saturated solution of the salt can be made by dissolving 0.0061 g of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}(\text{s})$ in 1.0 L of water.

Answer:

3

- A sample of 2.0 mg of $\text{Cu}(\text{OH})_2$ is added to 1.0 L of a solution buffered at a pH of 8.00. Will all of the $\text{Cu}(\text{OH})_2$ dissolve? Show all working. (The K_{sp} of $\text{Cu}(\text{OH})_2$ is $4.8 \times 10^{-20} \text{ M}^3$.)

Answer:

Marks
6

- Magnesium hydroxide, $\text{Mg}(\text{OH})_2$, is used as treatment for excess acidity in the stomach. Calculate the pH of a solution that is in equilibrium with $\text{Mg}(\text{OH})_2$. The solubility product constant, K_{sp} of $\text{Mg}(\text{OH})_2$ is $7.1 \times 10^{-12} \text{ M}^2$.

ANSWER:

Determine whether 2.0 g of $\text{Mg}(\text{OH})_2$ will dissolve in 1.0 L of a solution buffered to a pH of 7.00.

ANSWER: YES / NO

<ul style="list-style-type: none">The solubility product constant of BaSO_4 is $1.1 \times 10^{-10} \text{ M}^2$. What is the solubility of BaSO_4 in g L^{-1}?	Marks 3
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<ul style="list-style-type: none">The solubility product constant of Ag_2CrO_4 is $2.6 \times 10^{-12} \text{ M}^3$. What is the molar solubility of Ag_2CrO_4 in water?	5
<div style="border: 1px solid black; height: 200px; width: 100%;"></div> <div style="border: 1px solid black; width: 30%; margin-left: auto; padding: 5px;">ANSWER:</div>	
What is the molar solubility of Ag_2CrO_4 in a solution of 0.10 M AgNO_3 ?	
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