• Write balanced net ionic equations for each of the following reactions. If there is no reaction then write “no reaction”.

A solution of $\text{Ba(NO}_3\text{)}_2$ is added to a solution of $\text{Na}_2\text{SO}_4$.

A solution of $\text{NaCl}$ is added to a solution of $\text{AgNO}_3$.

A solution of $\text{Pb(NO}_3\text{)}_2$ is added to an acidified solution of $\text{KI}$.

A 2 M solution of $\text{NH}_3$ is added to a 0.1 M solution of $\text{Cu(NO}_3\text{)}_2$.

$\text{H}_2\text{S(g)}$ is bubbled through a solution of $\text{ZnSO}_4$ in the presence of 4 M $\text{HCl}$.

• Write the fully balanced equation for the redox reaction that occurs when chlorine gas is bubbled through a solution of iron(II) sulfate. The unbalanced equation is given.

$$\text{Fe}^{2+} + \text{Cl}_2 \rightarrow \text{Fe}^{3+} + \text{Cl}^-$$

Use the half-equation method: write both the oxidation and reduction half equations and the final balanced equation.

<table>
<thead>
<tr>
<th>Oxidation half equation</th>
<th>Reduction half equation</th>
<th>Overall reaction</th>
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• The solubility product constant of BaSO₄ is $1.1 \times 10^{-10}$ M². What is the solubility of BaSO₄ in g L⁻¹?

ANSWER:

• The solubility product constant of Ag₂CrO₄ is $2.6 \times 10^{-12}$ M³. What is the molar solubility of Ag₂CrO₄ in water?

ANSWER:

What is the molar solubility of Ag₂CrO₄ in a solution of 0.10 M AgNO₃?

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

| Marks | 6 |

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

| ANSWER: YES / NO |

ANSWER:
• 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 CaC$_2$O$_4$-H$_2$O(s) in 1.0 L of water.

Answer:

• A sample of 2.0 mg of Cu(OH)$_2$ is added to 1.0 L of a solution buffered at a pH of 8.00. Will all of the Cu(OH)$_2$ dissolve? Show all working.

(The $K_{sp}$ of Cu(OH)$_2$ is $4.8 \times 10^{-20}$ M$^3$.)

Answer: