

AP[®] CHEMISTRY
2012 SCORING GUIDELINES

Question 4
(15 points)

(a) A piece of solid strontium carbonate is dropped into a 0.1 *M* solution of hydrochloric acid.

(i) Balanced equation: $2 \text{H}^+ + \text{SrCO}_3 \rightarrow \text{Sr}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$ <p style="text-align: center;">OR,</p> $\text{H}^+ + \text{SrCO}_3 \rightarrow \text{Sr}^{2+} + \text{HCO}_3^-$	1 point is earned for the correct reactants. 2 points are earned for the correct products. 1 point is earned for correctly balancing the equation for mass and charge.
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(ii) Indicate one thing that would be observed as the reaction occurs.

The solid dissolves OR a gas is given off.	1 point is earned for either observation.
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(b) Magnesium metal is strongly heated in oxygen gas.

(i) Balanced equation: $2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO}$	2 points are earned for the correct reactants. 1 point is earned for the correct product. 1 point is earned for correctly balancing the equation for mass and charge.
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(ii) What is the oxidation number of magnesium before the reaction occurs, and what is the oxidation number of magnesium after the reaction is complete?

Oxidation number before = 0. Oxidation number after = +2.	1 point is earned for two correct responses.
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Question 4 (continued)

(c) A solution of nickel(II) chloride is added to a solution of sodium hydroxide, forming a precipitate.

<p>(i) Balanced equation:</p> $\text{Ni}^{2+} + 2 \text{OH}^{-} \rightarrow \text{Ni}(\text{OH})_2$	<p>2 points are earned for the correct reactants.</p> <p>1 point is earned for the correct product.</p> <p>1 point is earned for correctly balancing the equation for mass and charge.</p>
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(ii) If equal volumes of 1.0 *M* nickel (II) chloride and 1.0 *M* sodium hydroxide are used, what ion is present in the solution in the highest concentration after the precipitate forms?

<p>The chloride ion</p>	<p>1 point is earned for the correct ion.</p>
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