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: $2\ H^+ + SrCO_3 \rightarrow Sr^{2+} + CO_2 + H_2O$ OR, $H^+ + SrCO_3 \rightarrow Sr^{2+} + HCO_3^-$	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.

(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.

(b) Magnesium metal is strongly heated in oxygen gas.

(i) Balanced equation: $2\ Mg + O_2 \rightarrow 2\ MgO$	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.

(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.

Question 4 (continued)

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

(i) Balanced equation: $Ni^{2+} + 2\ OH^- \rightarrow Ni(OH)_2$	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.

(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?

The chloride ion	1 point is earned for the correct ion.