

AP[®] CHEMISTRY
2010 SCORING GUIDELINES

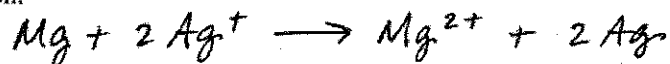
Question 4
(15 points)

For each of the following three reactions, write a balanced equation for the reaction in part (i) and answer the question about the reaction in part (ii). In part (i), coefficients should be in terms of lowest whole numbers. Assume that solutions are aqueous unless otherwise indicated. Represent substances in solutions as ions if the substances are extensively ionized. Omit formulas for any ions or molecules that are unchanged by the reaction. You may use the empty space at the bottom of the next page for scratch work, but only equations that are written in the answer boxes provided will be scored.

EXAMPLE:

A strip of magnesium metal is added to a solution of silver(I) nitrate.

(i) Balanced equation:

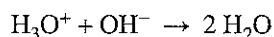


(ii) Which substance is oxidized in the reaction?

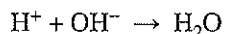
Mg is oxidized.

(a) A 0.2 M potassium hydroxide solution is titrated with a 0.1 M nitric acid solution.

(i) Balanced equation:



OR



One point is earned for each correct reactant.

One point is earned for the correct product.

One point is earned for correctly balancing (mass and charge) the equation.

(ii) What would be observed if the solution was titrated well past the equivalence point using bromthymol blue as the indicator? (Bromthymol blue is yellow in acidic solution and blue in basic solution.)

The solution would appear yellow.

One point is earned for the correct description of the solution.

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Question 4 (continued)

(b) Propane is burned completely in excess oxygen gas.

(i) Balanced equation: $\text{C}_3\text{H}_8 + 5 \text{O}_2 \rightarrow 3 \text{CO}_2 + 4 \text{H}_2\text{O}$	One point is earned for both correct reactants. Two points are earned for the correct products. One point is earned for correctly balancing the equation.
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(ii) When the products of the reaction are bubbled through distilled water, is the resulting solution neutral, acidic, or basic? Explain.

The resulting solution would be acidic because CO_2 reacts with water as a weak acid.	One point is earned for the correct choice with justification.
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(c) A solution of hydrogen peroxide is heated, and a gas is produced.

(i) Balanced equation: $2 \text{H}_2\text{O}_2 \rightarrow 2 \text{H}_2\text{O} + \text{O}_2$	One point is earned for the correct reactant. Two points are earned for the correct products. One point is earned for correctly balancing the equation.
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(ii) Identify the oxidation state of oxygen in hydrogen peroxide.

The oxidation state of O in H_2O_2 is -1 .	One point is earned for the correct oxidation state.
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