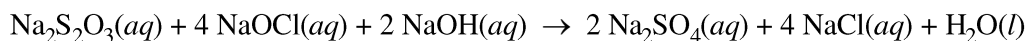


AP[®] CHEMISTRY
2018 SCORING GUIDELINES

Question 1



A student performs an experiment to determine the value of the enthalpy change, ΔH_{rxn}° , for the oxidation-reduction reaction represented by the balanced equation above.

(a) Determine the oxidation number of Cl in NaOCl.

+1	1 point is earned for the correct answer.
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(b) Calculate the number of grams of $\text{Na}_2\text{S}_2\text{O}_3$ needed to prepare 100.00 mL of 0.500 M $\text{Na}_2\text{S}_2\text{O}_3(aq)$.

$100.00 \text{ mL} \times \frac{0.500 \text{ mol Na}_2\text{S}_2\text{O}_3}{1000 \text{ mL}} \times \frac{158.10 \text{ g Na}_2\text{S}_2\text{O}_3}{1 \text{ mol Na}_2\text{S}_2\text{O}_3}$ $= 7.90 \text{ g Na}_2\text{S}_2\text{O}_3$	<p>1 point is earned for the correct number of moles of $\text{Na}_2\text{S}_2\text{O}_3$ (may be implicit).</p> <p>1 point is earned for the correct calculation of mass of $\text{Na}_2\text{S}_2\text{O}_3$ consistent with the number of moles.</p>
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In the experiment, the student uses the solutions shown in the table below.

Solution	Concentration (M)	Volume (mL)
$\text{Na}_2\text{S}_2\text{O}_3(aq)$	0.500	5.00
$\text{NaOCl}(aq)$	0.500	5.00
$\text{NaOH}(aq)$	0.500	5.00

(c) Using the balanced equation for the oxidation-reduction reaction and the information in the table above, determine which reactant is the limiting reactant. Justify your answer.

<p>NaOCl is the limiting reactant.</p> <p>Given that equal numbers of moles of each reactant were present initially, it follows from the coefficients of the reactants in the balanced equation that NaOCl will be depleted first.</p>	<p>1 point is earned for identifying the limiting reactant <u>and</u> providing a valid justification.</p>
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