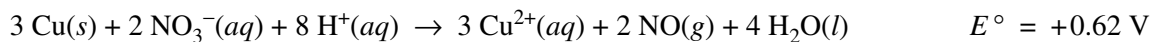


2008 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS

3. Answer the following questions related to chemical reactions involving nitrogen monoxide, NO(g).

The reaction between solid copper and nitric acid to form copper(II) ion, nitrogen monoxide gas, and water is represented by the following equation.



- (a) Using the information above and in the table below, calculate the standard reduction potential, E° , for the reduction of NO_3^- in acidic solution.

Half-Reaction	Standard Reduction Potential, E°
$\text{Cu}^{2+}(aq) + 2 e^- \rightarrow \text{Cu}(s)$	+0.34 V
$\text{NO}_3^-(aq) + 4 \text{ H}^+(aq) + 3 e^- \rightarrow \text{NO}(g) + 2 \text{ H}_2\text{O}(l)$?

- (b) Calculate the value of the standard free energy change, ΔG° , for the overall reaction between solid copper and nitric acid.
- (c) Predict whether the value of the standard entropy change, ΔS° , for the overall reaction is greater than 0, less than 0, or equal to 0. Justify your prediction.

Nitrogen monoxide gas, a product of the reaction above, can react with oxygen to produce nitrogen dioxide gas, as represented below.

