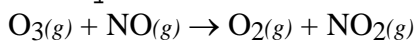


2000 D Required



Consider the reaction represented above.

- (a) Referring to the data in the table below, calculate the standard enthalpy change, for the reaction at 25°C. Be sure to show your work.

	$\text{O}_3(g)$	$\text{NO}(g)$	$\text{NO}_2(g)$
Standard enthalpy of formation, $\Delta H_f^\circ$ at 25°C (kJ mol <sup>-1</sup> )	143	90.	33

- (b) Make a qualitative prediction about the magnitude of the standard entropy change,  $\Delta S^\circ$ , for the reaction at 25°C. Justify your answer.
- (c) On the basis of your answers to parts (a) and (b), predict the sign of the standard free-energy change, for the reaction at 25°C. Explain your reasoning.
- (d) Use the information in the table below to write the rate-law expression for the reaction, and explain how you obtained your answer.

Experiment Number	Initial $[\text{O}_3]$ (mol L <sup>-1</sup> )	Initial $[\text{NO}]$ (mol L <sup>-1</sup> )	Initial Rate of Formation of $[\text{NO}_2]$ (mol L <sup>-1</sup> s <sup>-1</sup> )
1	0.0010	0.0010	x
2	0.0010	0.0020	2x
3	0.0020	0.0010	2x
4	0.0020	0.0020	4x

- (e) The following three-step mechanism is proposed for the reaction. Identify the step that must be the slowest in order for this mechanism to be consistent with the rate-law expression derived in part (d). Explain.

