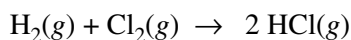


**2010 AP<sup>®</sup> CHEMISTRY FREE-RESPONSE QUESTIONS (Form B)**

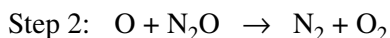


6. The table below gives data for a reaction rate study of the reaction represented above.

Experiment	Initial [H <sub>2</sub> ] (mol L <sup>-1</sup> )	Initial [Cl <sub>2</sub> ] (mol L <sup>-1</sup> )	Initial Rate of Formation of HCl (mol L <sup>-1</sup> s <sup>-1</sup> )
1	0.00100	0.000500	$1.82 \times 10^{-12}$
2	0.00200	0.000500	$3.64 \times 10^{-12}$
3	0.00200	0.000250	$1.82 \times 10^{-12}$

- Determine the order of the reaction with respect to H<sub>2</sub> and justify your answer.
- Determine the order of the reaction with respect to Cl<sub>2</sub> and justify your answer.
- Write the overall rate law for the reaction.
- Write the units of the rate constant.
- Predict the initial rate of the reaction if the initial concentration of H<sub>2</sub> is 0.00300 mol L<sup>-1</sup> and the initial concentration of Cl<sub>2</sub> is 0.000500 mol L<sup>-1</sup>.

The gas-phase decomposition of nitrous oxide has the following two-step mechanism.



- Write the balanced equation for the overall reaction.
- Is the oxygen atom, O, a catalyst for the reaction or is it an intermediate? Explain.
- Identify the slower step in the mechanism if the rate law for the reaction was determined to be  $\text{rate} = k [\text{N}_2\text{O}]$ . Justify your answer.

**STOP**

**END OF EXAM**