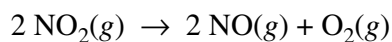
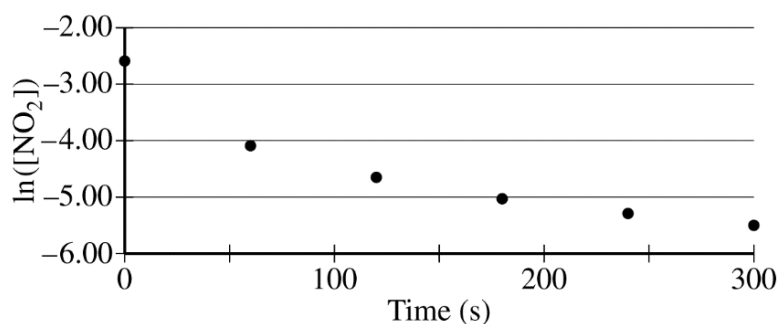
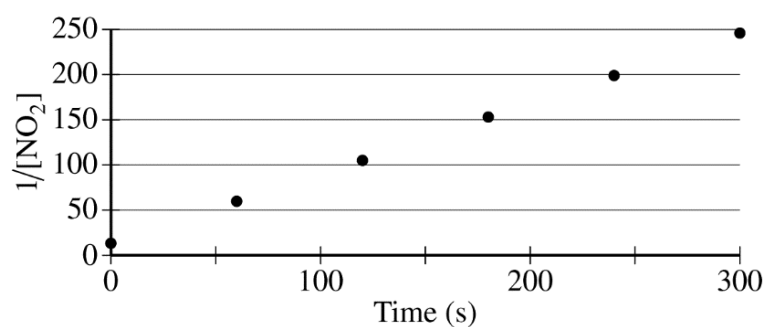
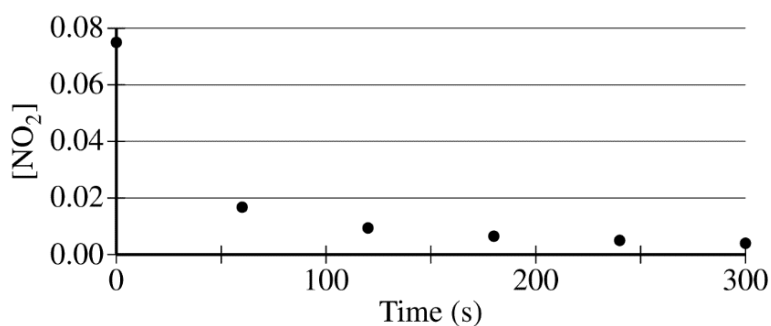


6. Nitrogen dioxide, $\text{NO}_2(g)$, is produced as a by-product of the combustion of fossil fuels in internal combustion engines. At elevated temperatures $\text{NO}_2(g)$ decomposes according to the equation below.



The concentration of a sample of $\text{NO}_2(g)$ is monitored as it decomposes and is recorded on the graph directly below. The two graphs that follow it are derived from the original data.

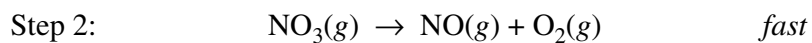
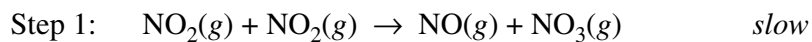


- (a) Explain how the graphs indicate that the reaction is second order.
- (b) Write the rate law for the decomposition of $\text{NO}_2(g)$.

(c) Consider two possible mechanisms for the decomposition reaction.

- (i) Is the rate law described by mechanism I shown below consistent with the rate law you wrote in part (b) ? Justify your answer.

Mechanism I



- (ii) Is the rate law described by mechanism II shown below consistent with the rate law you wrote in part (b) ? Justify your answer.

Mechanism II

