

## A First Course on Kinetics and Reaction Engineering

### Activity 4.1 Handout A

Consider reaction (1) below and assume it to be completely irreversible.



Suppose you started with a mixture that contained 5 moles of  $\text{NO}_2$  and 2 moles of  $\text{O}_2$ . Create a mole table for the system using the reaction as it is written above, and use it to answer the following questions.

1. What is the smallest possible value for the extent of reaction?
2. What is the largest possible value for the extent of reaction?
3. What is the smallest possible value for the fractional conversion of  $\text{NO}_2$ ?
4. What is the largest possible value for the fractional conversion of  $\text{NO}_2$ ?
5. What is the smallest possible value for the fractional conversion of  $\text{O}_2$ ?
6. What is the largest possible value for the fractional conversion of  $\text{O}_2$ ?
7. If the rate of formation of  $\text{N}_2\text{O}_5$  is  $0.05 \text{ mol min}^{-1} \text{ ft}^3$ , what is the generalized rate of reaction (1)?
8. If the rate of formation of  $\text{N}_2\text{O}_5$  is  $0.05 \text{ mol min}^{-1} \text{ ft}^3$ , what is the rate of reaction (1) with respect to  $\text{NO}_2$ ?
9. If the rate of formation of  $\text{N}_2\text{O}_5$  is  $0.05 \text{ mol min}^{-1} \text{ ft}^3$ , what is the rate of reaction (1) with respect to  $\text{O}_2$ ?