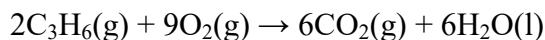


# Chemistry 225 Semester 04-2016

## Homework for Submission #1

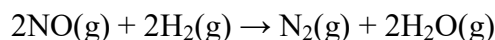
Answer the following questions and submit them for marking as instructed. Only answers showing full working may attract full marks. Careless and sloppy work will be penalised. Express your answers to the correct number of significant figures. Make sure you include correct units where appropriate. *Answers showing evidence of copying will attract zero marks.*

- 1) Propene is slowly oxidised in a plentiful supply of air at a constant temperature in the presence of a catalyst according to the following equation:



The rate of reaction with respect to propene is measured at a certain time as  $1.7 \times 10^{-4} \text{ M s}^{-1}$ . Calculate:

- The rate of reaction with respect to oxygen.
  - The rate of reaction with respect to carbon dioxide.
  - The general rate of reaction.
  - Sketch<sup>1</sup> two graphs (*use one set of axes*) (i) of the concentration of propene and (ii) of the concentration of carbon dioxide against time. Make sure these reflect the relative moles of substances participating in the reaction, but otherwise they do not need to show actual values.
  - If the concentration of propene falls from 0.0140 M to 0.0108 M during the course of 25 s, what is the average rate of reaction with respect to this reactant?
- 2) The reaction between nitrogen oxide and hydrogen proceeds according to the following equation at 904°C:



Experiments to determine the initial rate of reaction at various concentrations of reactants gave results as follows:

| Run # | [NO] / M | [H <sub>2</sub> ] / M | Rate / M s <sup>-1</sup> |
|-------|----------|-----------------------|--------------------------|
| 1     | 0.210    | 0.122                 | 0.0169                   |
| 2     | 0.210    | 0.244                 | 0.0338                   |
| 3     | 0.630    | 0.122                 | 0.1521                   |

- Determine the rate law for the reaction, indicating how you arrive at your answer.
- Calculate the rate constant.
- Calculate the rate of reaction when [NO] = 0.630 M and [H<sub>2</sub>] = 0.244 M. Is this an average or an instantaneous rate? Explain.

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<sup>1</sup> A sketch graph has labeled axes but, apart from the origin, no values are indicated. However, relative values are shown correctly. (One such is given in question 14.2 on page 615 in the 13<sup>th</sup> edition of Brown LeMay & Bursten's Chemistry - the Central Science.)