

CH104 Assigned Problems Chapter 13

Section	Problems
13.1	Chang: 3, 6, 7. SP: 1
13.2	Chang: 10, 17-19, 25. SP: 2
13.3	Chang: 23, 26, 30-32. SP: 3, 4
13.4	Chang: 34, 35, 38, 42, 43, 45. SP: 5
13.5	Chang: 47, 48, 52, 55, 56, 60
13.6	Chang: 61, 62, 64, 65, 68. SP: 6

CH104 Supplementary Problems: Chapter 13

Data and equations:

$$\ln [A] = \ln[A]_0 - kt$$

$$t_{1/2} = 0.693/k$$

$$k = Ae^{(-E_a/RT)}$$

$$\ln (k_1/k_2) = E_a/R (1/T_2 - 1/T_1)$$

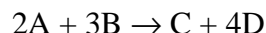
$$1/[A] = 1/[A]_0 + kt$$

$$t_{1/2} = 1/(k[A]_0)$$

$$\ln k = (-E_a/R) (1/T) + \ln A$$

1. For the reaction $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$, write the rate of appearance of H_2O and O_2 in terms of the rate of disappearance of H_2O_2 .

2. The reaction

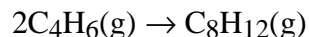


was studied at 30 °C. The initial rate was measured as a function of initial concentrations of reactants, and the following results were obtained:

<u>[A]₀ (M)</u>	<u>[B]₀ (M)</u>	<u>Rate (M/s)</u>
0.10	0.10	2.42×10^{-3}
0.20	0.20	1.92×10^{-2}
0.20	0.60	1.73×10^{-1}
0.20	0.10	4.84×10^{-3}

Write the rate law for this reaction and find the rate constant.

3. The dimerization of butadiene was studied at 500 K:



A graph of $1/[\text{C}_4\text{H}_6]$ versus t gave a straight line with a slope of $1.4 \times 10^{-2}/\text{M s}$, and a graph of $\ln[\text{C}_4\text{H}_6]$ versus t gave a curved line. What was the rate constant? Write the rate law for this reaction. If the initial concentration of C_4H_6 was 5.00 M, how long would it take for the

concentration of C_4H_6 to fall to 0.01 M? For the same initial concentration, what would the concentration of C_4H_6 be after 6 minutes?

4. The first-order rate constant for the reaction $A \rightarrow C$ is 2.12/s. Calculate the half-life of the reaction if the starting concentration of A is 2.0 M.

5. For a reaction $R \rightarrow P$, the rate constants were measured at several different temperatures. A graph of $\ln k$ versus $1/T$ gave a straight line with a slope of -1.2×10^4 K. What is the activation energy of the reaction in kJ/mol? The rate constant at 20.0 °C was found to be 2.0×10^{-5} /s. What will the rate constant be at 60.0 °C? What is the frequency factor, A?

6. Write the overall reactions and rate laws that correspond to the following reaction mechanisms. Identify any intermediates or catalysts.

