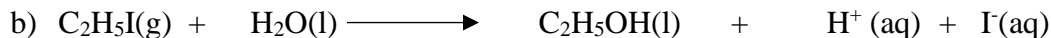


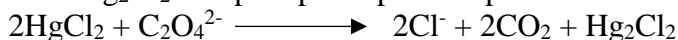
For complete credit show all the work for the calculations and give the answers in the correct significant figures. Keep the sheet of formulas handy for this study sheet.

1) Suggest experimental means by which the following reactions can be monitored for rate.



2) The initial concentration of H_2O_2 is 0.1108 M and 12 s later the concentration is 0.1060 M. what is the initial rate of this reaction expressed in M s^{-1} . (ans: $4.0 \times 10^{-4} \text{ M/s}$)

3) The rate of the following reaction in aqueous solution is monitored by measuring the number of moles of Hg_2Cl_2 that precipitate per liter per minute. The data obtained are listed in the table.



Exp	$[\text{HgCl}_2], \text{M}$	$[\text{C}_2\text{O}_4^{2-}], \text{M}$	Initial rate M min^{-1}
1	0.105	0.15	1.8×10^{-5}
2	0.105	0.30	7.1×10^{-5}
3	0.052	0.30	3.5×10^{-5}
4	0.052	0.15	8.9×10^{-6}

- Determine the order of reaction with respect to HgCl_2 and $\text{C}_2\text{O}_4^{2-}$ and overall. (ans: 1,2,3)
- What is the value of the rate constant, k ? (ans: $7.6 \times 10^{-3} \text{ M}^{-2} \text{ min}^{-1}$)
- What would be the initial rate of reaction if $[\text{HgCl}_2] = 0.094 \text{ M}$ and $[\text{C}_2\text{O}_4^{2-}] = 0.19 \text{ M}$? (ans: $2.6 \times 10^{-5} \text{ M/min}$)
- Are all four experiments necessary to answer parts a through c?

- 4) A first order reaction $A \longrightarrow \text{products}$, has a rate of reaction of 0.0025 M s^{-1} , when $[A] = 0.484 \text{ M}$.
- a) What is the rate constant, k , for this reaction? (ans: $5.17 \times 10^{-3} \text{ s}^{-1}$)
- b) Does $t_{3/4}$ depend on the initial concentration? Does $t_{4/5}$? Explain?
- 5) The rate constant for the second order reaction is $0.80 \text{ M}^{-1}\text{s}^{-1}$ at 10°C .
- $$2\text{NOBr} \longrightarrow 2\text{NO} + \text{Br}_2$$
- a) Starting with a concentration of 0.086 M , calculate the concentration of NOBr after 22 s . (ans: 0.034 M)
- b) Calculate the half lives when $[\text{NOBr}] = 0.072 \text{ M}$ and $[\text{NOBr}]_0 = 0.054 \text{ M}$. (ans: $17 \text{ s}, 23 \text{ s}$)
- 6) The second order rate constant of the dimerization of protein P is $6.2 \times 10^{-3} \text{ M}^{-1}\text{s}^{-1}$ at 25°C .
 $\text{P} + \text{P} \longrightarrow \text{P}_2$. If the concentration of the protein is $2.7 \times 10^{-4} \text{ M}$, a) calculate the initial rate (M/s) of the formation of P_2 ; and b) how long in seconds, will it take to decrease the concentration of P to $2.7 \times 10^{-5} \text{ M}$? (ans: $4.5 \times 10^{-10} \text{ M/s}$)

Extra Credit

- 7) For the reaction given below the frequency factor A is $8.7 \times 10^{12} \text{ s}^{-1}$ and the activation energy is 63 KJ/mol. What is the rate constant for the reaction at 75 °C? (ans: $3.0 \times 10^3 \text{ s}^{-1}$)

