CH 222
Sample Quiz #6 Name: _____ Lab Section: _____
***Answers***

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1. Consider the data (below) gathered for the following reaction: **A + B → C** (8 points)

| [A] (M) | [B] (M) | Δ[C]/Δ*t* (initial) M/s |
|---|---|---|
| 0.100 | 0.200 | $6.80 \times 10^{-6}$ |
| 0.100 | 0.400 | $2.72 \times 10^{-5}$ |
| 0.200 | 0.400 | $5.44 \times 10^{-5}$ |

   a. What is the order of the reaction with respect to A: **1** B: **2** Overall order: **3**

   b. What is the numerical value for the rate constant?

   **$k = 1.70 \times 10^{-3}$**

   c. Write the rate law for the reaction. **$rate = k[A][B]^2$**

   d. What is the value of the rate when [A] = 0.337 M and [B] = 0.122 M?

   **$rate = 8.53 \times 10^{-6}$**

2. In basic solution, $(CH_3)_3CCl$ reacts according to the equation below.

$$(CH_3)_3CCl + OH^- \rightarrow (CH_3)_3COH + Cl^-$$

The accepted mechanism for the reaction is

$$(CH_3)_3CCl \rightarrow (CH_3)_3C^+ + Cl^- \quad \text{(slow)}$$
$$(CH_3)_3C^+ + OH^- \rightarrow (CH_3)_3COH \quad \text{(fast)}$$

   a. What is a rate law that is consistent with the mechanism for this reaction? (2 points)

   **$rate = k[(CH_3)_3CCl]$** ***slow step***

   b. Are intermediates present in the reaction? If so, list them. (2 points)

   **yes, $(CH_3)_3C^+$**

3. For a chemical reaction, the activation energy for the forward reaction is +187 kJ and the activation energy for the backward reaction is +112 kJ. What is the overall energy change for the forward reaction? (4 points)

   **forward reaction is endothermic (reverse reaction has lower activation energy)**
   **ΔH = 187 - 112 = +75 kJ**

4. What is the half-life of a first order reaction with a rate constant of 0.457 $s^{-1}$? (4 points)

   **$t_{1/2} = 1.52$ s**