Show your work on all numerical problems. This assignment is due on Monday, January 25, at classtime. Please read through Section 16.8 by classtime on Monday, January 20. The quiz on Monday will be over learning objectives 4.1.

1. (10 points) The following initial rate data were collected in a study of a chemical reaction. Determine the rate law and the value of the rate constant with its appropriate units.

<table>
<thead>
<tr>
<th>[A]₀ (M)</th>
<th>[B]₀ (M)</th>
<th>[C]₀ (M)</th>
<th>Rate (M/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.2</td>
<td>0.1</td>
<td>3.4×10⁻⁴</td>
</tr>
<tr>
<td>0.5</td>
<td>0.4</td>
<td>0.2</td>
<td>1.36×10⁻³</td>
</tr>
<tr>
<td>0.75</td>
<td>0.2</td>
<td>0.1</td>
<td>7.65×10⁻⁴</td>
</tr>
<tr>
<td>1.0</td>
<td>0.2</td>
<td>0.05</td>
<td>6.8×10⁻⁴</td>
</tr>
</tbody>
</table>

2. (10 points) Apply the rate-determining step approximation to the following mechanism to write its rate law in terms of only reactants and products. Show your work.

\[ \text{H}^+ + \text{I}^- \rightleftharpoons \text{HI} \quad \text{rapidequilibrium} \]
\[ \text{HI} + \text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{HOI} \quad \text{slow} \]
\[ \text{HOI} + \text{I}^- \rightarrow \text{I}_2 + \text{OH}^- \quad \text{fast} \]
\[ \text{OH}^- + \text{H}^+ \rightarrow \text{H}_2\text{O} \quad \text{fast} \]

3. (10 points) Apply the steady-state to the mechanism in Problem 2 to write its rate law in terms of only reactants and products. Show your work.

4. (5 points) Your results for Problems 2 and 3 were different even though they were the same mechanism. Under what conditions would the two rate laws be the same? Are those conditions consistent with the rate-determining step approximation?

5. (5 points) Consider the following methods of treating data from Section 16.4:
   a. The half-life method
   b. Powell-plot method
   c. Initial-rate method
   d. Isolation method
   e. Trial and error by plotting ln[A] vs. t and 1/[A] vs. t

Summarize in a short essay the advantages and disadvantages of each method.