Tips

1) Look at each problem like an experiment
   - We manipulate one variable and interpret outcomes
2) Identify the manipulated variable
3) Identify change and interpret
4) If tutee does not understand conceptually then give equation

\[
\frac{\text{rate}_1}{\text{rate}_2} = \frac{K [A]^x [B]^y}{K [A]^x_z [B]^y_z} \rightarrow \frac{\text{rate}_1}{\text{rate}_2} = \frac{[A]^x [B]^y}{[A]^x_z [B]^y_z}
\]

Problems

\[2\text{MnO}_4^- + 5\text{ClO}_3^- + 6\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 5\text{ClO}_4^- + 3\text{H}_2\text{O}\]

<table>
<thead>
<tr>
<th>Exp #</th>
<th>[MnO$_4^-$]</th>
<th>[ClO$_3^-$]</th>
<th>[H$^+$]</th>
<th>Rate (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only MnO$_4^-$</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>5.2 x 10$^{-3}$</td>
</tr>
<tr>
<td>ClO$_3^-$</td>
<td>0.25</td>
<td>0.1</td>
<td>0.1</td>
<td>3.3 x 10$^{-2}$</td>
</tr>
<tr>
<td>H$^+$</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
<td>1.6 x 10$^{-2}$</td>
</tr>
<tr>
<td>4</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>7.4 x 10$^{-3}$</td>
</tr>
</tbody>
</table>

1 \rightarrow 2 only MnO$_4^-$ is manipulate

\[
\frac{3.3 \times 10^{-2}}{5.2 \times 10^{-3}} = 6.23
\]

We multiply MnO$_4^-$ by 2.5

so \(2.5^x = 6.23\)

\[x = 2\]

So reaction is second order with respect to MnO$_4^-$. 

* Complete rest on own.
FAQs

Q: What if a student is overwhelmed by a table of numbers?
A: Cover up some #s and just have them focus on important things.