**Exercise – Reaction Mechanisms**

1. Given the following reaction mechanism:



a) Write the balanced net reaction.
b) Identify the reaction intermediate(s).
c) Identify the catalyst(s).

2. Examine the following reaction mechanism:



a) Write out the net reaction.
b) Identify the overall rate of the net reaction.
c) Increasing [ P ] , increases the rate of the net reaction.
    Increasing [ Q ] , increases the rate of the net reaction.
    Increasing [ S ] , has no effect of the rate.
    Explain why this is possible.

3. Write the net reaction for the mechanism.



4. A proposed mechanism for the preparation of the poisonous liquid nitrobenzene (C6H6NO2) is



a) What is the RDS? Why?
b) What is the net reaction?
c) Without H2SO4 this is a very slow reaction. Explain.

**Answer Key**

1.



intermediate: IO–
catalyst: I–

2.



b) Since the rate determining step is slow, the entire rate is slow.

c) Increasing [ P ] , increases the rate of the net reaction.
Increasing [ Q ] , increases the rate of the net reaction.
Increasing [ S ] , has no effect of the rate.
This occurs because both P and Q are present in the rate determining step, but S is not. Only reactants in the rate determining step will significantly affect the rate of the reaction.

3. 2 A + B → 2 C + D

4.



a) The RDS is C6H6 + NO2+ → C6H6NO2+ because it is the slowest step.

b) C6H6 + NO2+→ C6H6NO2

c) H2SO4 is introduced in step 2 and is unchanged at the end of the reaction. H2SO4 is most likely a catalyst since it speeds up the reaction and is unchanged at the end of the reaction.

d) Step 1 is slowest, therefore it has the largest activation energy. Step 2 is the fastest, so it should have the smallest activation energy. Step 3 is fast, so it should have a small activation energy.