1. Draw the mechanism including all resonance structures for the intermediate. Why is a catalyst not required?

2. Draw the mechanism including all resonance structures for the intermediate.
3. Draw the mechanism including all resonance structures for the intermediate.

4. Draw the mechanism including all resonance structures for the intermediate.
5. Furan undergoes electrophilic substitution more readily than benzene; mild reagents and conditions are sufficient.

Propose mechanisms for the bromination of furan at the 2-position and at the 3-position. Draw the resonance structures of the intermediates and compare their stability. Explain why furan undergoes substitution primarily at the 2-position.

More resonance stabilization in 2-position intermediates

6. Unlike most electrophilic aromatic substitutions, sulfonation is reversible. When one sample of toluene is sulfonated at 0° C and another sample is sulfonated at 100° C the following results are obtained.

Explain the change in product ratios when the temperature is increased.

Reaction is reversible - thermodynamically more stable product predominates at high temp.

Because the SO$_3$H group can be added to a benzene ring and removed later, it is sometimes called a blocking group. Show how 2,6-dibromotoluene can be made from toluene using sulfonation and desulfonation as intermediate steps in the synthesis.