Use scratch paper wherever there is not enough space.

List 3 strange things you might observe in reactions that indicate there might be a neighboring group effect (NGE).

1. 

2. 

3. 

The Generic electrophilic attack on furan occurs to favor product “A” over “B”. Draw mechanisms leading to both, including curved arrows and resonance structures, to explain why “A” is favored. (Use scratch paper)

\[ \text{O} \quad \text{E} \quad \text{O} \quad \text{E} \quad \text{O} \]

\[ \text{E} \quad \text{A} \quad \text{E} \quad \text{B} \]

Show mechanisms (every step, every proton transfer, curved arrows in the right direction) for the following transformations. (Use scratch paper)

\[ \text{O} \quad \text{O} \quad \text{NNH}_2 \quad \text{AcOH} \quad \text{Cl} \quad \text{O} \quad \text{NN} \quad \text{H} \quad \text{H} \quad \text{CO} \]

The trans compound below reacts much faster than the cis. Draw the product for each case and mechanisms for each to explain why. State in words as well why.

trans 

\[ \text{Br} \quad \text{H}_2\text{O} / \text{EtOH} \]

H 

\[ \text{S} \quad \text{O} \quad \text{Cl} \quad \text{H} \quad \text{H} \quad \text{N} \quad \text{H} \quad \text{N} \quad \text{H} \]

\[ \text{C} = \text{O} \]

cis 

\[ \text{Br} \quad \text{H}_2\text{O} / \text{EtOH} \]

H 

\[ \text{S} \quad \text{O} \quad \text{Cl} \quad \text{H} \quad \text{H} \quad \text{N} \quad \text{H} \quad \text{N} \quad \text{H} \]
Draw all the products which will be formed in varying amounts.

\[
\text{Br} \quad \stackrel{\text{NH}_3}{\longrightarrow}
\]

Since the above reaction is pooh, show how you would cleanly make propyl amine starting from propyl bromide. Then show how you could make it from ethyl bromide. Then from an aldehyd containing 3 carbons. (Note: you now have the power to make attach different functional groups, either directly or making a chain longer, should you be asked to do so in the future) No mechanisms necessary.

Fill in the boxes with reagents or products.
Now I’m going to get nasty. Show me what you got. Provide a clean synthesis for the following molecules, using the indicated starting materials.

You may not add more than 3 carbons in each step.