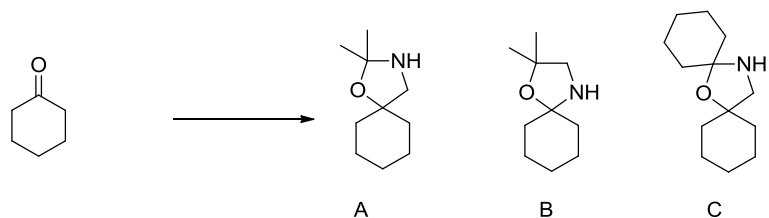


Solutions to Problems – Set 4 : Carbonyl compounds (part 2)

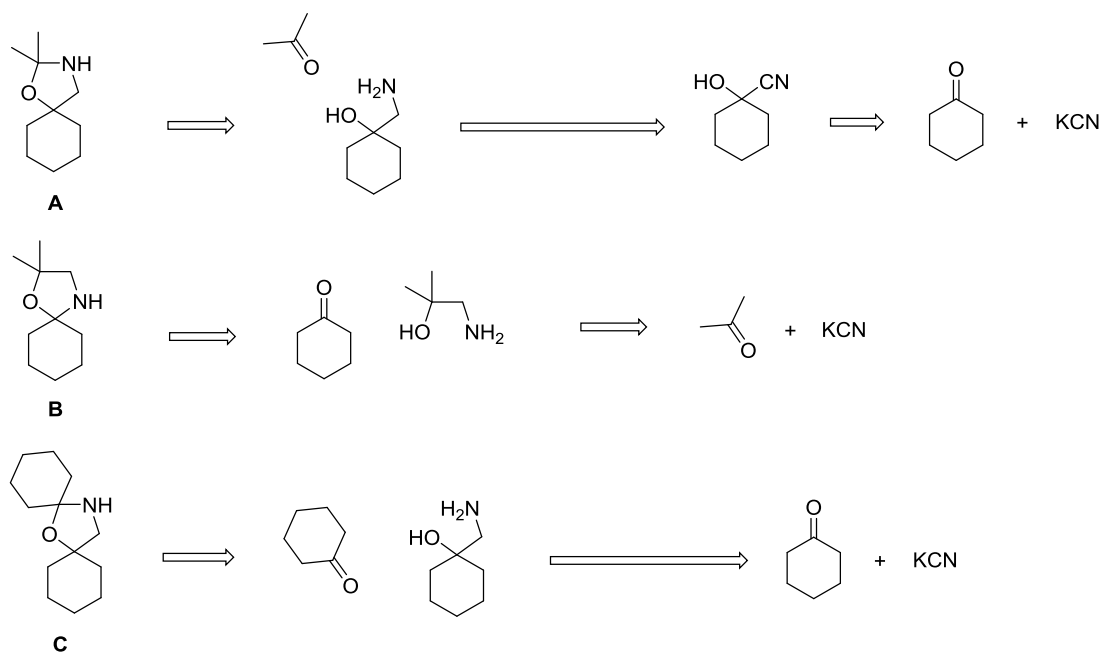
Problem 1

Give possible synthetic pathway for compounds **A**, **B** and **C** from cyclohexanone:



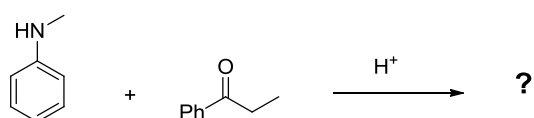
Solution

All three above compounds contain hemi-aminal functional group (has both a hydroxyl and an amine attached to the same carbon atom). Their precursors are easily identified.



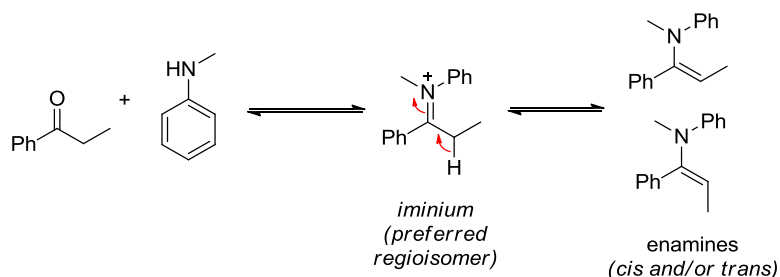
Problem 2

For the following condensation provide a mechanism leading to all the possible products.



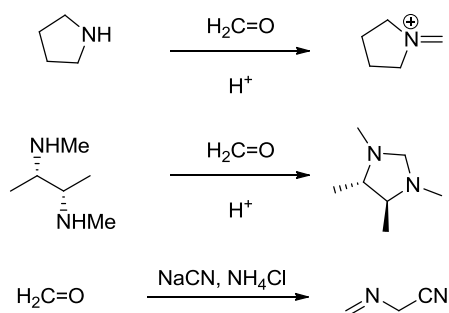
Solution

After condensation of the secondary amine with the ketone, an iminium ion is formed. Its preferred geometry is probably with the two phenyl rings in *trans*. Then, upon deprotonation in α position, enamines with two different geometries can be formed.



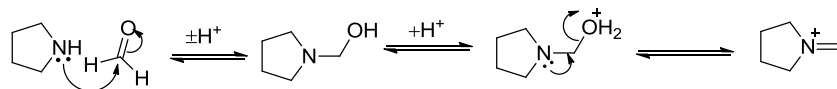
Problem 3

Suggest mechanism for the following two reactions with the smallest aldehyde, formaldehyde.

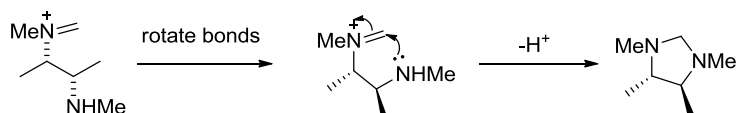


Solution

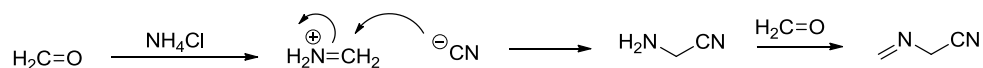
Remember what you have learnt about imine formations, nothing has changed here.



For the 2nd reaction, we may do the same reaction with formaldehyde to give us the iminium. Keep also track of the stereochemistry and notice that the iminium is a reactive species.

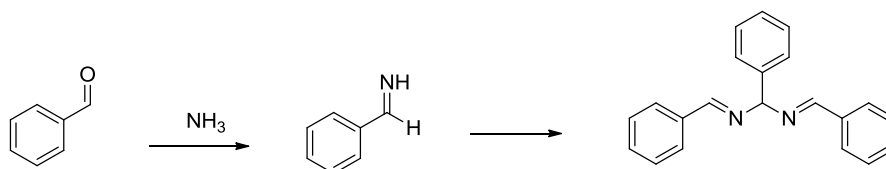


The 3rd reaction starts with imine formation. Cyanide is the nucleophile that captures the iminium ion and a second imine formation completes the mechanism.



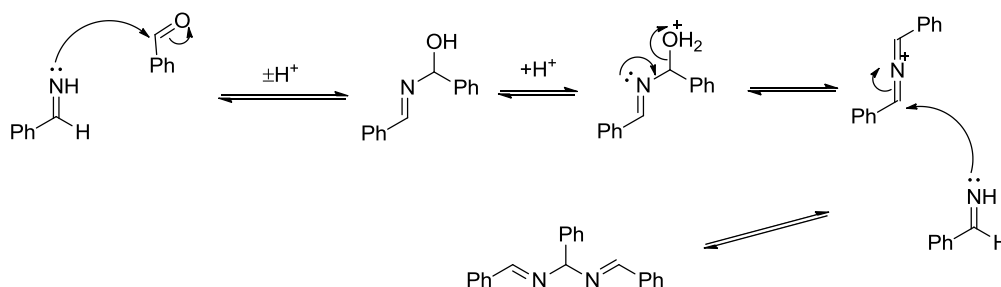
Problem 4

A stable product can be isolated from the reaction between ammonia with benzaldehyde. Propose the mechanism.



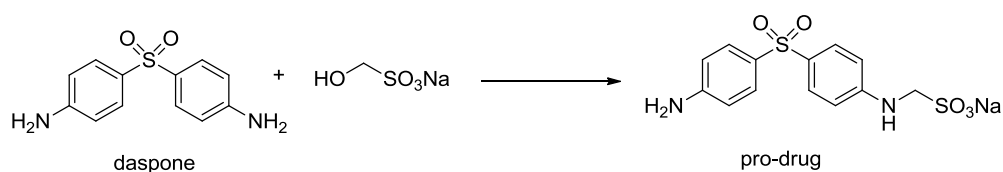
Solution

Evidently a trimerisation has occurred. For this reason 3 different benzaldehydes or imines must be involved in the reaction mechanism.



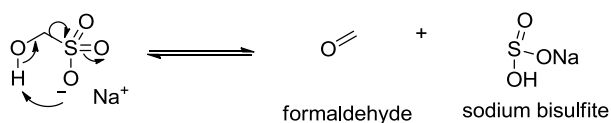
Problem 5

The drug daspone is insoluble in water, but its administered pro-drug is a water soluble (pro-drug means that in the human body the drug is released in its active form). Suggest a mechanism leading to the pro-drug.

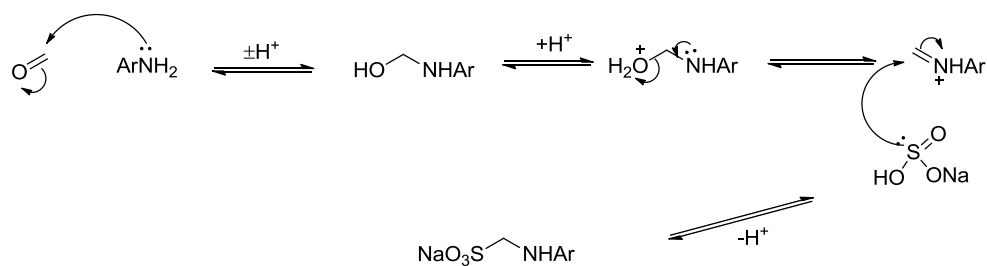


Solution

The equilibrium of the bisulfite formation may be controlled by the reaction conditions.

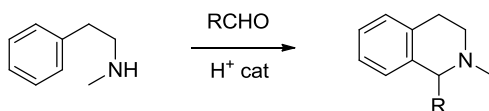
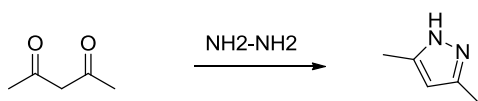


Once the formaldehyde is released the aromatic amine, reacts with it:



Problem 6

Suggest mechanism for the following reactions



Solution

Both reactions go through the formation of imine or iminium.

