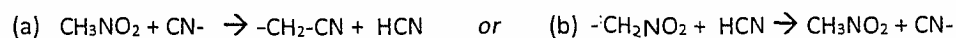


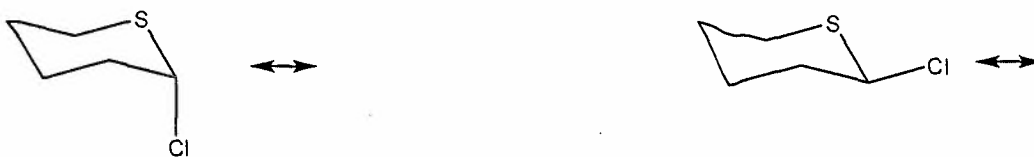
Problem 1. pKa of two leaving groups nitromethane and HCN are 10.2 and 9.4 and . Predict the thermodynamically feasible reaction from the given data with a brief reason. [3]



Ans:

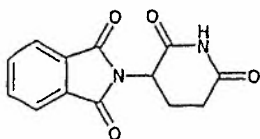
Reason:

2(a) Draw the relevant orbitals (with labels) responsible for the hyperconjugation in the following systems. Draw the corresponding hyperconjugation structures. [2 + 2] Show the orbitals on the given structures.



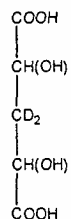
(b) Based on the above answer, which of them is lower in energy? [1]

Q3. Phthalimide is a chiral compound. The (R) isomer can be used to treat morning sickness for pregnant women, however the (S) isomer causes birth defects of the foetus. Draw the Fischer projection of the (R)-isomer. (You do not have to draw the whole molecule. Draw the functionalities around the chiral centre. [2]



Thalidomide

Q4. (a) How many stereoisomers will the following compound have (*Structures not required*)? (b) How many of them will be *meso*? Draw each of the *meso* isomers in Newmann projection. (c) What is the stereochemical relationship between two non-mirror-image *meso* isomers? [1+ 2+ 1]



Ans: (a)

Ans. (c)

Ans: (b)

Q5. Write the resonance structures of the cyanide ion (CN⁻) showing all the bonds and the lone pairs. [2]

Q6. Predict the product with mechanism: CH₃CH₂MgBr reacts with acetylacetone CH₃COCH₂COCH₃ (pK_{a1} = 9). In a 1:1 mole ratio. [4]