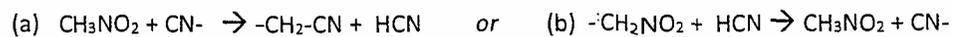


Problem 1. pKa of two leaving groups nitromethane and HCN are 10.2 and 9.4 and . Predict the thermodynamically feasible reaction from the given data with a brief reason. [3]



Ans:

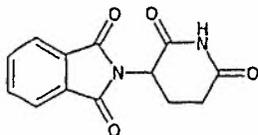
Reason:

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.



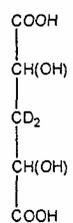
(b) Based on the above answer, which of them is lower in energy? [1]

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]