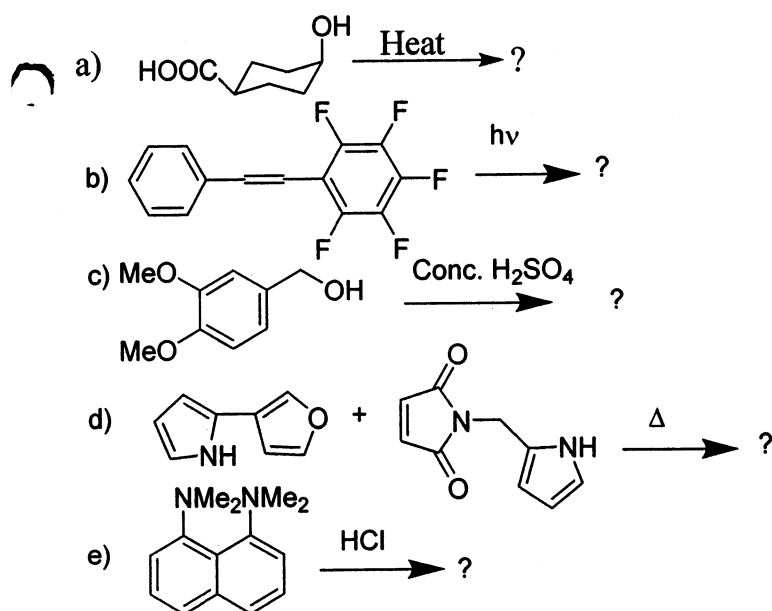


PART-A [3 x 5M = 15 marks]

Answer any 3 questions

- (a) Describe the interaction behind writing with a led pencil on a paper and rubbing with an eraser. (b) Why azulene is ionic? (c) How will you synthesize Crown ethers? [2+1+2=5M]
- (a) Write the stereo isomers of Phenylalanine and Tartaric acid with absolute configurations. (b) What is molecular recognition? [2+2+1=5M]
- (a) Write a note about π - π stacking. (b) What is the difference between molecular chemistry and supramolecular chemistry? (c) What is the role of Valinomycin? [2+2+1=5M]
- Write the products [1×5=5M]



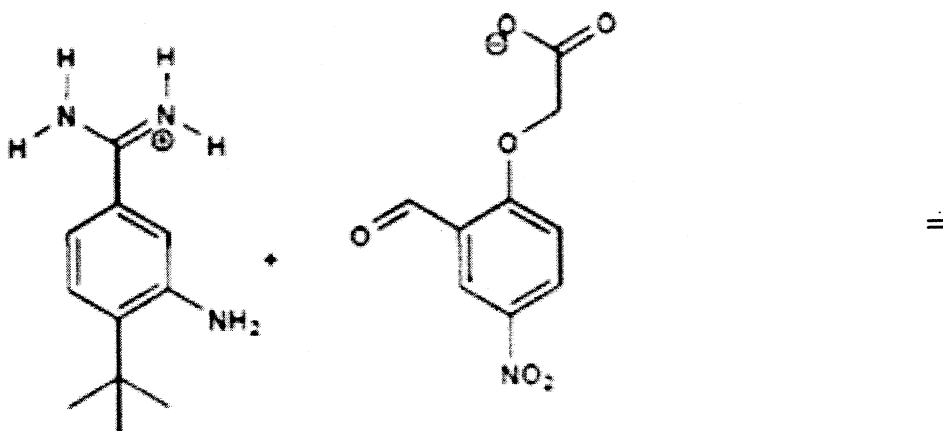
PART-B [5 × 3M = 15 marks]

Answer any 5 questions

- (a) Describe very strong H bonding with one example. Please provide bond distance as well. (b) Describe di-hydrogen bonding with one example. Please provide bond distance as well. [3M]
- What is the binding constant? Please derive K_{11} and K_{12} for a sequential process involving the binding of more than one metal ion with ligand L. [3M]
- What is the volume to charge ratio in zeolites? Define it with respect to the stability of the zeolite structure. [3M]
- Define the role of structure directing agents in zeolites. Why quaternary ammonium salts act as good structure directing agents. [3M]

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9. Describe the product with hydrogen bonding in the following reaction. [3M]



10. What is nucleation? Please plot time vs percent of crystallinity during the hydrothermal synthesis of zeolites. [3M]

PART-C [5x4M = 20 marks]

Answer any 5 questions

11. What is a "supramolecular synthon"? Given the below functional groups, how many combinations of co-crystals one may form by taking two appropriate groups at a time? Draw possible synthons for each co-crystal case : (a) carboxylic acid, (b) amide, (c) pyridine, (i) -Ar-I (iodo-group on aromatic ring) [4M]
12. Describe terms "co-crystal" and "salt" in the context of organic solids? Explain how one would be able to predictably achieve these forms? [4M]
13. What is a halogen bond? Compare the role of iodine atom in a halogen bond with that of hydrogen atom in a hydrogen bond. [4M]
14. Compounds A (M.P. = 100°C) and B (M.P. = 120 °C), with very similar molecular structure, crystallize in monoclinic $P2_1/n$ space group with almost same unit cell parameters. A student co-crystallized both A and B together in different molar ratios and obtained nice uniform single crystals. HPLC of single crystals confirmed that both the compounds are present in each batch, but with different stoichiometric ratios. What are these solid forms with different molar ratios of A and B are called? What would be the trend of melting points (from Differential Scanning Calorimetry) of these solids that possess various stoichiometric ratios of A:B ranging from 100:0%, ..., 0:100%? [4M]
15. Describe the solid-state (2+2) photochemical reactions using the polymorphs of cinnamic acid. [4M]
16. Describe "Ostwald's rule of stages" in brief with a suitable diagram. [4M]