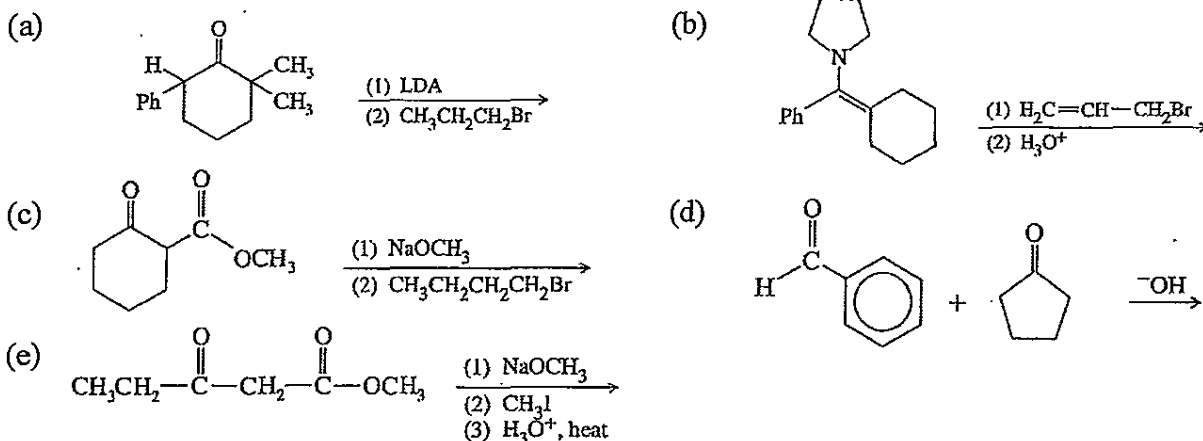
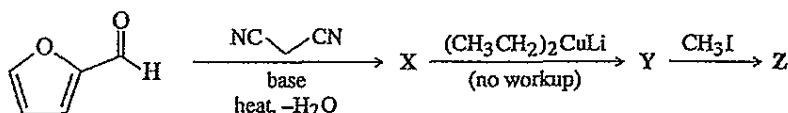


※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

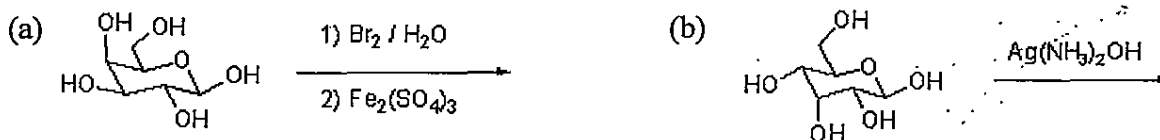
1. Predict the product of the following reactions. (10 pts)



2. Predict the products from this sequence of reactions. (10 pts)

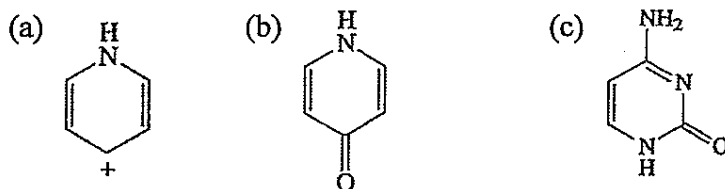


3. Draw the product of the following reactions in a Fischer projection. (10 pts)

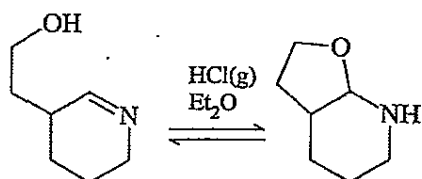


4. Draw the structure of (a) (1*R*, 2*R*)-1-bromo-2-chlorocyclobutane and (b) (1*R*, 2*S*, 3*S*)-1,2-dibromo-3-ethylcyclohexane. Take particular care to indicate stereochemistry properly. (10 pts)

5. Some of the following compounds show aromatic properties, and others do not. Predict which ones are likely to be aromatic, and also predict which nitrogen atoms are more basic than water and which are less basic. (10 pts)

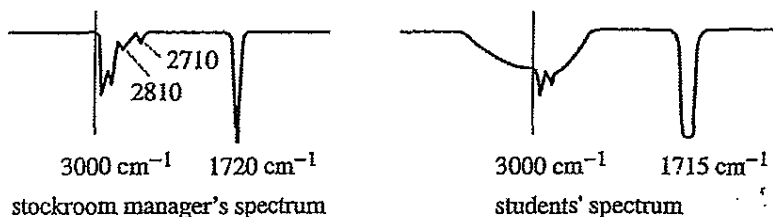


6. Show a complete mechanism for this equilibrium established in diethyl ether with HCl gas as catalyst. (10 pts)



7. The ^1H NMR spectrum of bromocyclohexane shows a downfield peak (one proton) at δ 4.16. This signal is a single peak at room temperature, but at -75°C separates into two peaks of unequal area (but totaling one proton): δ 3.97 and δ 4.64 in the ratio 4.6 : 10. How do you account for the separation of peaks? Which conformation of the molecule predominates at room temperature and at -75°C , and (at -75°C) what percentage of molecules does it account for? (10 pts)

8. The manager of an organic chemistry stockroom prepared unknowns for a "Ketones and Aldehydes" experiment by placing two drops of the liquid unknowns in test tubes and storing the test tubes for several days until they were needed. One of the unknowns was misidentified by every student. This unknown was taken from a bottle marked "Heptaldehyde". The stockroom manager took an IR spectrum of the liquid in the bottle and found a sharp carbonyl stretch around 1720 cm^{-1} and small, sharp peaks around 2710 and 2810 cm^{-1} as shown in the following spectra. The students complained that their spectra showed no peaks at 2710 or 2810 cm^{-1} , but a broad absorption centered over the 3000 cm^{-1} region and a carbonyl peak around 1715 cm^{-1} . They also maintained that their samples are soluble in dilute aqueous sodium hydroxide. (10 pts)



- Identify the compound in the stockroom manager's bottle, and the compound in the students' test tubes.
- Explain the discrepancy between the stockroom manager's spectrum and the students' results.
- Suggest how this misunderstanding might be prevented in the future.

9. Give structures for compounds A through J. (20 pts)

