

1. F.S - 2009

Sl. No.

7124

B-JGT-J-DIB

## CHEMISTRY

### Paper II

Time Allowed : Three Hours

Maximum Marks : 200

### INSTRUCTIONS

*Candidates should attempt Question Nos. 1 and 5 which are compulsory, and THREE of the remaining questions selecting at least ONE question from each Section.*

*Marks for each question are indicated against each.*

*Assume suitable data if considered necessary and indicate the same clearly.*

*Answers must be written in ENGLISH only.*

*Unless otherwise indicated, symbols and notations have their usual meanings.*

---

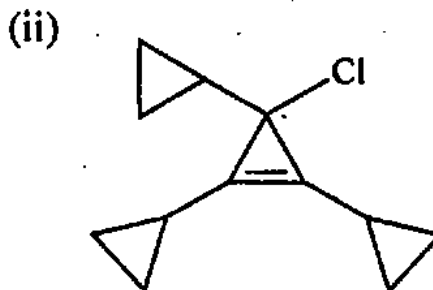
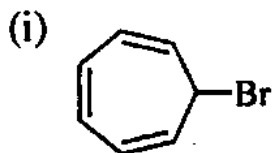
(Contd.)

**Section - A**

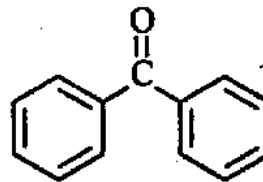
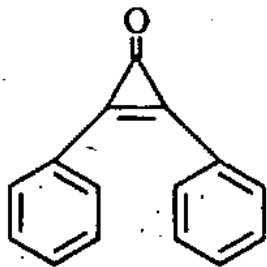
1. Answer any *four* of the following (in about 150 words each): 10×4

Explain the following briefly :

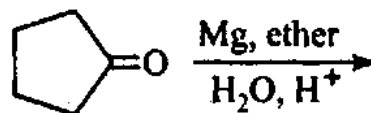
- (a) Formation of corresponding stable ions from the following molecules.



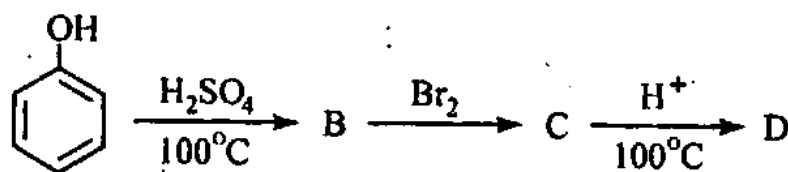
- (b) Which of the following two compounds will have higher dipole moment and why ?



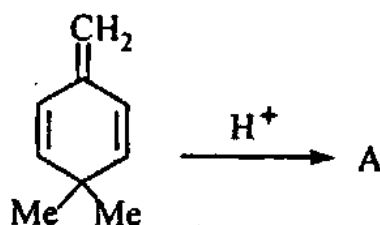
- (c) Write the product and outline mechanistic steps for its formation



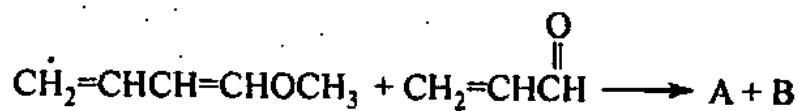
- (d) Will an amide be formed from the reaction of an acyl chloride with an aqueous solution of pyridine ?
- (e) Why should cyclopentadiene show acidic properties ?
2. (a) Write structure of B, C and D. Explain the formation of products. 2+2+2+4



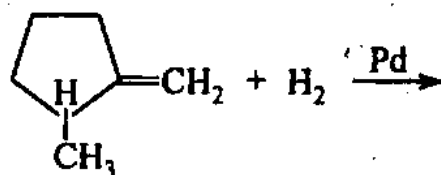
- (b) Predict the product and outline mechanistic steps for following reaction. 5+5



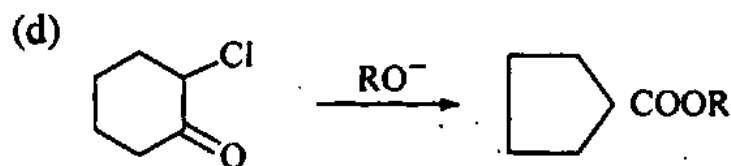
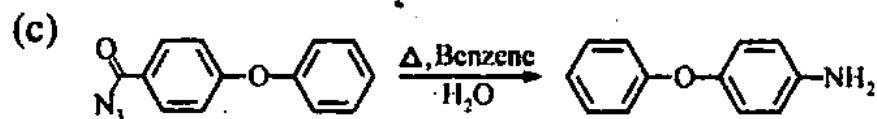
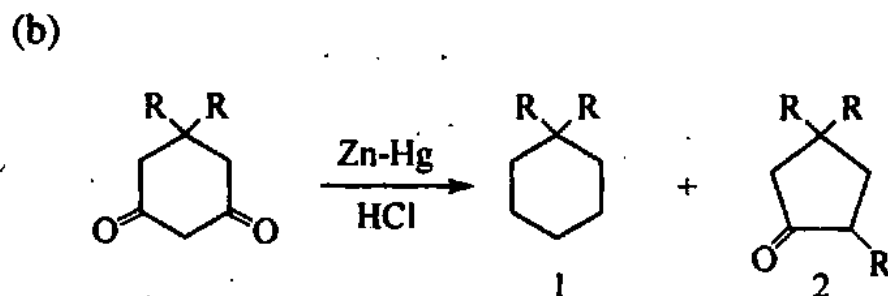
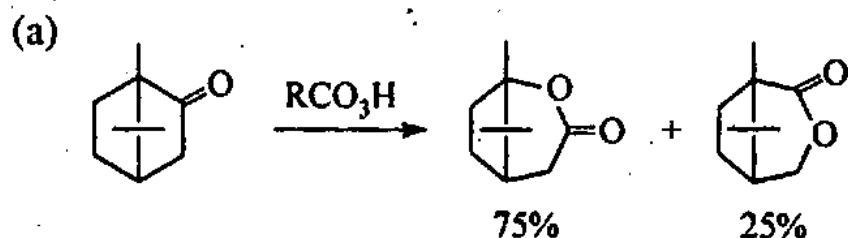
- (c) Predict the possible products of following Diels Alder reaction and explain which product is preferentially formed and why ? 3+3+4



- (d) Write the structure of the product formed in the following reaction. Explain briefly its formation. 5+5



3. Give the name of the reaction and explain the mechanism involved in the formation of the products. 10×4

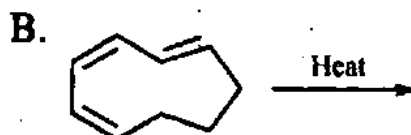
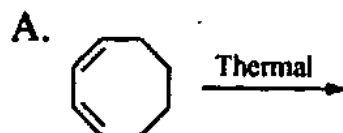


4. Explain briefly

(a) While writing the Diels Alder products for reaction of 2,4,6-cycloheptatrienone with cyclopentadiene and with ethene respectively, why does it use two pi electrons with cyclopentadiene while with ethene it uses four pi electrons ? 15

(b) Why lycopene and beta carotene appear coloured in nature ? 5

(c) Predict the product of following electrocyclic reactions. Indicate and comment upon the steric positions of hydrogens in the product. 10



(d) Draw the structure of [18]-Annulene and show how many types of NMR signals are given by it. Explain. 10

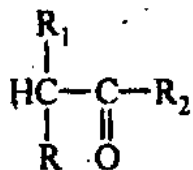
Section - B

5. Answer any *four* of the following :

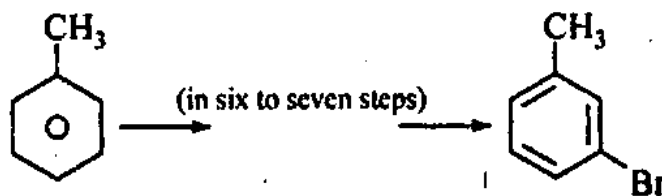
(a) Use aldol condensation to synthesize useful compound from cheap and readily available compounds/reagents, the food preservative sorbic acid,



- (b) Considering bromination of carbonyl compounds as acid catalysed, suggest a reasonable mechanism in which enol is an intermediate, use the following compound. 10

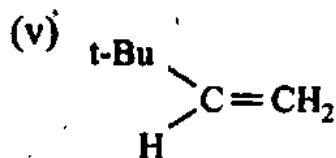
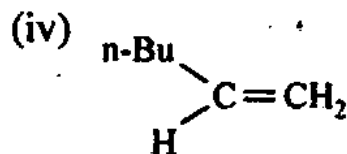
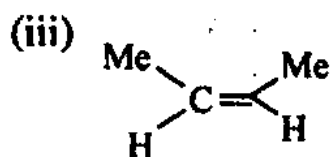
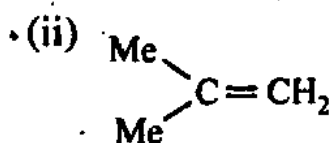
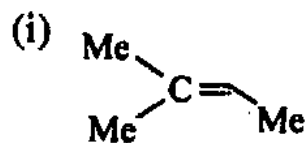


- (c) Reaction of 1 mole of semicarbazide with a mixture of 1 mole each of cyclohexanone and benzaldehyde precipitates cyclohexanone semicarbazone, but after a few hours the precipitate is benzaldehyde semicarbazone. Explain. 10
- (d) Why attack of  $CN^-$  on benzaldehyde does not bring about Cannizzaro reaction while that of  $OH^-$  brings about it. Write the mechanistic steps and products in the two cases. 10
- (e) Effect the following conversion 10

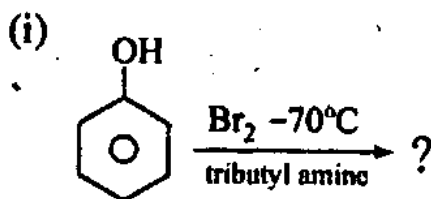


6. (a) Why carboxylic acid group of amino acids is more acidic ( $pK_a = 2$ ) than carboxylic acid group of acetic acid ( $pK_a = 4.76$ )? 5

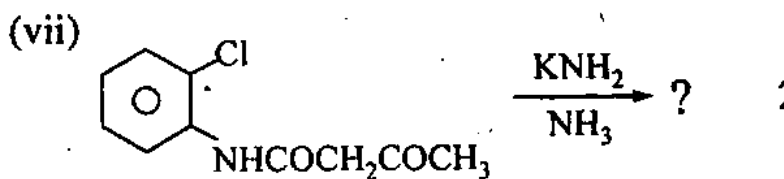
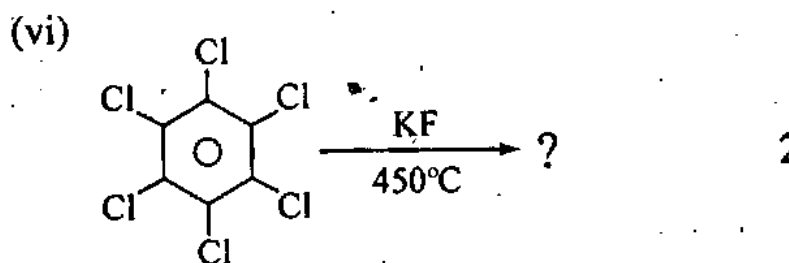
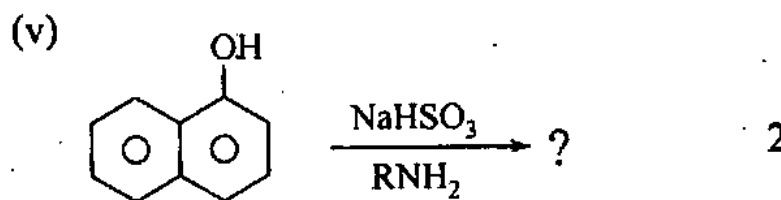
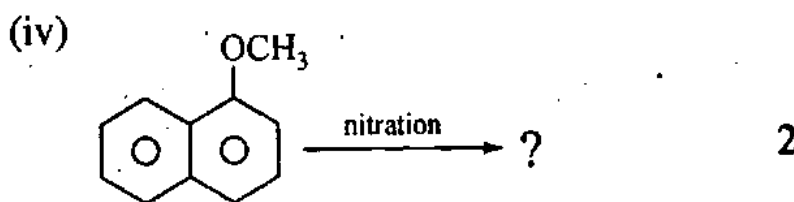
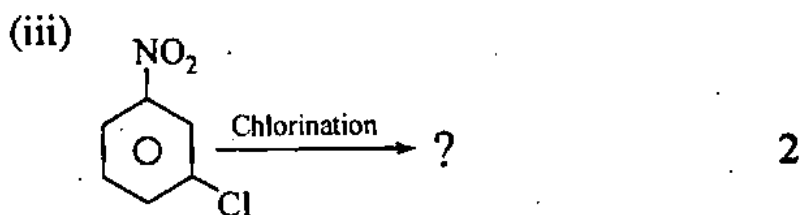
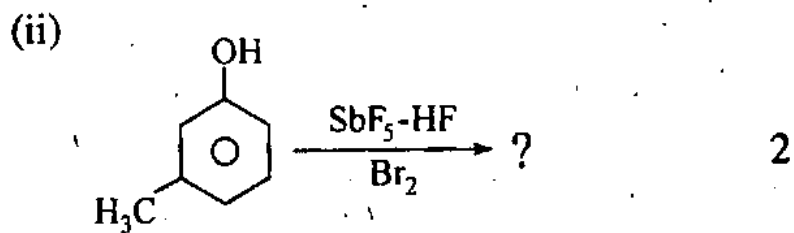
(b) Arrange the following alkenes for their increasing rate of bromination in methanol. Justify in a few lines. 5+5



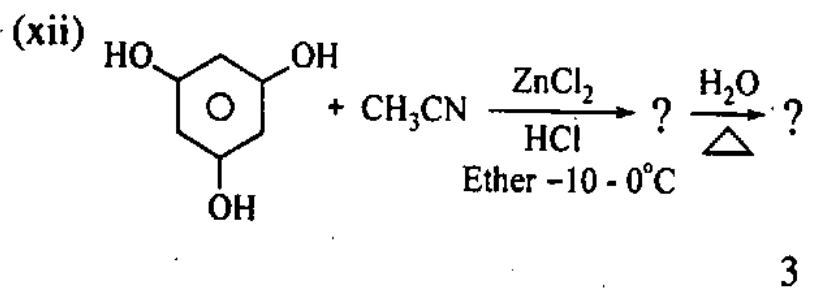
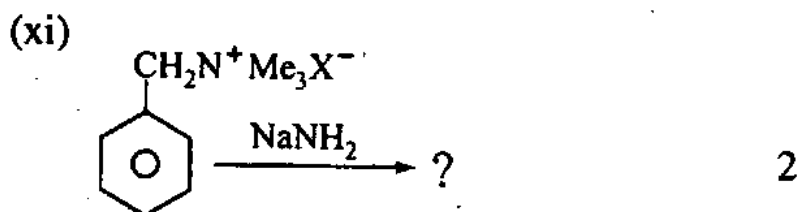
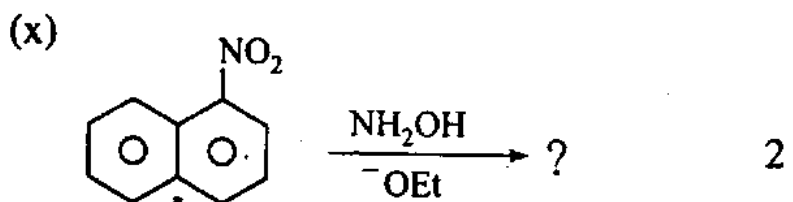
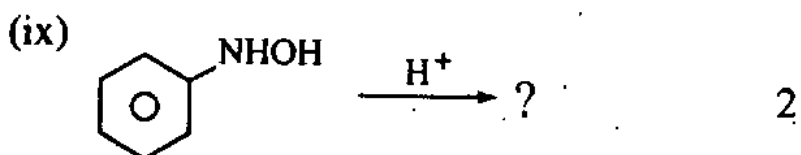
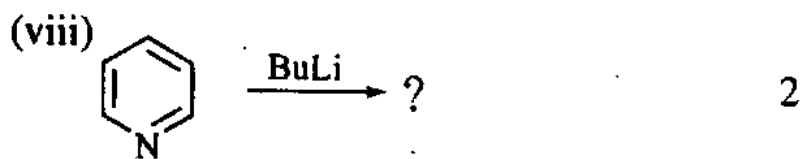
(c) Write reaction products in the following :



2







7. (a) A compound with molecular formula  $C_8H_{14}O$  shows the following proton NMR, and IR bands.

The singlet at  $\delta$  3.1 in the proton NMR disappears when the sample is shaken with  $D_2O$ .  
IR :  $3500\text{ cm}^{-1}$ ,  $3300\text{ cm}^{-1}$ ,  $2100\text{ cm}^{-1}$ .

$^1\text{H NMR}$  : d (6H,  $\delta$  1.0), s (3H,  $\delta$  1.5), d (2H,  $\delta$  1.6), m (1H,  $\delta$  1.9), s (1H,  $\delta$  2.3) and s (1H,  $\delta$  3.1).

Determine the structure of the compound, with justification. 15

- (b) When 1-butanol is dissolved in superacid at  $-60^\circ\text{C}$  the  $^1\text{H}$  NMR shows signals at  $\delta$  9.5 (2H, t),  $\delta$  5 (2H, m). On raising the temperature to above  $0^\circ\text{C}$  all the above signals decrease largely and then the  $^1\text{H}$  NMR is dominated by a new singlet at  $\delta$  4.0.

Explain the results. 10

- (c) A hydrocarbon in its mass spectrum showed molecular ion at  $m/z = 134$  and prominent fragments at  $m/z = 119$  and 77. The spectral data for this compound are as follows :

$^1\text{H}$  NMR  $\delta = 7.0$  (s, 4H); 2.82 (heptet,  $J = 7.0$  Hz, 1H), 2.28 (s, 3H) and 1.22 ppm (d,  $J = 7.0$  Hz, 6H);  $^{13}\text{C}$  ( $^1\text{H}$ ) NMR  $\delta = 21.3$ , 24.2, 38.9, 126.6, 128.6, 134.8, and 145.7 ppm; IR bands at 3030, 2970, 2880, 1515, 1465 and  $815\text{ cm}^{-1}$ ;  $\text{UV}\lambda_{\text{max}}(\epsilon) = 265 (450)$ .

What is its structure ? Justify your answer. 15

8. (a) Explain the following with a suitable simple example for each

(i) Co-polymer

(ii) Coordination polymerization. 5+5

(b) Examine the structures of the following synthetic polymers. Tell what class of compounds it belongs to and give structure of the likely monomers. (3+3)×5

