

U.G. 6th Semester Examination - 2026

CHEMISTRY

[MAJOR-IX]

Course Code : CHEM-MAT-09

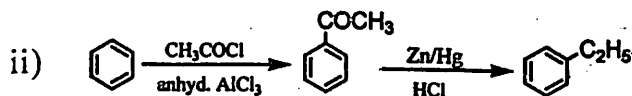
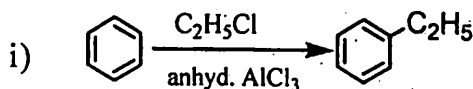
(Organic-3)

[NEP-2020]

Full Marks : 60

Time : $2\frac{1}{2}$ Hours*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer any ten questions: $2 \times 10 = 20$

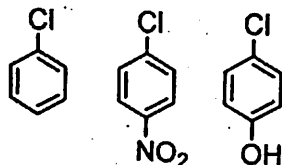
- a) Explain the fact that the addition rate of bromine to alkene increases by the addition of AlBr_3 but decreases by the addition of KBr .
- b) Ethyl benzene can be prepared by the following two ways:



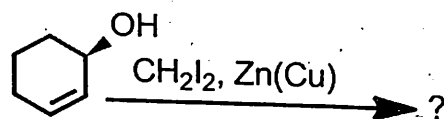
Which is the better method and why?

[Turn Over]

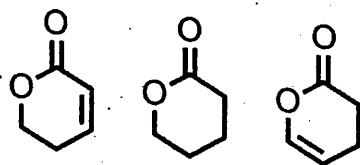
- c) Arrange the following compounds in increasing order of reactivity towards nucleophilic substitution reaction.



- d) Indicate the major product in the following reaction and explain its formation.

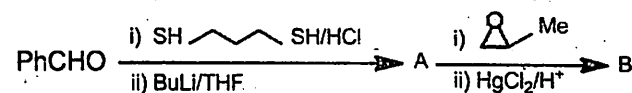


- e) Explain the fact that $(\text{CF}_3)_2\text{C}=\text{O}$ gives hydrates very rapidly but $(\text{Me}_3\text{C})_2\text{C}=\text{O}$ does not.
- f) Predict the stable conformation of Cis-1,4-Cyclohexanediol.
- g) Arrange the following in order of increasing ν value in IR Spectroscopy—



(Brief explanation is required).

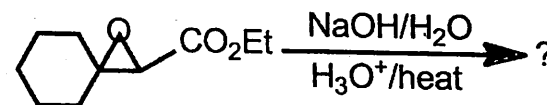
- h) Identify A and B:



- i) Discuss the reactions of dimethyl aniline with NaNO_2 and dilute HCl in cold condition.
- j) Mention two chemical differences between RCN and RNC.
- k) How will you distinguish 4-nitro-N, N-dimethylaniline and acidified 4-nitro-N, N-dimethylaniline by UV spectroscopy?
- l) Explain why acetic anhydride shows two carbonyl stretching frequencies in IR spectroscopy?
- m) Explain with an example that anthracene can act as a diene.
- n) Mention the symmetry elements present in boat form of cyclohexane.
- o) Convert D-arabinose to D-mannose.

2. Answer any four questions: $5 \times 4 = 20$

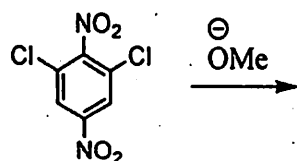
- a) i) Predict the product(s) in the following reaction and suggest mechanism.



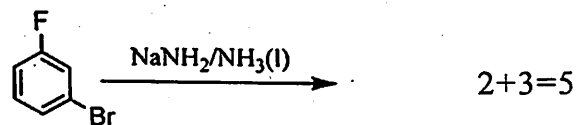
- ii) Write down the major product of the following reaction with mechanism and explain:



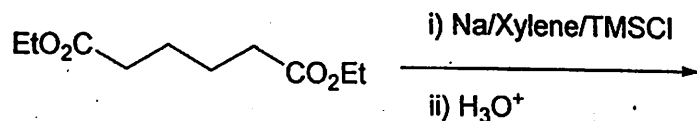
- b) i) Predict the product(s) with plausible mechanism and explanation in the following reaction:



- ii) Predict the major product in the following reaction and explain with a suitable mechanism:



- c) i) Predict the product in the following reaction with proper mechanism and clearly explain the role of TMSCl .



- ii) What is directed aldol condensation? Explain with an example. $3+2=5$

- d) i) The $-\text{OH}$ stretching frequency of phenol appears at higher wave number in CCl_4 solution than in benzene solution. Explain.

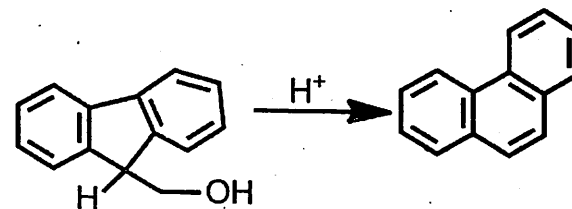
- ii) Homoannular dienes absorb at higher λ_{max} than heteroannular dienes; explain. $2+3=5$

- e) i) Provide an example of abnormal Grignard addition with plausible mechanistic explanation.

- ii) Draw the Newman projection formula of chair and boat form of cyclohexane. $3+2=5$

- f) i) How would you justify the fact that all methylpyranosides of the α -D-hexose series have the same configurations at C_1 and C_5 ?

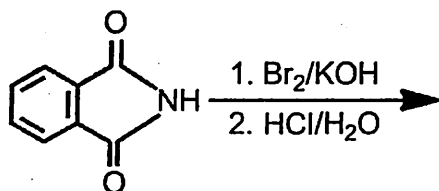
- ii) Suggest plausible mechanism for the following conversion.



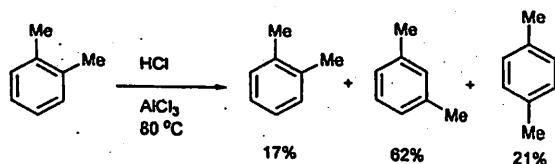
$3+2=5$

3. Answer any two questions: $10 \times 2 = 20$

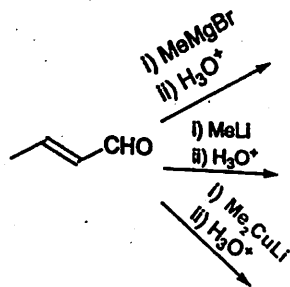
- a) i) Predict the product in the following reaction and give mechanism.



- ii) Predict the product(s) with suitable mechanistic explanation of addition reaction of singlet and triplet carbenes to Z-2-butene.
iii) Explain the following observation:



- iv) Explain why periodic acid is better choice than $\text{Pb}(\text{OAc})_4$ for the oxidation of carbohydrate. $2+3+3+2=10$
b) i) Predict the products of the following reactions with proper mechanistic explanation.



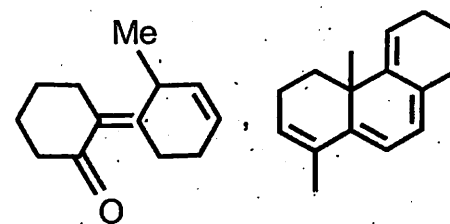
- ii) *p*-Toluidine reacts with benzene diazonium chloride to form a compound which, on boiling with H_2SO_4 gives four products (excluding nitrogen). Explain the fact with proper mechanistic explanation.

- iii) What is I-strain in alicyclic compound? Explain with an example. $4+4+2=10$

- c) i) Why ethylene fails to show any IR signal around 1600 cm^{-1} ?

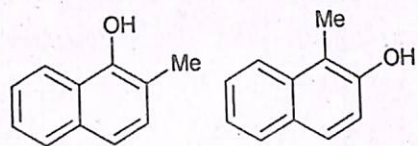
- ii) How would you distinguish between vinyl acetate and methyl acrylate by IR spectroscopy?

- iii) Calculate λ_{max} value of any one of the following molecules on the basis of Woodward Fieser Rule.



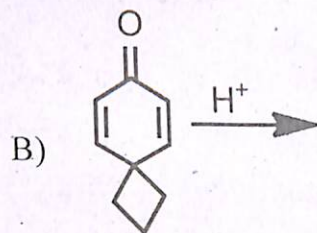
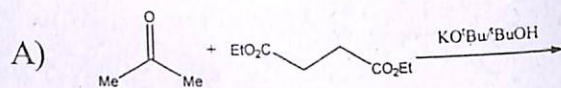
- iv) Compare the reactivity of dichlorocarbene towards phenanthrene and anthracene.

- v) Which of the following two compounds will react with benzene diazonium chloride under basic condition to give an azo dye? Give reason.

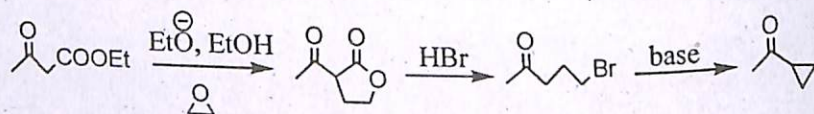


$$2+2+2+2+2=10$$

- d) i) Predict the products of the following reactions with proper mechanistic explanation.



- ii) Explain the reaction with mechanism:



- iii) Convert: D-Mannose to D-Fructose.

$$(2\frac{1}{2} \times 2) + 3 + 2 = 10$$