

5/CHE-301 Syllabus-2023

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(Nov-Dec)

FYUP : 5th Semester Examination

MAJOR

CHEMISTRY

(Organic Chemistry—II)

CHE-301

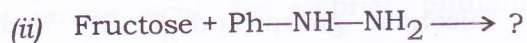
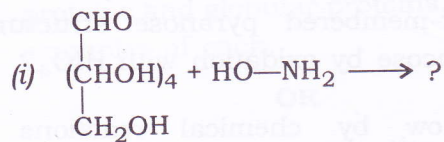
Marks : 75

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

1. (a) Complete the following reactions by writing suitable mechanism for each :

3×2=6



- (b) Why is maltose a reducing sugar?
Explain by writing a suitable chemical reaction.

1+2=3

(2)

- (c) What is epimerization? Write the steps involved in the conversion of an aldopentose to an aldohexose. $1+3=4$
- (d) Although cellulose contains several hydroxy groups, yet it remains insoluble in water. Explain. 2
- (e) Write the products of the reaction of sucrose with (i) Ac_2O and (ii) $\text{H}_2\text{O}/\text{H}^+$. $1\frac{1}{2}+1\frac{1}{2}=3$

OR

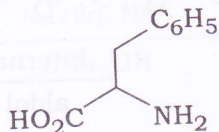
2. (a) What are aldoses and ketoses? Give one example of each. $1+1+1=3$
- (b) Why is the β -isomer of glucose more stable than the α -isomer? Explain by drawing their conformational structures. 3
- (c) How will you confirm the presence of a six-membered pyranose structure in glucose by oxidation with HIO_4 ? 3
- (d) Show by chemical reactions that glucose contains (i) one primary alcoholic group and (ii) five hydroxyl groups. $2+2=4$
- (e) Draw the Haworth projection formulae of (i) α -maltose and (ii) β -fructose. $2+1=3$

(3)

- (f) Write the preparation of cellulose trinitrate from cellulose. 2
3. (a) Write a chemical method of synthesis of vitamin A from β -ionone. 4
- (b) What is a zwitterion? Draw the zwitter-ionic structures of alanine and aspartic acid. $1+1+1=3$
- (c) Write the steps involved in the synthesis of a tripeptide gly-ala-phe and also indicate the peptide bonds in the molecule. $4+1=5$
- (d) What is denaturation of proteins? Explain any two factors that cause denaturation of proteins. $1+1+1=3$
- (e) On the basis of molecular shape, how will you differentiate between fibrous proteins and globular proteins. Give two examples of each. $2+1+1=4$

OR

4. (a) How will you prepare the following amino acid by Gabriel phthalimide synthesis? 4



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(Turn Over)

(4)

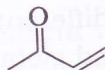
(b) Differentiate between peptides and proteins. 3

(c) Write the synthesis of ascorbic acid from D-glucose. 4

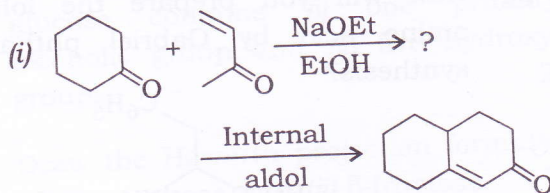
(d) What is isoelectric point of an amino acid? Show with an illustration how the amino acids exist at low and high pH. 1+1+1=3

(e) What is a primary structure of protein? Briefly explain how the β -pleated sheet structure of protein is formed. Also show how intermolecular H-bonds occur between the chains in this structure. 1+2+2=5

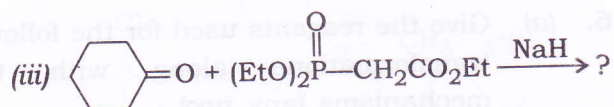
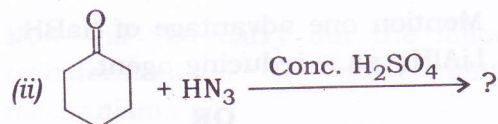
5. (a) What is Mannich base? Write the steps involved in the formation of the following compound by Mannich reaction : 1+3=4



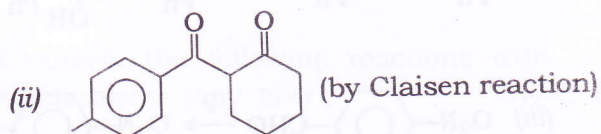
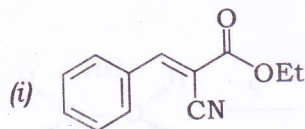
(b) Complete the following reactions (any two) by writing suitable mechanisms : 3×2=6



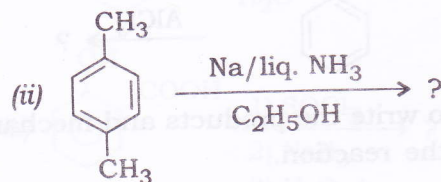
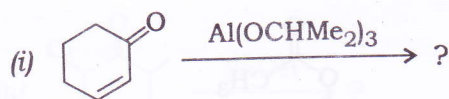
(5)



- (c) How will you synthesize the following compounds? Write the relevant mechanism of each reaction : $2 \times 2 = 4$



- (d) Write down the products of the following reactions with suitable mechanisms : $2 \times 2 = 4$

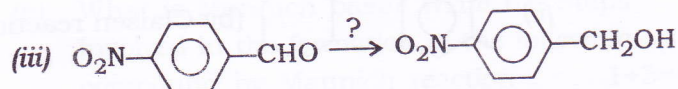
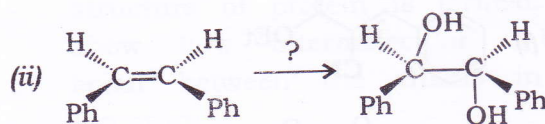
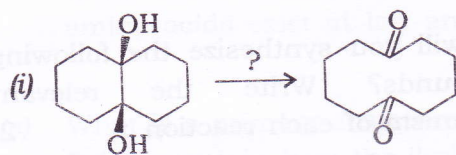


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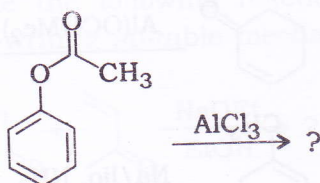
- (e) Mention one advantage of NaBH_4 over LiAlH_4 as a reducing agent. 1

OR

6. (a) Give the reagents used for the following transformations along with their mechanisms (any two) : $2\frac{1}{2} \times 2 = 5$



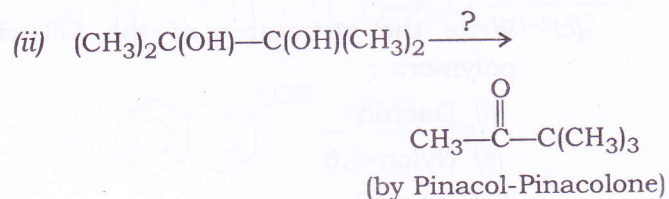
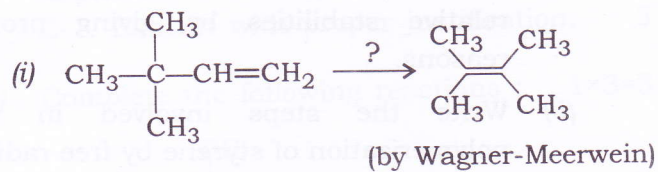
- (b) Discuss the effect of temperature on the following reaction :



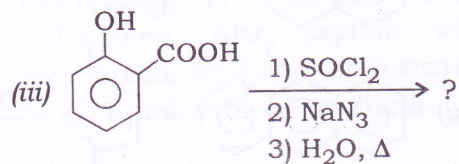
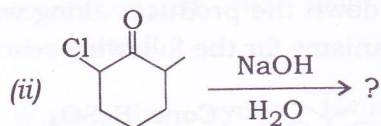
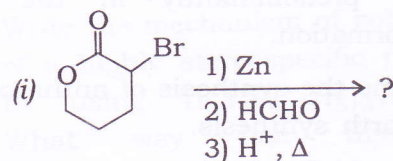
Also write the products and mechanism of the reaction. $2+2=4$

(7)

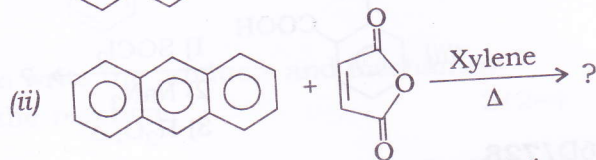
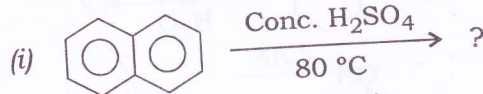
- (c) How will you carry out the following transformations? Write suitable mechanisms : $2\frac{1}{2} \times 2 = 5$



- (d) Complete the following reactions with mechanisms (any two) : $2\frac{1}{2} \times 2 = 5$



7. (a) Draw all the possible chair conformations of both *cis*- and *trans*-1,3-dimethyl cyclohexane. Arrange their relative stabilities by giving proper reasons. 2+2=4
- (b) Write the steps involved in the polymerization of styrene by free radical mechanism. 3
- (c) Write the structures of the following polymers : 1×4=4
- (i) Dacron
 - (ii) Nylon-6,6
 - (iii) Buna-S
 - (iv) Vulcanized rubber
- (d) Explain why *t*-butyl cyclohexane exist predominantly in the *trans*-conformation. 2
- (e) Outline the synthesis of anthracene by Haworth synthesis. 3
- (f) Write down the products along with the mechanisms for the following reactions : 1½×2=3



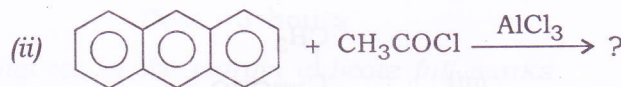
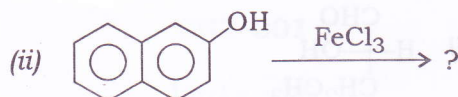
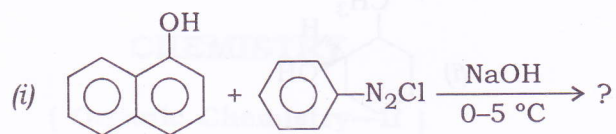
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(9)

OR

8. (a) Electrophilic substitution reaction of naphthalene takes place exclusively at C-1. Explain with proper justification. 3

- (b) Complete the following reactions : 1×3=3



- (c) Write the mechanism of polymerization of a highly stereospecific polyethylene by using $\text{TiCl}_4-(\text{C}_2\text{H}_5)_3\text{Al}$ catalyst. What way has this catalyst revolutionized the field of polymer chemistry? 3+1=4

- (d) Write the cyclic bromonium ion mechanism of bromine addition to Z-2-butene. Also explain why this mechanism leads to the formation of a racemic mixture of products. 2+2=4

(10)

(e) How are polymers obtained by free radical mechanism different from those obtained by ionic mechanism? 2

(f) Assign *R/S* configurations of the following compounds : 1×3=3

