

[6]

Ex/P-XV-O/2019

M. SC. CHEMISTRY EXAMINATION, 2019

(4th Semester)

ORGANIC CHEMISTRY SPECIAL

PAPER - XV-O

Time : Two hours

Full Marks : 50

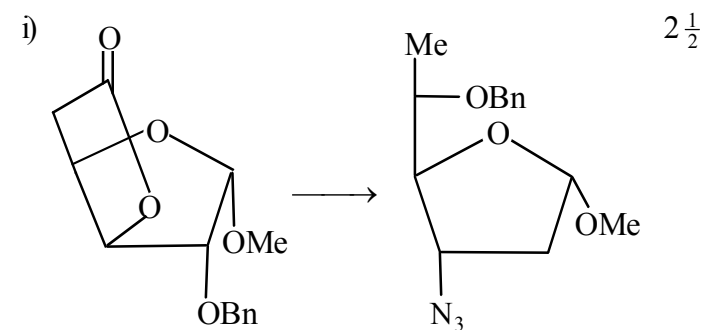
(25 marks for each unit)

Use a separate answerscript for each unit.

UNIT - O - 4151

Answer *any five* questions :

1. a) Utilizing any one IAD-technique synthesize β -D-Manp-(1 \rightarrow 6)- α -D-Glcp-1-OMe. 5
- b) Using a common building block synthesize β -D-Glcp-(1 \rightarrow 4)- β -D-Glcp-1-OMe. 5
- \uparrow
OMe
- c) Carry out the following transformations :



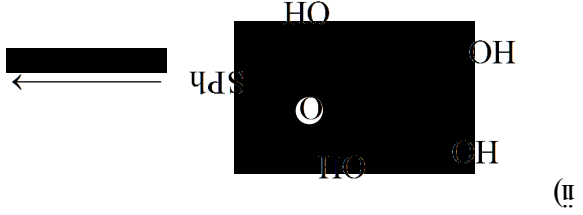
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b) Write a brief account of *any two* of the following :

1 $\frac{1}{2}$ \times 2

- i) Glutathione
- ii) Near UV-CD
- iii) β -bend structure.

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d) i) Utilizing a Nature's chiral pool in each case synthesise :

I) *S*-epichlorohydrin

II) *L*-glyceraldehyde

ii) Define RRT for Gas liquid chromatographic analysis.

1

e) i) Identify the oligosaccharide (Os, equiv wt 355) which

furnishes the following results :

3

• NaBH_4 reduction followed by hydrolysis of Os yields

D-GlcUA & D-galactitol in the mole ratio 1 : 1.

• A methyl glycoside of Os on Periodate oxidation

reduces 3 moles of the oxidant with simultaneous

liberation of HCO_2H per equivalent.

[5]

3. a) i) What are ' ϕ ' and ' ψ ' of polypeptide chain ? 1

ii) Polyglycine, a simple polypeptide, can form a helix

with $\phi = -80^\circ$ and $\psi = +150^\circ$. From the

Ramachandran plot, describe this helix with respect

to number of residues per turn and handedness. 1

b) How are helices formed ? $1 \frac{1}{2}$

c) What is a motif ? Describe the formation of different

motifs in a protein. $2 \frac{1}{2}$

4. a) What are the amide-I and amide-II bonds of a protein in

FTIR spectroscopy ? Show the application of these

bonds in the prediction of different secondary structural

elements of a protein. $1+2$

b) i) What is 'molten-globule' state of a protein ? Mention

the significance of it.

$2+1$

ii) What is protein misfolding ?

5. a) Collagen triple helix is very stable and has large tensile

strength though it contains repeating -Gly-Pro-Hyp-

triplets.

Explain the formation and stability of this triple helix. 3

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UNIT - O - 4152

2. a) The following reagents are often used in protein chemistry: 2

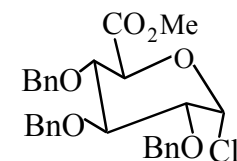
Urea, β -mercaptoethanol, HCO_3H , $\text{Ph-N}=\text{C}=\text{S}$, 6N HCl , Trypsin.

Which one is best suited for accomplishing each of the following tasks?

- i) Reversible denaturation of a protein devoid of S-S-bonds.
 - ii) Cleavage of peptide bonds on the carboxyl site of methionine.
 - iii) Determination of the amino acid sequence of a small peptide.
 - iv) Hydrolysis of a protein for the determination of amino acid composition.
- b) Discuss briefly the experimental approach for the determination of the positions of -S-S- bonds in a protein. 2
- c) What are homologous proteins? What are the conservative substitutions in a homologous protein? 2
- d) Write the name and structure of a rare amino acid of protein. 1

[3]

- Smith degradation of the above oxidation product yields glyceric acid and D-threitol.
- ii) Assign the peaks at m/e 129 and 87 appearing after GC-MS of 1, 5-di-O-acetyl-2, 3, 4, 6 - tetra-O-methylglucitol. 2
- f) i) Depict the mechanistic pathway of an O-glycosylation reaction proceeding via *in-situ*-anomerisation. What is the requirement in respect of the glycosyl donor? What is the major anomer obtained via this pathway for D-mannose-based donor? $2\frac{1}{2}$
- ii) Write the IUPAC name of A.



A

- iii) How is D-glucose converted to the corresponding 2-deoxy sugar? $1\frac{1}{2}$