

2021

MICROBIOLOGY — HONOURS

First Paper

(Group - A)

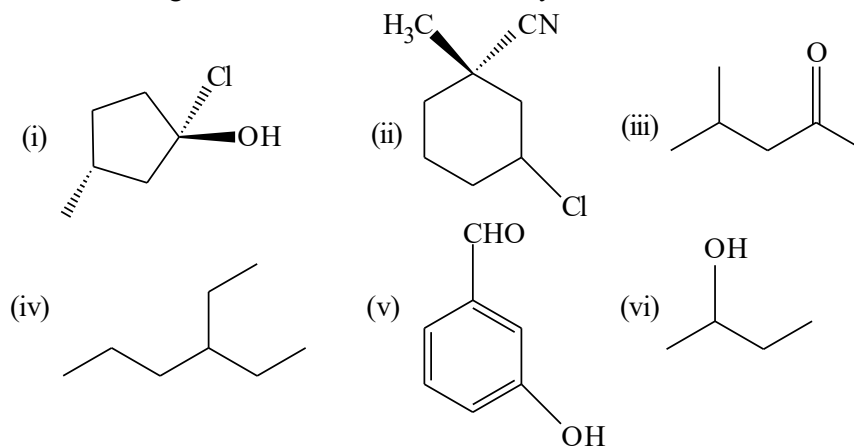
Full Marks : 50

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*Answer *all* questions.

1. (a) Write down the structure of α - D(+) Glucose in Fischer Projection formula. Explain the phenomenon of mutarotation associated with it.
- (b) Draw the structure of the following :
- Acidic amino acid
 - Aromatic amino acid.
- (c) Show the R or S configuration of each asymmetric carbon in the structure of meso-tartaric acid.
- (d) What are essential fatty acids?
- (e) Differentiate between nucleotide and nucleoside. (1+2)+(1+1)+2+1½+1½

Or,

- (a) What is ring inversion of cyclohexane? Is this phenomenon a type chemical exchange?
- (b) Which of the following cyclohexane conformations has the most energy (is the LEAST stable)
- Chair
 - half-Chair
 - boat
 - twist-boat.
- (c) Which of the following molecules are chiral and why?



Please Turn Over

(d) Define the following with the suitable examples :

(i) Plane of symmetry

(ii) Optical Isomerism.

(2+1)+1+3+3

2. (a) What are meant by (i) Hetero polysaccharide, and (ii) Invert sugar ?

(b) Define Iodine value of fat. What is its significance?

(c) Compare simple lipid with compound lipid.

(d) Give example of a phospholipid along with its structure.

(1½+1½)+(2+1)+2+2

Or,

(a) Arrange the following fatty acids in order from lowest melting point to highest : myristic acid, arachidonic acid, linolenic acid, stearic acid, oleic acid. What do the highest have in common? What do the lowest have in common?

(b) Triglycerides are named because of the features they have in common. What is/are the functional groups they have in common? What are the other structures triglycerides have in common?

(c) Using Fischer projections, show all of the stereoisomers for 3-chloro-2-butanol (C₄H₉ClO or CH₃CH(Cl)CH(OH)CH₃). Label each isomer with the corresponding configuration. Indicate the relationship between each pair of isomers as enantiomers or diastereomers. If a meso compound is present then label it as such.

3+3+4

3. (a) What is the basic difference between fibrous and globular proteins? Explain from structural point of view.

(b) Which protein is the most abundant in our body? Write about its structural specificity.

(c) Name one biologically active peptide. Draw its structure.

(d) What happens when D-Ribose is heated with Bromine water?

3+(1+2)+(1+1)+2

Or,

(a) Name the four different types of interactions responsible for creating tertiary structures in proteins.

(b) Define denaturation of proteins and list four different ways to denature a protein.

(c) Why doesn't methionine form disulfides?

(d) Which level of protein organization is the most important in determining the final conformation? Why?

2+3+2+3

4. (a) Why is haemoglobin considered as a globular protein? What are the structural dissimilarities between oxyhaemoglobin and deoxyhaemoglobin?

(b) A protein has pI less than 7.0. If you would like to purify the protein from impurities at neutral pH buffer, what type of ion exchanger would you use?

(c) Proline is not generally present in α -helix and β -sheet structures of protein. — Why?

(d) What do you mean by hyperchromic shift?

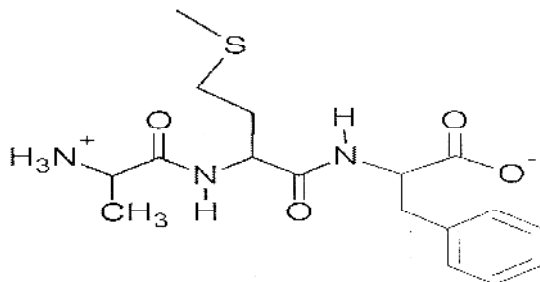
(1+3)+2+2+2

(3)

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Or,

- (a) Sketch the following two tripeptide chains : Asp-Gly-Ser and Ile-Asn-Met at physiological pH.
- (b) Look carefully at the following polypeptide chain and use its structure to answer the following questions.



- (i) Provide the sequence for the peptide using the 3-letter abbreviations.
- (ii) Which amino acid is the N-terminus? Which amino acid is the C-terminus?
- (iii) Circle the side chains and classify them as non-polar, polar, acidic or basic. (3+3)+(1+1+2)
5. (a) The two strands of DNA are not identical but complimentary. Explain.
- (b) What products would be formed when a nucleotide from DNA containing thymine is hydrolyzed?
- (c) Write the important structural and functional difference between DNA and RNA.
- (d) Which moieties of nucleosides are involved in the formation of phosphodiester linkages present in dinucleotides? What does the word diester in the name of linkage indicate? Which acid is involved in the formation of this linkage? 2+2+3+3

Or,

- (a) Write briefly about the function of rRNA.
- (b) Draw a well labelled diagram showing the secondary structure of tRNA and describe the significance of each of its arm. Why is tRNA called an adaptor molecule?
- (c) What is meant by polarity of DNA? What is its significance in replication or transcription mechanisms?
- (d) How the stability of DNA double-helix changes with increasing salt concentration? 2+(3+1)+2+2
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