

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Q1.

Proteins contain sequences of amino acids joined by peptide links.

Amino acid chains (polypeptides) are attracted to each other by hydrogen bonding.

- (a) (i) A section of a protein is formed from one molecule of each of the amino acids glycine ($\text{H}_2\text{NCH}_2\text{COOH}$) and alanine ($\text{H}_2\text{NCH}(\text{CH}_3)\text{COOH}$).

Add bonds and atoms to the diagram to complete a structural formula for this section of the protein.

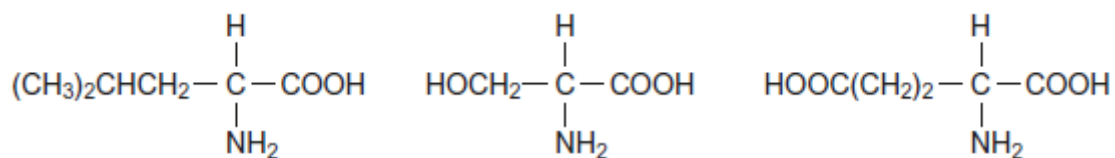


(2)

- (ii) Draw a diagram to show how an amino acid chain can form a hydrogen bond with another amino acid chain.
Your diagram need only show the relevant atoms from one amino acid in each chain.

(1)

- (b) Leucine, serine and glutamic acid are naturally-occurring amino acids.



leucine

serine

glutamic acid

- (i) Give the IUPAC name of leucine.

(1)

- (ii) Draw the structure of the zwitterion of serine.

(1)

- (iii) Draw the structure of the ester formed by two molecules of serine.

(1)

- (iv) Draw the structure of the species formed by glutamic acid at low pH.

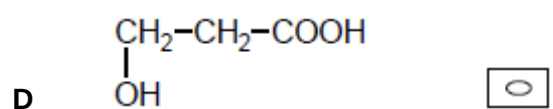
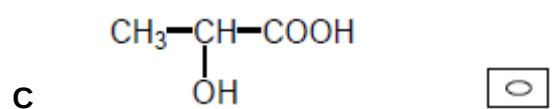
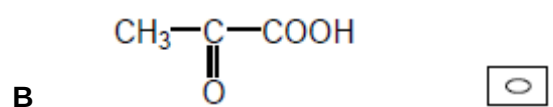
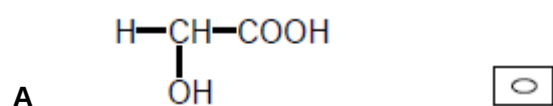
(1)

(Total 7 marks)

Q2.

A drug is designed to simulate one of the following molecules that adsorbs onto the active site of an enzyme.

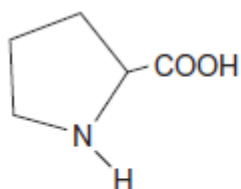
Which molecule requires the design of an optically active drug?



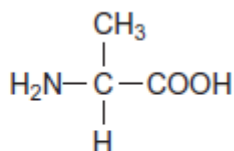
(Total 1 mark)

Q3.

- (a) The structures and common names of two amino acids are shown.



proline



alanine

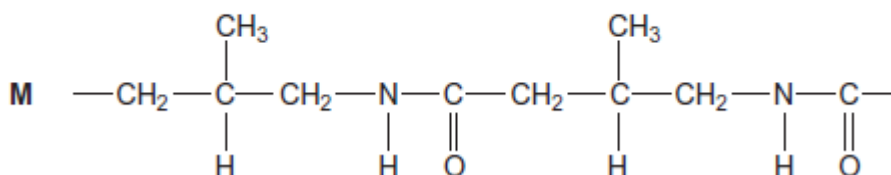
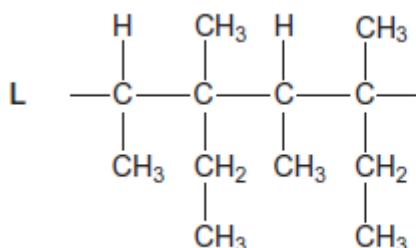
- (i) Draw the structure of the zwitterion of proline.

(1)

- (ii) Draw the structure of the tripeptide formed when a proline molecule bonds to two alanine molecules, one on each side.

(2)

- (b) Sections of two polymers, **L** and **M**, are shown.



- (i) Give the IUPAC name of a monomer that forms polymer **L**.

(1)

- (ii) Give the IUPAC name of the monomer that forms polymer **M**.

(1)

- (iii) Draw the section of a polymer made from a dicarboxylic acid and a diamine that is isomeric with the section of polymer **M** shown.

(1)

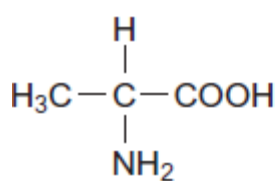
- (vi) Explain why polymer **L** is non-biodegradable.

(1)

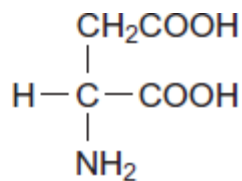
(Total 7 marks)

Q4.

Alanine and aspartic acid are naturally occurring amino acids.



alanine



aspartic acid

- (a) Draw the structure of the zwitterion formed by alanine.

(1)

- (b) Draw the structure of the compound formed when alanine reacts with methanol in the presence of a small amount of concentrated sulfuric acid.

(1)

- (c) Draw the structure of the species formed by aspartic acid at high pH.

(1)

- (d) Draw the structure of a dipeptide formed by two aspartic acid molecules.

(1)

(Total 4 marks)