

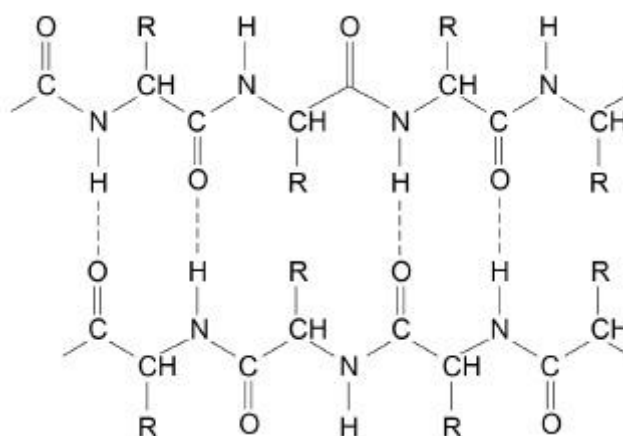
Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Q1.

Use the Data Booklet to help you answer this question about amino acids.
 The diagram shows parts of two polypeptide chains in a beta-pleated sheet of a protein.



- (a) The polypeptide chains are held together by hydrogen bonding as shown in the diagram.

Explain how these hydrogen bonds form.

(2)

- (b) A different type of bond can form between two polypeptide chains when the chains each contain the amino acid cysteine.

Complete the structure to show the bond that forms between the side chains of two cysteine molecules.



(1)

- (c) The type of bond in **part (b)** between two polypeptide chains influences the three-dimensional structure of the protein.

Name this type of protein structure.

(1)

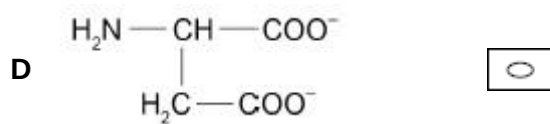
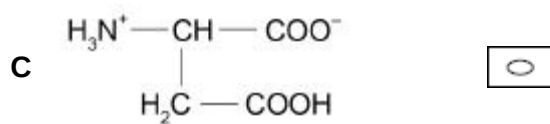
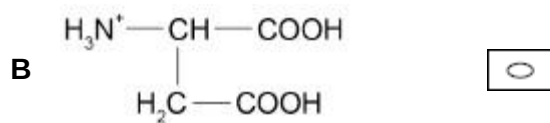
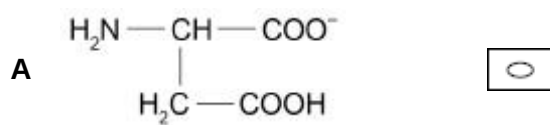
- (d) Draw the structure of the zwitterion of a dipeptide formed by alanine and serine.

(2)

(Total 6 marks)

Q2.

Which structure is formed by aspartic acid in solution at pH 12?



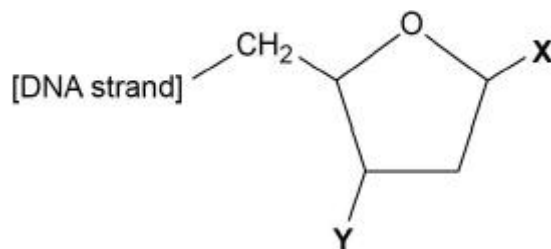
(Total 1 mark)

Q3.

Use the Data Booklet to help you answer these questions.

DNA exists as two strands of nucleotides in the form of a double helix with hydrogen bonding between the two strands.

- (a) A deoxyribose molecule in a strand of DNA is shown.



Name the types of group attached to 2-deoxyribose at positions X and Y.

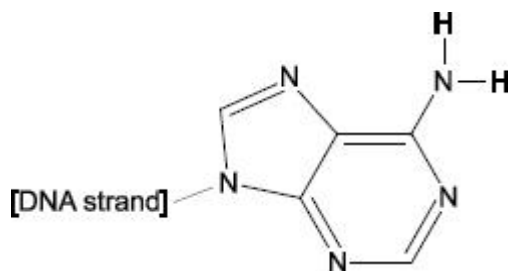
X _____

Y _____

(2)

- (b) In the DNA double helix, adenine is linked by hydrogen bonds to a molecule in the other strand of DNA.

Complete the diagram below to show the other molecule and the hydrogen bonds between it and adenine.



(2)

(Total 4 marks)

Q4.

Use the Data Booklet to help you answer this question.

This question is about amino acids and peptide (amide) links.

(a) Draw the structure of the zwitterion formed by phenylalanine.

(1)

(b) Draw the structure of serine at high pH.

(1)

(c) Draw the structures of both dipeptides formed when phenylalanine reacts with serine.

In each structure show all the atoms and bonds in the amide link.

(2)

(d) An amide link is also formed when an acyl chloride reacts with a primary amine.

Name and outline a mechanism for the reaction between $\text{CH}_3\text{CH}_2\text{COCl}$ and $\text{CH}_3\text{CH}_2\text{NH}_2$

Give the IUPAC name of the organic product.

Name of mechanism _____

Mechanism

IUPAC name of organic product _____

(6)

(Total 10 marks)