



CHEMISTRY ONLINE
— **TUITION** —

Phone: +442081445350

www.chemistryonlinetuition.com

Email: asherrana@chemistryonlinetuition.com

CHEMISTRY

INORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	AMINO ACIDS, PROTEIN AND DNA
PAPER TYPE:	QUESTION PAPER - 3
TOTAL QUESTIONS	10
TOTAL MARKS	39

ChemistryOnlineTuition Ltd reserves the right to take legal action against any individual/ company/organization involved in copyright abuse.

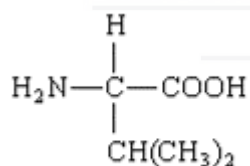
Amino Acids, Protein and DNA

1. The amide or peptide link is found in synthetic polyamides and also in naturally occurring proteins.

Name and outline a mechanism for the reaction of $\text{CH}_3\text{CH}_2\text{COCl}$ with CH_3NH_2



2. Consider the following amino acid.



(a) Draw the structure of the amino acid species present in a solution at pH 12.

I am Sorry !!!!!

(5)

(1)

(b) Draw the structure of the dipeptide formed from two molecules of this amino acid.

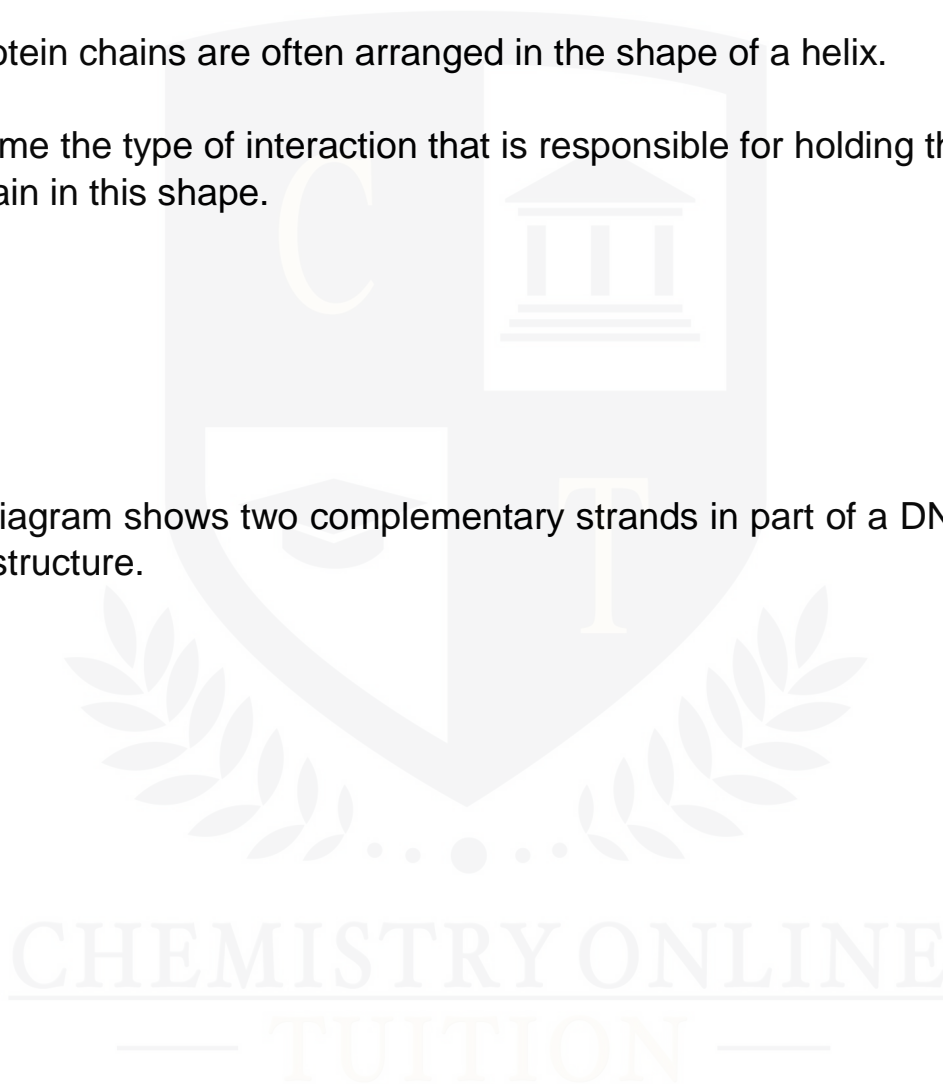
(1)

(c) Protein chains are often arranged in the shape of a helix.

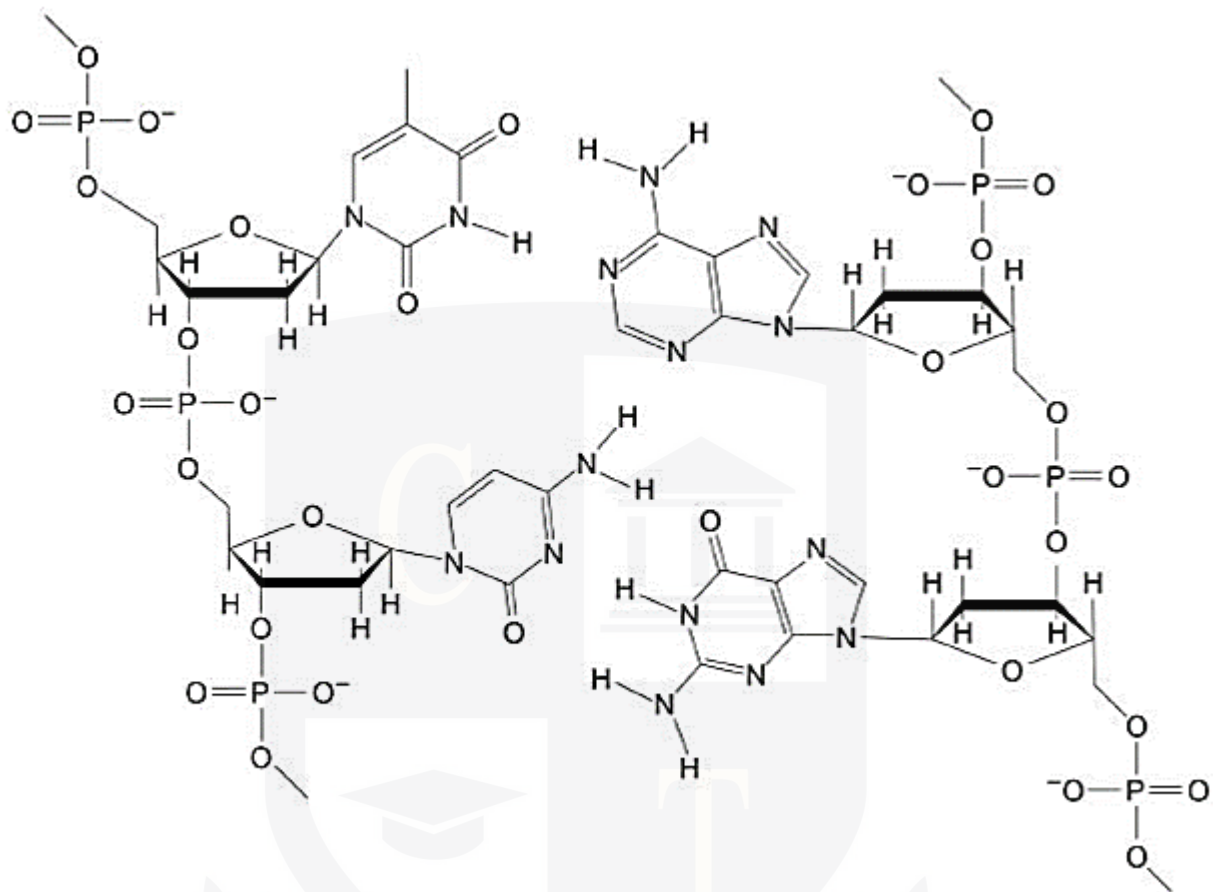
Name the type of interaction that is responsible for holding the protein chain in this shape.

(1)

3. The diagram shows two complementary strands in part of a DNA double helix structure.



I am Sorry !!!!!



(a) Draw all the hydrogen bonds between the complementary strands shown in the diagram.

Use dashed lines to show the hydrogen bonds.

You do not need to show lone pairs of electrons or partial charges.

CHEMISTRY ONLINE
— TUITION —

(2)

(b) Draw a ring around each of the component parts that make up the cytosine nucleotide in the section of DNA shown in the diagram above.

(2)

(c) State the meaning of the term complementary when it is used to refer to DNA strands.

(1)

4. Synthetic polyamides have structures similar to those found in proteins.

(a) Draw the structure of 2-aminopropanoic acid.

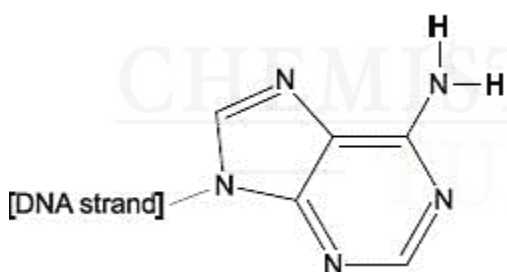
(1)

(b) Draw the organic product formed by the condensation of two molecules of 2-aminopropanoic acid.

(1)

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

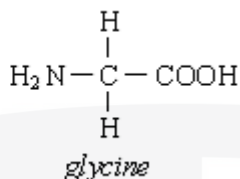
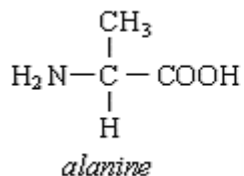
Complete the diagram below to show the other molecule and the hydrogen bonds between it and adenine.



I am Sorry !!!!!

(2)

6. The structures of the amino acids alanine and glycine are shown below.



(a) Give the systematic name for alanine.

(1)

(b) Alanine exists as a pair of stereoisomers.

(i) Explain the meaning of the term stereoisomers.

(2)

(ii) State how you could distinguish between the stereoisomers.

(2)

(c) Give the structural formula of the species formed by glycine at pH 14.

(1)

(d) When two amino acids react together, a dipeptide is formed.

Give the structural formulae of the two dipeptides which are formed when alanine and glycine react together.

(2)

(e) Give the structural formula of the organic compound formed when glycine reacts with methanol in the presence of a small amount of concentrated sulphuric acid.

(1)

7. Synthetic polyamides are produced by the reaction of dicarboxylic acids with compounds such as $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$

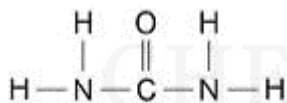
(a) Name the compound $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$

(1)

(b) Give the repeating unit in the polyamide nylon 6,6.

(1)

8. Urea has the displayed formula



Suggest why urea is effective at separating the complementary strands in DNA.

(2)

9. The amide or peptide link is found in synthetic polyamides and also in naturally occurring proteins.

(a) Draw the repeating unit of the polyamide formed by the reaction of propanedioic acid with hexane-1,6-diamine.

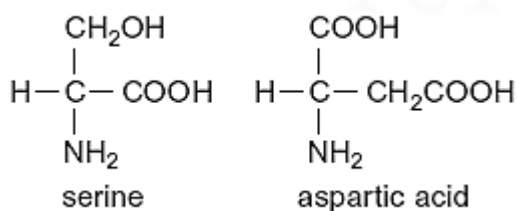
(2)

(b) In terms of the intermolecular forces between the polymer chains.

Explain why polyamides can be made into fibres suitable for use in sewing and weaving, whereas polyalkenes usually produce fibres that are too weak for this purpose.

(3)

10. The amino acids serine and aspartic acid are shown below.



(a) Give the IUPAC name of serine.

(1)

(b) Draw the structure of the species formed when aspartic acid reacts with aqueous sodium hydroxide.

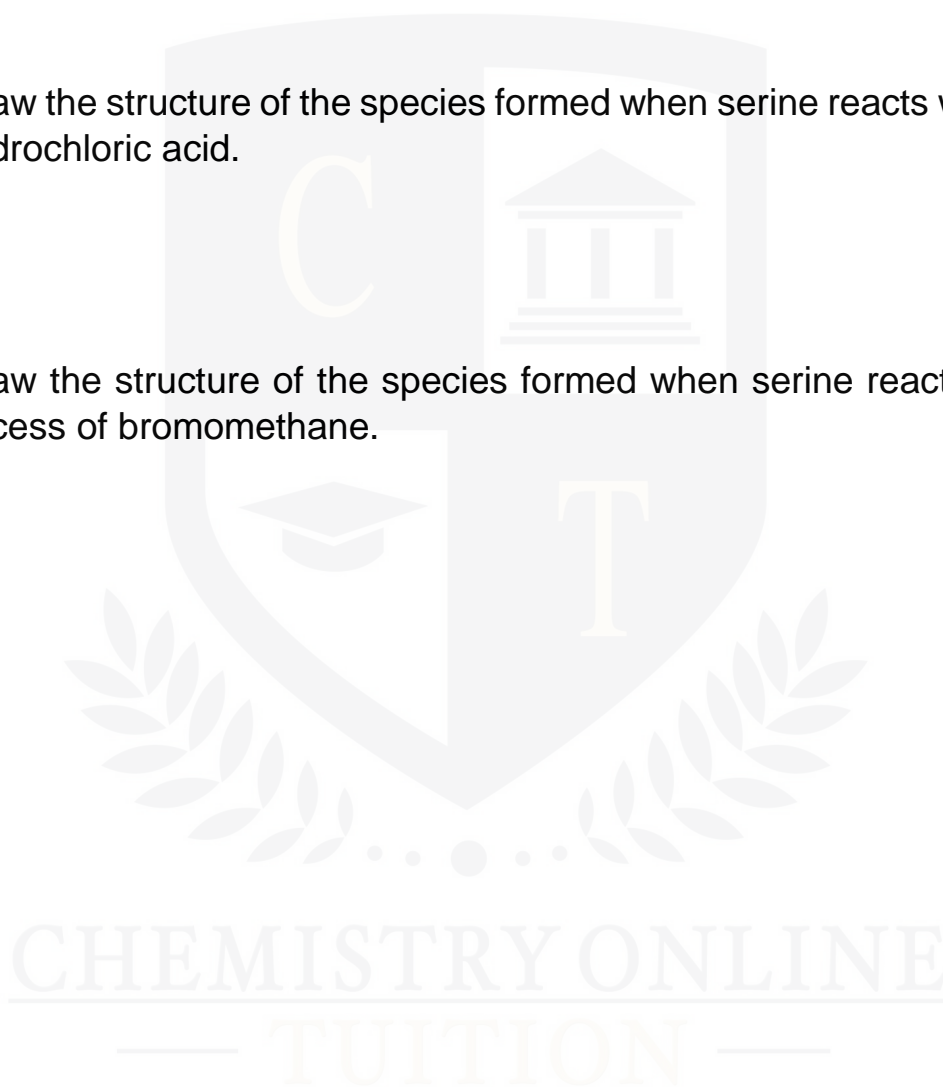
(1)

(c) Draw the structure of the species formed when serine reacts with dilute hydrochloric acid.

(1)

(d) Draw the structure of the species formed when serine reacts with an excess of bromomethane.

(1)



I am Sorry !!!!!



DR. ASHAR RANA



CHEMISTRY ONLINE
— TUITION —

Phone: +442081445350
www.chemistryonlinetuition.com
Email: asherrana@chemistryonlinetuition.com

- Founder & CEO of Chemistry Online Tuition Ltd.
- Tutoring students in UK and worldwide since 2008
- CIE & EDEXCEL Examiner since 2015
- Chemistry, Physics, and Math's Tutor

CONTACT INFORMATION FOR **CHEMISTRY ONLINE TUITION**

- UK Contact: 02081445350
- International Phone/WhatsApp: 00442081445350
- Website: www.chemistryonlinetuition.com
- Email: asherrana@chemistryonlinetuition.com
- Address: 210-Old Brompton Road, London SW5 OBS, UK