



ADVANCED GCE
CHEMISTRY
 Biochemistry

2815/02

Candidates answer on the Question Paper
 A calculator may be used for this paper

OCR Supplied Materials:

- *Data Sheet for Chemistry* (inserted)

Other Materials Required:

- Scientific calculator

Monday 28 June 2010
Morning

Duration: 50 minutes



Candidate
Forename

Candidate
Surname

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

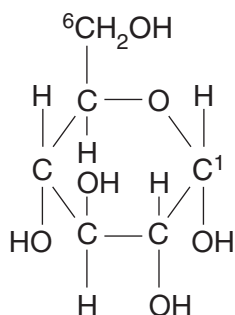
- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **45**.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use a scientific calculator.
- A copy of the *Data Sheet for Chemistry* is provided as an insert with this question paper.
- You are advised to show all the steps in any calculations.
- This document consists of **12** pages. Any blank pages are indicated.

Examiner's Use Only:

| | | | |
|--------------|--|--|--|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Total | | | |

Answer **all** the questions.

- 1 Isomaltose is a disaccharide formed from two α -glucose units joined together by a 1α -6 linkage.



α -D-glucose

- (a) Draw the structure of the disaccharide, isomaltose.

You may find the structure of α -D-glucose, shown in the diagram above, helpful.

[2]

- (b) Suggest why isomaltose is soluble in water.

.....

.....

.....

..... [2]

(c) Glucose is stored in plants as amylose which is a form of starch.

(i) Draw the structure of **two** glucose units linked together in an amylose chain.

[1]

(ii) State the type of linkage.

[1]

(iii) Suggest **three** ways in which the structure of amylose is suited to its biological function.

[3]

[Total: 9]

2 The structures of four amino acids are shown in **Fig. 2.1** below.

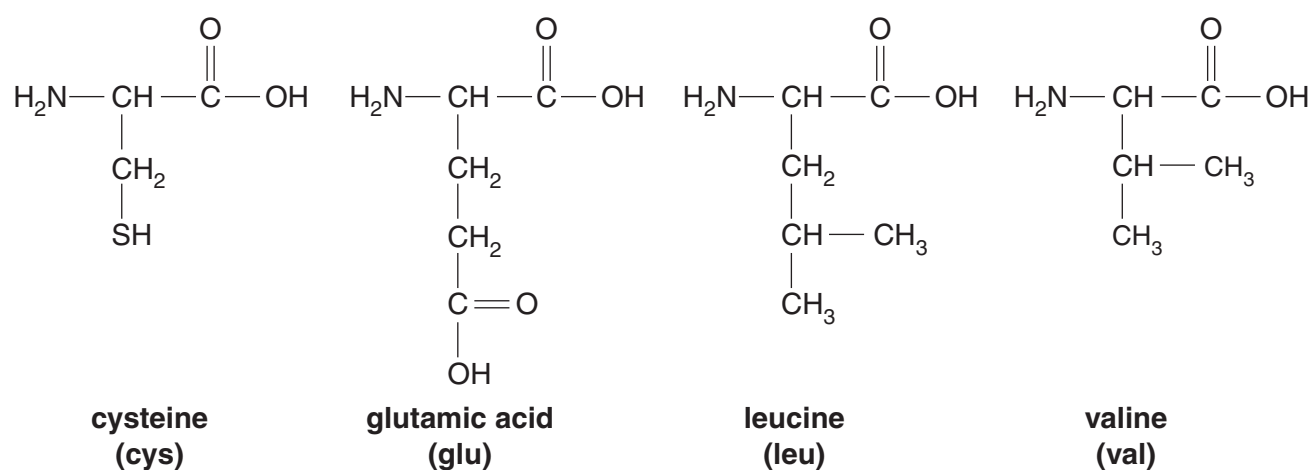


Fig. 2.1

(a) (i) Name the **two** functional groups involved in the formation of a peptide linkage.

..... [1]

(ii) Draw a diagram to show the tripeptide, cys–val–leu, clearly showing the peptide linkages.

[2]

(b) Draw the structure of glutamic acid at pH 14.

[2]

- (c) Amino acids contribute to the primary, secondary and tertiary structure of a protein. One form of secondary structure is the α -helix.

- Use a simple diagram to show how the peptide chain is arranged in an α -helix.
- Describe the interactions between the peptide linkages in this structure.

.....

.....

.....

.....

.....

..... [3]

- (d) A section of a polypeptide chain is shown below.

glu–ala–leu–arg–cys–his–phe–tyr–ser–gln–cys–val–pro–his–arg–ser–leu–glu–

The side chains of some of these amino acids are responsible for maintaining the tertiary structure of the protein.

Using **Fig. 2.1**, state the type of bonding or attraction involved between:

- (i) val and leu,[1]
- (ii) cys and cys,[1]
- (iii) glu and glu.[1]

- (e) Which is the weakest interaction between side chains?

..... [1]

[Total: 12]

3 Enzymes are biological catalysts with a high degree of specificity.

(a) (i) How does a catalyst speed up the rate of a chemical reaction?

.....
..... [1]

(ii) What is meant by the term *specificity*?

.....
..... [1]

(b) A chef washed his fat-covered apron using a washing powder containing the enzymes protease and amylase, which break down protein and starch. The wash was carried out at 85 °C in an automatic washing machine.

Suggest **two** reasons why the apron may **not** be clean after the wash.

Explain your answers.

.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- (c) Commercially, enzymes are often immobilised.

State **two** advantages and **one** disadvantage of using immobilised enzymes.

Two advantages:

.....

.....

.....

.....

.....

One disadvantage:

.....

.....

..... [3]

Describe and explain the effect of oxalic acid on the rate of blood clotting.

..... [5]

[Total: 15]

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

TURN OVER FOR QUESTION 4

- 4 A strand of RNA is found in a virus. The strand contains the sequence of twelve bases shown below.

5'-UCGAAAGUGCCU-3'

- (a) (i) How can you tell that this sequence is **not** from DNA?

..... [1]

- (ii) State **two** other ways in which DNA differs from RNA.

.....

.....

..... [2]

- (b) The strand can be directly translated during protein synthesis.

Use the table to work out the order of amino acids coded by the sequence of bases above.

| first base in triplet | second base in triplet | | | | third base in triplet |
|--------------------------|------------------------|-----|------|------|--------------------------|
| U | U | C | A | G | U C A G |
| | Phe | Ser | Tyr | Cys | |
| | Phe | Ser | Tyr | Cys | |
| | Leu | Ser | Stop | Stop | |
| | Leu | Ser | Stop | Trp | |
| C | Leu | Pro | His | Arg | U C A G |
| | Leu | Pro | His | Arg | |
| | Leu | Pro | Gln | Arg | |
| | Leu | Pro | Gln | Arg | |
| | Leu | Pro | Gln | Arg | |
| A | Ile | Thr | Asn | Ser | U C A G |
| | Ile | Thr | Asn | Ser | |
| | Ile | Thr | Lys | Arg | |
| | Met | Thr | Lys | Arg | |
| | Met | Thr | Lys | Arg | |
| G | Val | Ala | Asp | Gly | U C A G |
| | Val | Ala | Asp | Gly | |
| | Val | Ala | Glu | Gly | |
| | Val | Ala | Glu | Gly | |
| | Val | Ala | Glu | Gly | |

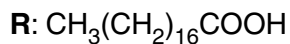
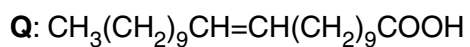
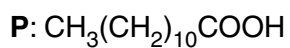
answer = [2]

- (c) The first base was removed from the sequence above and placed at the opposite end.

How many amino acids were changed in the protein?

answer = [1]

- (d) Fats and oils are naturally occurring esters. On hydrolysis with aqueous sodium hydroxide, a sample of oil produced the sodium salts of the following fatty acids.



- (i) What is the other product of the hydrolysis?

..... [1]

- (ii) Draw the structure of the oil that was hydrolysed, showing clearly how all the oxygen atoms are bonded.

[2]

[Total: 9]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.