

**ADVANCED GCE
CHEMISTRY**

Biochemistry

THURSDAY 24 JANUARY 2008

2815/02

Afternoon
Time: 50 minutes

Additional materials: Scientific calculator
Data Sheet for Chemistry (Inserted)



Candidate
Forename

Candidate
Surname

Centre
Number

--	--	--	--	--

Candidate
Number

--	--	--	--

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

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 calculation.

FOR EXAMINER'S USE

Qu.	Max.	Mark
1	10	
2	9	
3	17	
4	9	
TOTAL	45	

This document consists of **11** printed pages, **1** blank page and a *Data Sheet for Chemistry*.

Answer **all** the questions.

1 This question is about RNA.

(a) Describe the structure of a nucleotide of RNA. Your answer should include a diagram.

.....

.....

.....

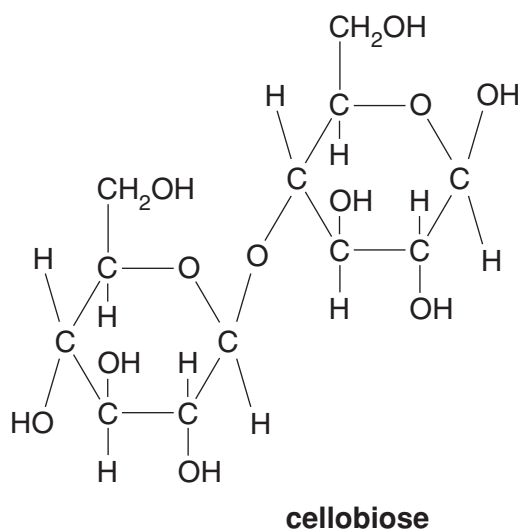
.....

.....[3]

.....[6

[Total: 10]

2 Cellobiose is a disaccharide.



- (a) What name is given to the type of reaction that forms the link between the two monosaccharides that make up cellobiose?

.....[1]

- (b) Cellobiose is formed by partial hydrolysis of cellulose.

How can you tell from the structure that cellobiose is formed from cellulose and **not** from starch?

.....[1]

- (c) Cellobiose may be hydrolysed to glucose.

- (i) State **two** methods of hydrolysing cellobiose.

.....
[2]

- (ii) Write a balanced equation for this hydrolysis.

.....[1]

(d) Cellobiose is far more soluble than cellulose in water.

Suggest an explanation for this difference in solubility.

Your answer should include a diagram.

.....

.....

.....

.....

.....[4]

[Total: 9]

- 3** Tributyrin is found in dairy products such as butter.
Tributyrin is a triglyceride formed from butanoic acid and glycerol (propane-1,2,3-triol).

(a) (i) Draw the structure of tributyrin, showing every bond in the functional groups.

[2]

(ii) Name the functional group in tributyrin.

.....[1]

(iii) State **two** roles of triglycerides in living organisms.

.....

.....[2]

(iv) Explain why tributyrin is soluble in non-polar solvents.

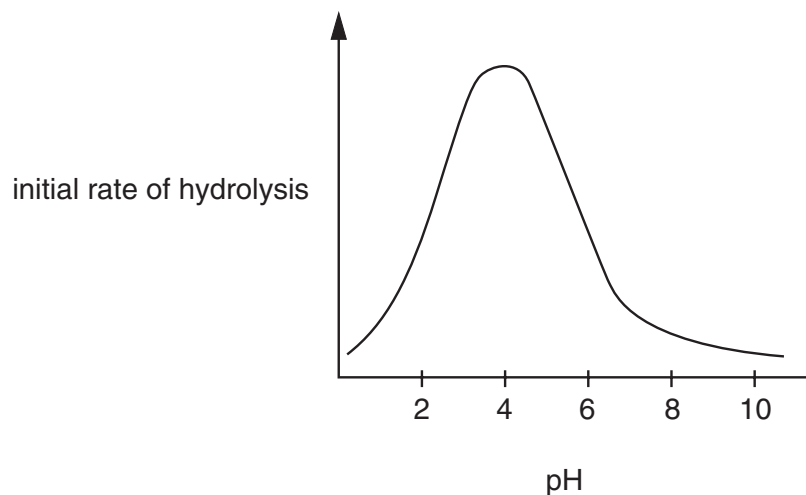
.....

.....

.....[2]

(b) The hydrolysis of tributyrin is catalysed by the enzyme salivary lipase.

(i) The initial rate of this hydrolysis varies with pH as shown below.



Explain why the initial rate of hydrolysis is slow at pH values above 7.

.....

.....

.....

.....

.....

.....

.....[4]

(ii) Tributyrin can also be hydrolysed by heating with aqueous sodium hydroxide. Glycerol is one of the products of this reaction.

Name the other product.

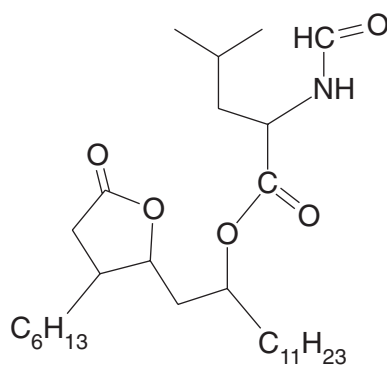
.....[1]

(c) Tristearin is a triglyceride formed from stearic acid, $C_{17}H_{35}COOH$, and glycerol. Salivary lipase is much less effective in catalysing the hydrolysis of tristearin than tributyrin.

Suggest a reason for this difference.

.....[1]

- (d) The activity of salivary lipase is reduced in the presence of the competitive inhibitor orlistat.



orlistat

- (i) What is meant by the term *competitive inhibitor*?

.....
[1]

- (ii) Suggest **one** feature of the structure of orlistat that allows it to act as a competitive inhibitor of salivary lipase. Explain your answer.

.....

[2]

- (e) Suggest why lipases are sometimes added to biological washing powders.

.....
[1]

[Total: 17]

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

TURN OVER FOR QUESTION 4

4 This question is about the structure of proteins.

(a) What is meant by the term *primary structure* of a protein?

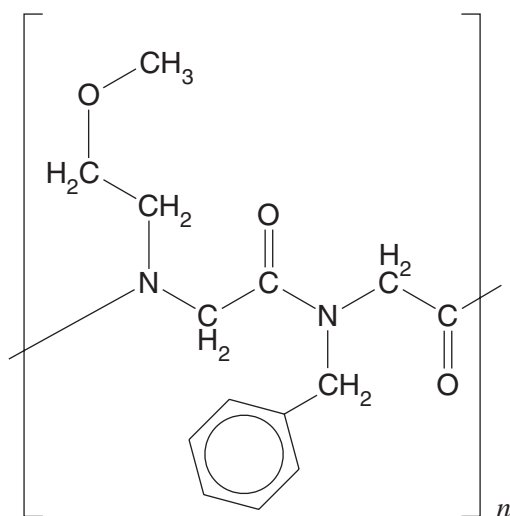
.....[1]

(b) One type of secondary structure of a protein is an α -helix.

Draw a labelled diagram to show how the helical structure is held in place. The atoms involved in stabilising the helix should be clearly shown.

[2]

(c) The repeat unit of a synthetic polymer, similar to a natural protein, is shown below.



(i) Suggest **one** similarity in structure between this synthetic polymer and a natural protein.

.....[1]

- (ii) Unlike natural proteins this synthetic polymer does **not** have a secondary structure. Explain why not.

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

- (iii) Suggest **two** further differences in structure between this synthetic polymer and a natural protein.

.....
.....
.....[2]

- (iv) Suggest how the side chains of the synthetic polymer might interact with each other.

.....
.....
.....[2]

[Total: 9]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

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.

© OCR 2008