

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**Advanced GCE**

**CHEMISTRY**

**Biochemistry**

**2815/02**

Tuesday

**24 JUNE 2003**

Morning

50 minutes

Candidates answer on the question paper

Additional materials:

*Data Sheet for Chemistry*

Scientific calculator

Candidate Name	Centre Number	Candidate Number												
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**TIME** 50 minutes

**INSTRUCTIONS TO CANDIDATES**

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers in the spaces provided on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.

**INFORMATION FOR CANDIDATES**

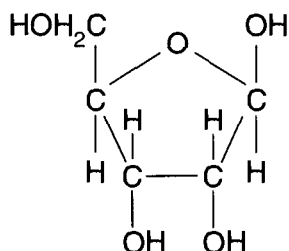
- The number of marks is given in brackets [ ] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use a scientific calculator.
- You may use the *Data Sheet for Chemistry*.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	8	
2	12	
3	13	
4	12	
<b>TOTAL</b>	<b>45</b>	

**This question paper consists of 10 printed pages and 2 blank pages.**

Answer **all** the questions.

- 1 This question is about the monosaccharide  $\beta$ -D-ribose, shown below.



**$\beta$ -D-ribose**

- (a) (i) What is the molecular formula of ribose?

.....[1]

- (ii) How would you expect the cyclic structure of  $\alpha$ -D-ribose to differ from that of  $\beta$ -D-ribose?

.....

.....[1]

- (iii) Draw the open chain structure for ribose.

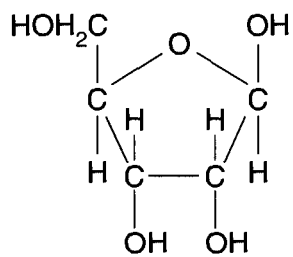
[1]

- (iv) Which **two** functional groups are formed when the cyclic structure is opened out to make the chain?

.....

.....[2]

(b) Explain, using the diagram below, why  $\beta$ -D-ribose is very soluble in water.



.....  
.....  
.....[3]

[Total: 8]

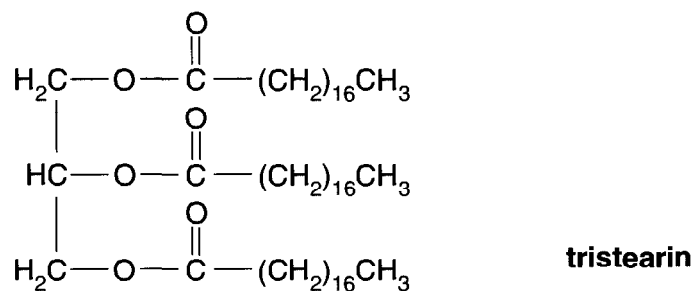


.....[7]

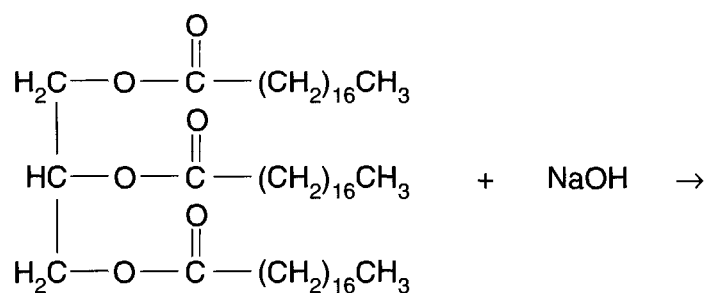
Quality of Written Communication [1]

[Total: 12]

- 3 This compound is tristearin, a triglyceride, which can be hydrolysed by heating with aqueous sodium hydroxide to make soap.



- (a) (i) Complete and balance this equation for the soap-making reaction.



[3]

- (ii) Work out the mass of soap that could be produced from 1000 g of tristearin.  
Molar mass of tristearin:  $890 \text{ g mol}^{-1}$

answer .....g [3]

- (b) Explain why compounds such as tristearin are soluble in non-polar solvents such as hexane.

.....  
.....  
.....  
.....  
.....[3]

- (c) Suggest, with a reason, **one** commercial use of enzymes which hydrolyse triglycerides.

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

- (d) Triglycerides containing erucic acid,  $C_{21}H_{41}COOH$ , from rapeseed oil are now being used as high temperature lubricants.

- (i) Explain how you can tell from the formula that erucic acid is likely to be unsaturated.

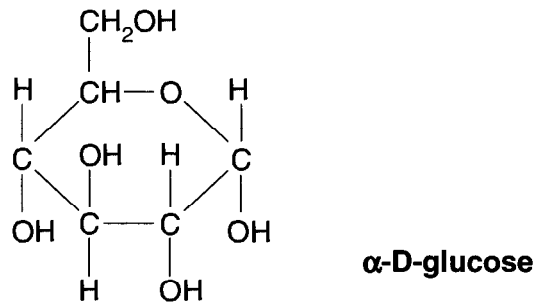
.....  
.....[1]

- (ii) Suggest **one** advantage of using high temperature lubricants derived from vegetable oils.

.....[1]

[Total: 13]

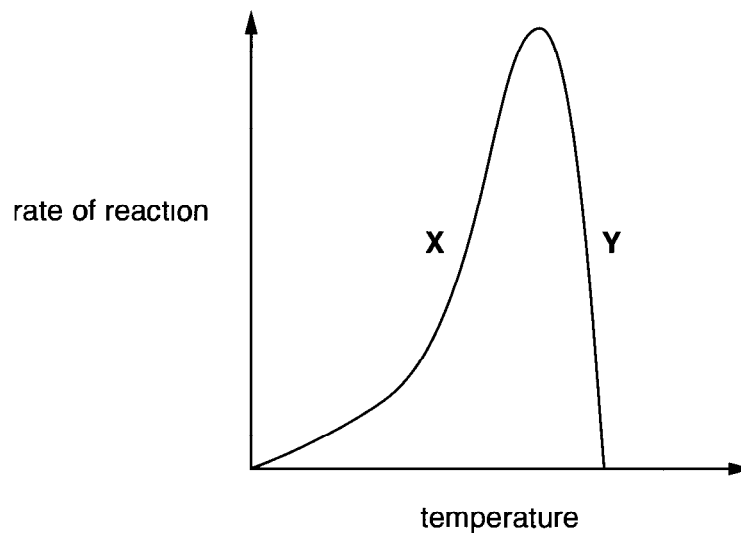
- 4 Maltose is a disaccharide which can be hydrolysed by the enzyme maltase to form  $\alpha$ -D-glucose.



- (a) Draw the structure of maltose, showing clearly the 1,4 link.

[2]

- (b) This diagram shows how the rate of an enzyme catalysed reaction varies with temperature.



- (i) Explain why the rate of reaction increases in the region X.

.....

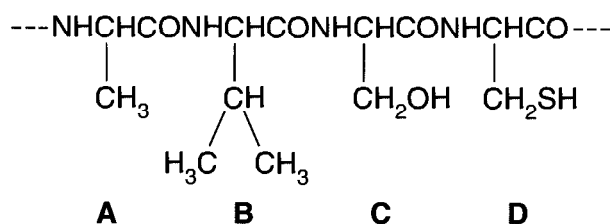
.....

..... [2]

- (ii) Explain why the rate of reaction decreases in the region **Y**.

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

- (c) The diagram shows the structure, at pH 7, of a tetrapeptide fragment from a protein.



- (i) Draw the structure of the first amino acid, **A**, that could be obtained by hydrolysis of this fragment.

[1]

- (ii) Indicate, on the diagram, **two** groups that could be involved in maintaining the secondary structure of the protein. [1]

- (iii) Show, with labelled diagrams, how the side-chains on amino acids **C** and **D** could be involved in the maintenance of the tertiary structure of the protein.

**C**

**D**

[4]

[Total: 12]