OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced GCE

CHEMISTRY 2815/02

Biochemistry

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

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	
TOTAL	45	

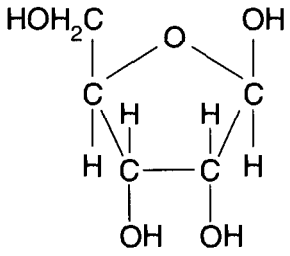
This question paper consists of 10 printed pages and 2 blank pages.

SP (SLC/SLC) S37214/4

Registered Charity Number 1066969
[Turn over

Answer **all** the questions.

1 This question is about the monosaccharide β-D-ribose, shown below.



β-D-ribose

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

.....[1]

(ii) How would you expect the cyclic structure of α-D-ribose to differ from that of β-D-ribose?

.....

.....[1]

(iii) Draw the open chain structure for ribose.

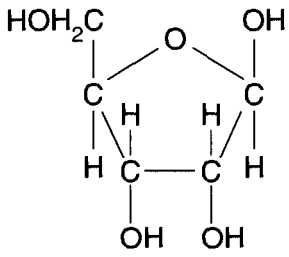
[1]

(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 β-D-ribose is very soluble in water.



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.....[3]

[Total: 8]

2 Ribose is a key part of the polymeric structure of RNA.

(a) (i) Outline the structure of the backbone of the polymer, showing clearly how the ribose units are bonded in the chain.

[3]

(ii) How does the chemical composition of the backbone of DNA differ from that of RNA?

.....[1]

(b) In this question, one mark is available for the quality of written communication.

Describe how base pairing between different m-RNA and t-RNA molecules assists in the process of translation.

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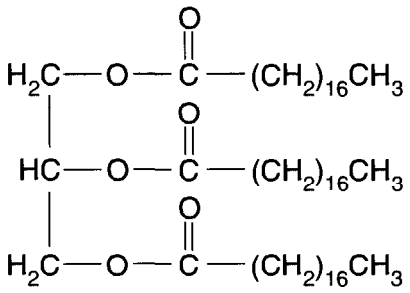
.....[7]

Quality of Written Communication [1]

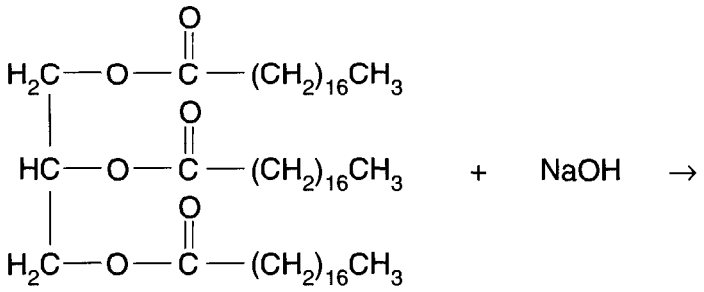
[Total: 12]

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



tristearin

(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 g mol^{-1}

answer .....g [3]

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

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.....[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.

.....

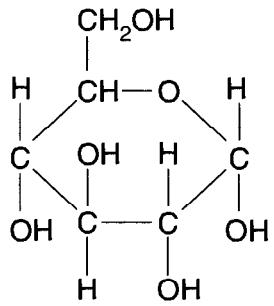
.....[1]

(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 α-D-glucose.

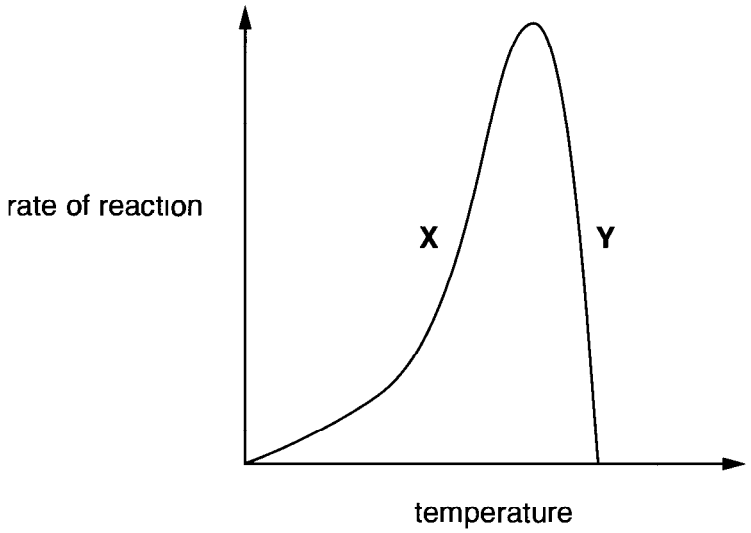


α-D-glucose

(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**.

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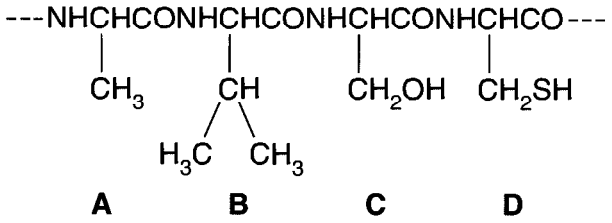
.....[2]

(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]