



**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

**Wednesday 27 January 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 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.
- This document consists of **12** pages. Any blank pages are indicated.

Examiner's Use Only:

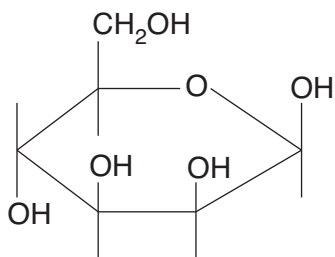
1			
2			
3			
4			
<b>Total</b>			



Answer **all** the questions.

- 1 This question is about the monosaccharide, D-mannose, which appears in fruits such as cranberries.

The diagram below shows a structure of  $\beta$ -D-mannose.



**$\beta$ -D-mannose**

- (a) (i) What is the empirical formula of  $\beta$ -D-mannose?

..... [1]

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

.....

..... [1]

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

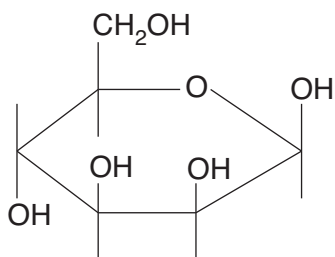
[1]

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

.....

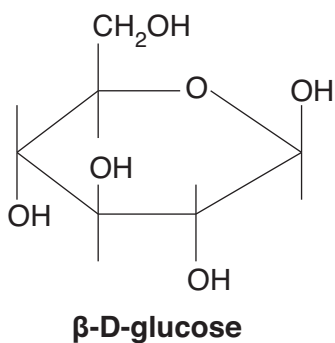
..... [2]

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



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

- (c)  $\beta$ -D-Glucose, shown below, is an isomer of  $\beta$ -D-mannose.  $\beta$ -D-Glucose can be polymerised to form cellulose, a polysaccharide.



- (i) Draw a diagram to show how **three**  $\beta$ -D-glucose monomers are linked together in cellulose.

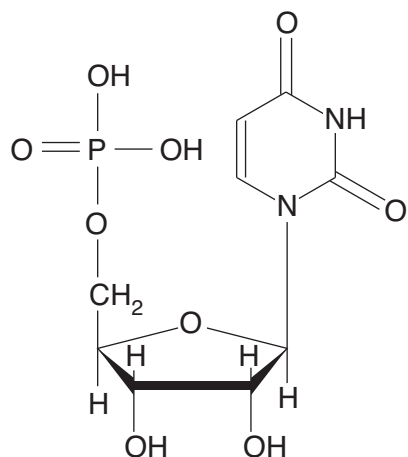
[2]

- (ii) What is the main function of cellulose in plants?

..... [1]

[Total: 10]

- 2 (a) The diagram below shows the structure of a nucleotide, containing the base uracil.



- (i) On the structure of the nucleotide above, circle two places where the nucleotide would be linked to other nucleotides in a nucleic acid chain. [2]

- (ii) Would the nucleotide above be found in DNA or RNA?

Give **two** reasons for your choice.

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

- (iii) Outline how base pairing allows DNA to survive undamaged for long periods of time.

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

You may wish to include diagrams in your answer.

[6]

**[Total: 14]**

- 3** Palmitic acid,  $\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$ , is one of the most common saturated fatty acids found in animals and plants. As its name indicates, it is a major component of the oil from palm trees.

**(a)** Draw the structure of a triglyceride made from propane-1,2,3-triol and palmitic acid.

Show clearly all of the bonds in the ester groups.

[2]

**(b)** Explain why triglycerides are soluble in non-polar solvents but **not** in water.

.....

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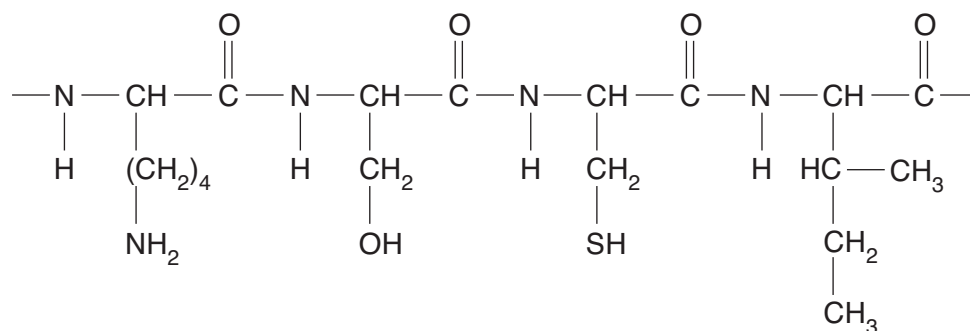
..... [3]

**(c)** State **one** function of a triglyceride in animals and **one** function of a triglyceride in plants.

function in animals .....

function in plants ..... [2]

[Total: 7]



- ..... [1]

- (i) Name **one** type of enzyme that could be used to hydrolyse a polypeptide.

..... [1]

- (ii) State an alternative method that could be carried out to hydrolyse a polypeptide in the laboratory.

..... [1]

- (iii) Draw the structure, at pH 1, for the left-hand amino acid in the fragment above after hydrolysis.

[1]

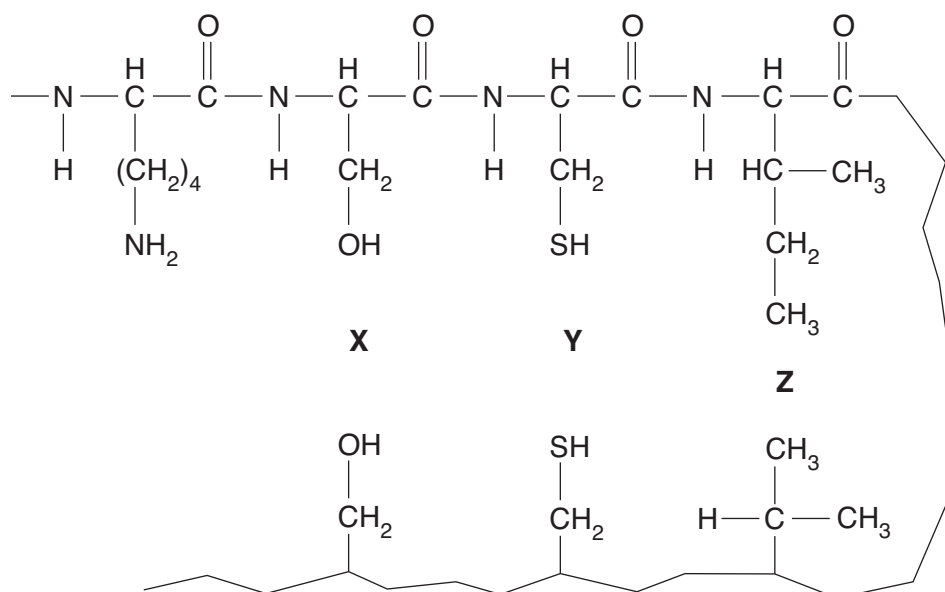
- (c)** In keratin, polypeptide chains can twist to form a secondary structure known as an  $\alpha$ -helix.

Draw a simple diagram to illustrate an  $\alpha$ -helix and show how this structure is stabilised.

[2]

(d) The diagram shows a section of an enzyme.

Some of the amino acid side-chains shown can be involved in maintaining the tertiary structure of the enzyme.



(i) State the type of bonding or interaction that would be possible at points **X**, **Y** and **Z**.

**X** .....

**Y** .....

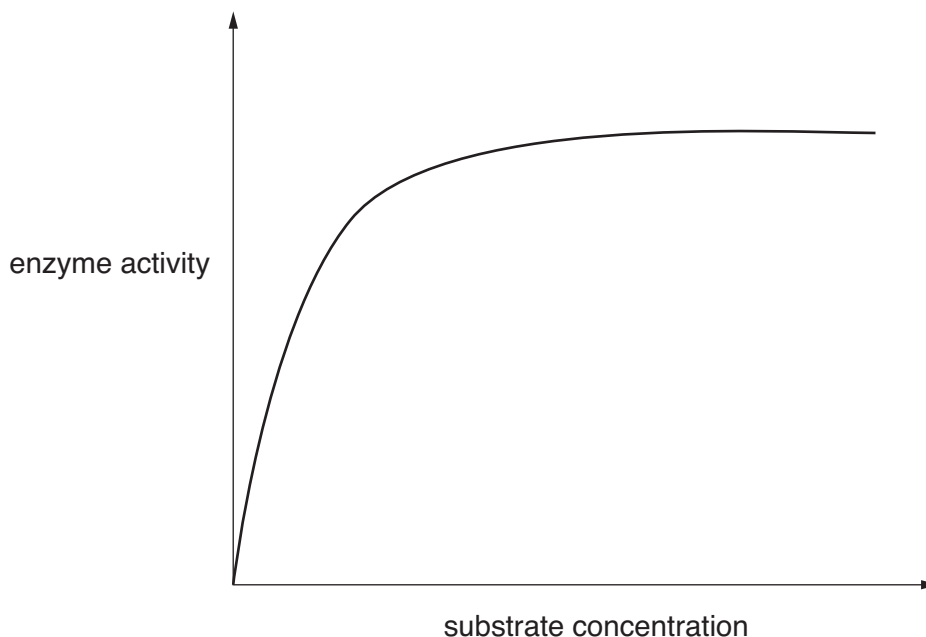
**Z** ..... [3]

(ii) Which of the interactions, **X**, **Y** or **Z**, would be the weakest?

..... [1]



- (e) The figure below shows how the activity of an enzyme varies with substrate concentration.



- (i) Explain why the curve reaches a maximum value.

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

- (ii) On the figure, draw the curve you would expect if a non-competitive inhibitor were present. [1]

- (iii) Explain how a non-competitive inhibitor carries out its function.

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

[Total: 14]

**END OF QUESTION PAPER**

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