

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS****Advanced GCE****CHEMISTRY****2815/02**

Biochemistry

Tuesday

**25 JANUARY 2005**

Afternoon

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.

<b>FOR EXAMINER'S USE</b>		
<b>Qu.</b>	<b>Max.</b>	<b>Mark</b>
<b>1</b>	<b>10</b>	
<b>2</b>	<b>10</b>	
<b>3</b>	<b>8</b>	
<b>4</b>	<b>10</b>	
<b>5</b>	<b>7</b>	
<b>TOTAL</b>	<b>45</b>	

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**This question paper consists of 12 printed pages.**

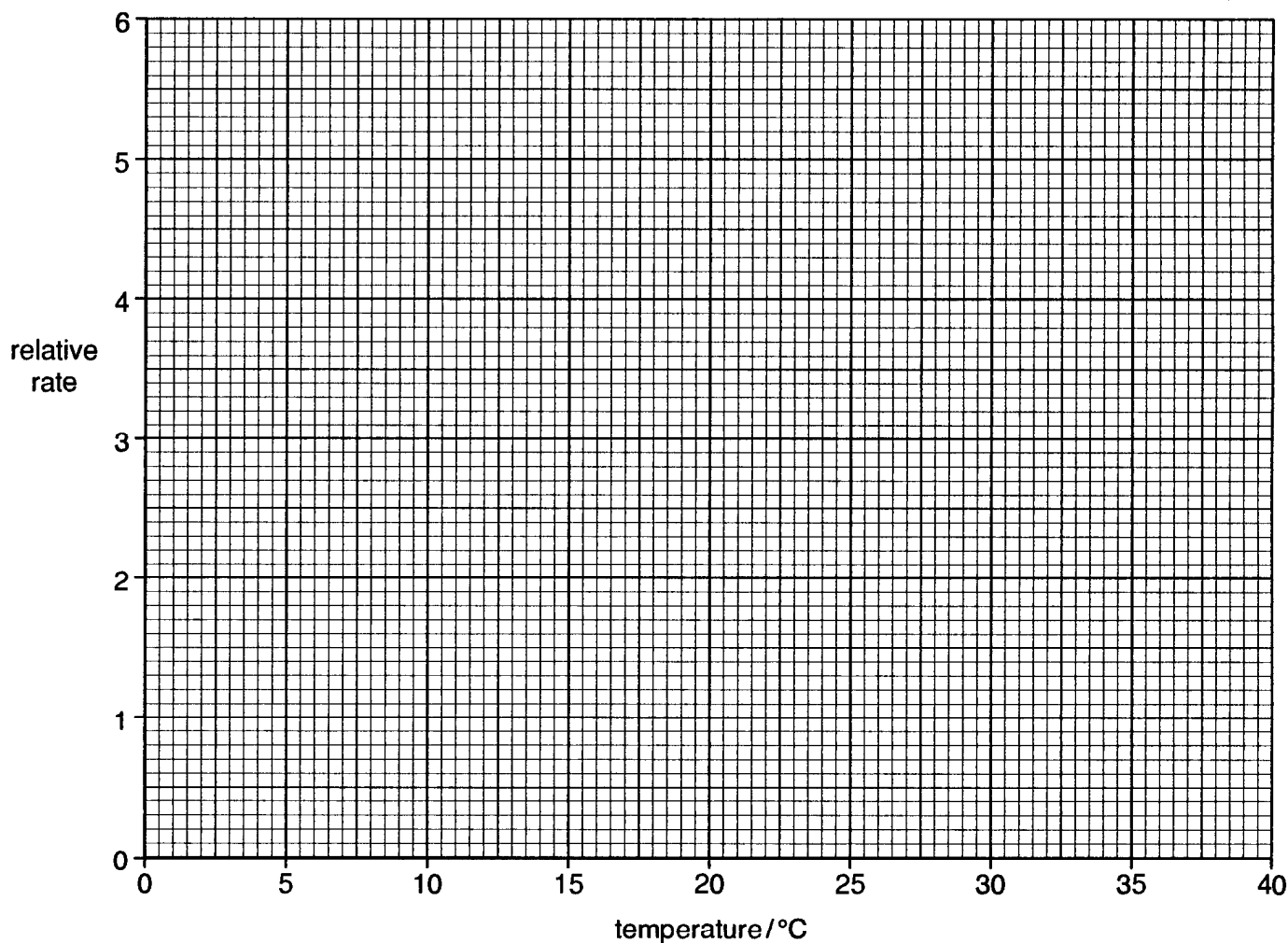
Answer **all** the questions.

- 1 Gelatin is a protein which is used for making jelly. The hydrolysis of gelatin is catalysed by the enzyme papain, from pineapple.

In an experiment, the rate of hydrolysis of gelatin using papain was measured at different temperatures. The results are shown in the table below.

temperature / °C	relative rate of reaction
10	1.0
15	1.2
20	1.6
25	3.2
30	4.9
35	4.8
40	1.6

- (a) (i) Plot these results on the axes provided, and draw a smooth curve through the points.



[2]

(ii) Use your graph to predict the optimum temperature for papain.

.....[1]

(iii) Explain what is happening to the enzyme above the optimum temperature.

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

(b) Gelatin can also be used to immobilise enzymes.

(i) Give **two** possible advantages of immobilising enzymes.

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

(ii) Suggest why gelatin should **not** be used to immobilise papain.

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

(c) Suggest **one** advantage and **one** disadvantage of adding papain to washing powder.

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

[Total: 10]

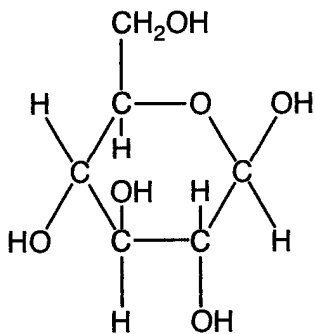
- 2 In this question, one mark is available for the quality of use and organisation of scientific terms.

Describe the structure of DNA and of a molecule of cellulose.

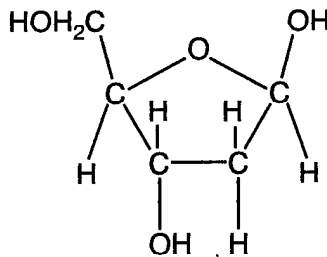
For DNA, explain how hydrogen bonding is involved.

Suggest how cellulose molecules are held together to form strong structural fibres.

You should include diagrams in your answer. The structures of  $\beta$ -D-glucose and  $\beta$ -D-deoxyribose are provided.



$\beta$ -D-glucose



$\beta$ -D-deoxyribose

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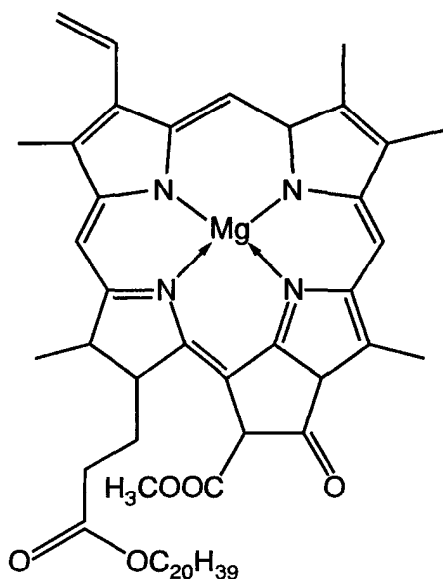
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- 3 This question is about haemoglobin and the photosynthetic pigment chlorophyll-a. The structure of chlorophyll-a is shown below.



- (a) (i) State **one** way in which the structure of chlorophyll-a is similar to that of haemoglobin.

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

- (ii) Suggest **one** way in which the structure of chlorophyll-a differs from that of haemoglobin.

.....[1]

- (b) Suggest the formula of **one** alcohol that would be released by hydrolysis of an ester group in chlorophyll-a.

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

- (c) Describe the quaternary structure of haemoglobin.

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

(d) Outline how haemoglobin carries out its function.

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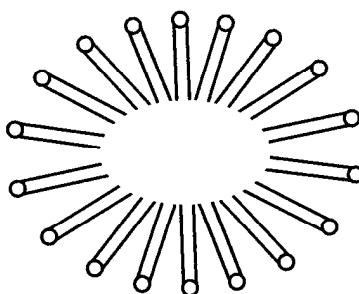
.....

.....

[3]

[Total: 8]

4 The diagram below represents a micelle, made of phospholipids.



(a) (i) What is represented by  in the diagram?

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

(ii) Suggest what intermolecular forces hold the micelle together.

.....[1]

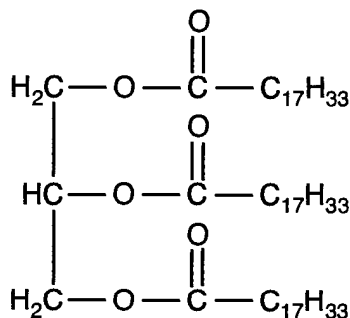
(iii) State the difference in structure between a micelle and a bimolecular membrane.

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



(b) Soap molecules can also form micelles in water.

- (i) State the reagents and conditions needed to make a soap from a triglyceride such as triolein shown below.

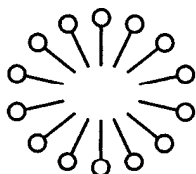


.....  
 .....[2]

- (ii) Write an equation for the reaction you described in (i).

[2]

- (iii) A soap micelle can be represented by the structure below.



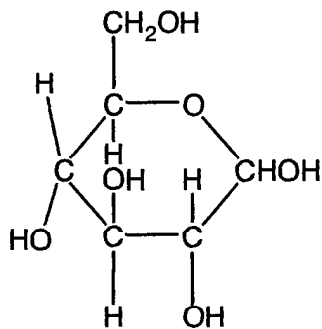
**Soap micelle**

Suggest the nature of the — and the O in the diagram.

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

[Total: 10]

- 5 This question is about the carbohydrates D-glucose and maltose.



**D-glucose**

- (a) Draw an open chain structure for D-glucose.

[1]

- (b) Maltose is a disaccharide derived from D-glucose,  $C_6H_{12}O_6$ .

Draw the structure of maltose.

[2]

(c) Describe **one** way in which maltose can be hydrolysed.

.....[1]

(d) Suggest why maltose is much more soluble in water than starch.

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

[Total: 7]

**END OF QUESTION PAPER**