

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

CHEMISTRY

2815/02

Biochemistry

Monday

26 JUNE 2006

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 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.

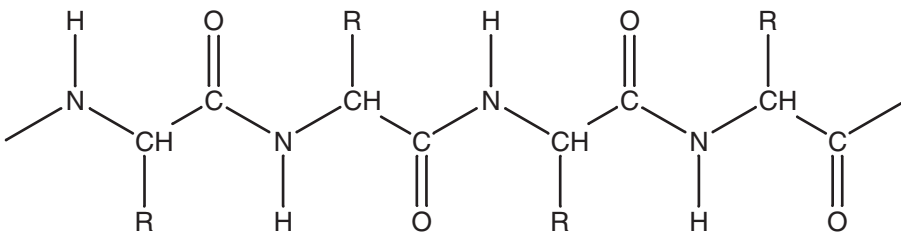
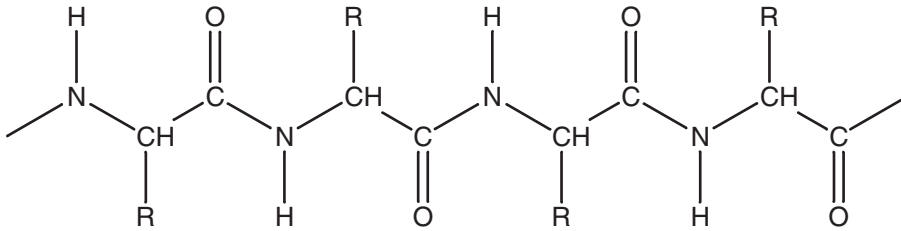
| FOR EXAMINER'S USE | | |
|--------------------|-----------|------|
| Qu. | Max. | Mark |
| 1 | 15 | |
| 2 | 11 | |
| 3 | 10 | |
| 4 | 9 | |
| TOTAL | 45 | |

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

Answer **all** the questions.

1 This question is about some aspects of proteins.

(a) The secondary structure of proteins involves hydrogen bonding. The diagram shows the arrangement of protein strands in silk. R groups are the sidechains.



(i) Draw a hydrogen bond on the diagram to show how the strands are held together in the secondary structure. [1]

(ii) Name the **two** types of secondary structure found in proteins.

.....
 [1]

(b) Hydrogen bonding is also involved in maintaining tertiary structure.

(i) Name **two other** types of interaction which maintain tertiary structure.

.....
 [2]

(ii) Suggest **one** type of repulsion that can occur between R groups.

..... [1]

(iii) Explain why the tertiary structure of proteins is affected by changes in pH.

.....

 [3]

(c) In this question, one mark is available for the quality of use and organisation of scientific terms.

Different enzymes catalyse different reactions.

Explain, in terms of structure, why enzymes are specific in their actions.

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..... [4]

Quality of Written Communication [1]

(d) A dipeptide has the molecular formula $C_6H_{12}N_2O_4$. Suggest a possible structural formula for the dipeptide.

[2]

[Total: 15]

- 2 The phosphoglyceride, phosphatidyl choline, is a common component of bimolecular layers in cell membranes.

(a) Draw a simple diagram of a portion of a bimolecular layer.

Use the symbol  to represent a molecule of phosphoglyceride.

[1]

(b) Phosphatidyl choline is made out of the following:

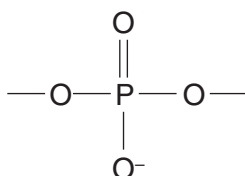
choline $\text{HOCH}_2\text{CH}_2\overset{+}{\text{N}}(\text{CH}_3)_3$

glycerol, propane-1,2,3-triol

phosphate group

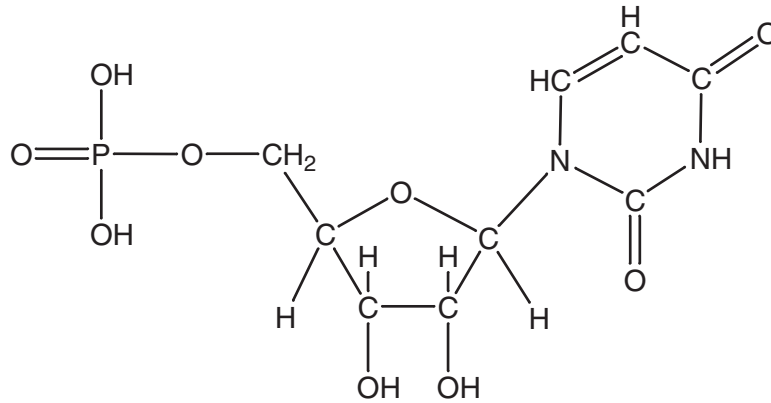
stearic acid, $\text{C}_{17}\text{H}_{35}\text{COOH}$

Complete the structure of phosphatidyl choline, using the phosphate group below.



[3]

- 3 (a) The diagram below shows the structure of the nucleotide uridine-5'-monophosphate, which includes the base uracil.



uridine-5'-monophosphate

- (i) Would this nucleotide be found in DNA or RNA? Give **two** reasons for your choice.

.....

 [2]

- (ii) On the structure above, indicate **two** points at which the base is hydrogen bonded to its complementary base during transcription. [2]

- (b) The m-RNA sequence 5'-AGCGCAGACCCU-3' codes for the amino acid sequence -Ser-Ala-Arg-Pro-.

- (i) Deduce the sequence of DNA bases from which the m-RNA sequence above could be produced by transcription.

..... [1]

- (ii) Identify the m-RNA code used here for the amino acid arginine (Arg).

..... [1]

(iii) Describe how molecules of t-RNA are involved in the process of translation of this m-RNA sequence.

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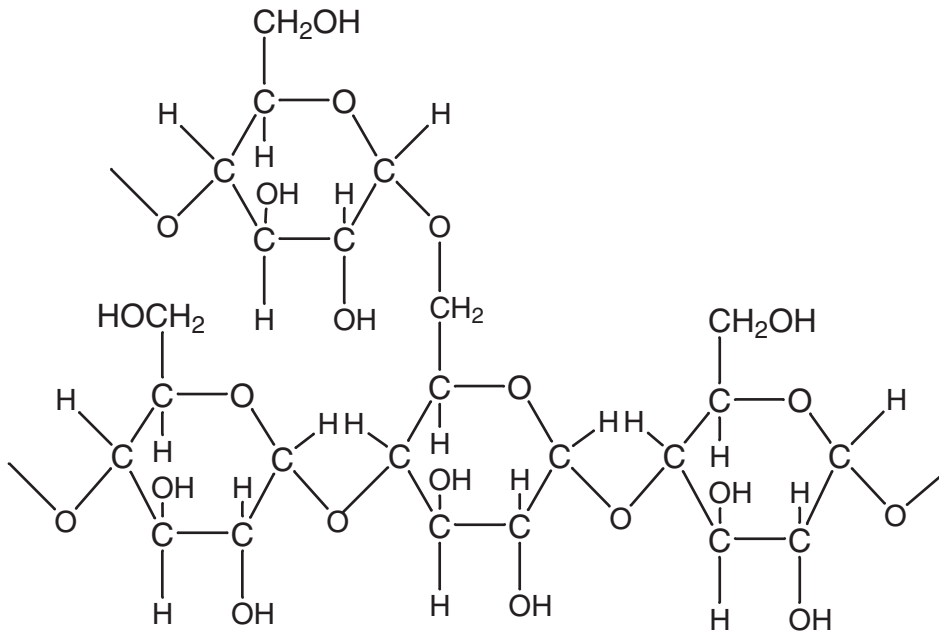
.....

.....

..... [4]

[Total: 10]

- 4 The diagram below shows part of the structure of amylopectin, a polysaccharide found in plants.



- (a) Use the diagram to show the numbered positions and stereochemistry of the glycosidic links in amylopectin. [2]

- (b) State **two** methods that would catalyse the hydrolysis of the glycosidic links in amylopectin.

..... [1]

- (c) Explain how the properties of amylopectin enable it to function as a storage polymer.

..... [3]

(d) Glycogen is another storage polymer of glucose, found in animals.

(i) Explain why glucose is very soluble in water.

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

(ii) Suggest why glycogen is not readily soluble in water.

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

[Total: 9]

END OF QUESTION PAPER

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