

Protein synthesis

Question Paper 4

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Nucleic acids and protein synthesis
Sub Topic	Protein synthesis
Booklet	Theory
Paper Type	Question Paper 4

Time Allowed : 56 minutes

Score : / 46

Percentage : /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

- [Total: 15]

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2 Fig. 3.1 shows a molecule of haemoglobin.

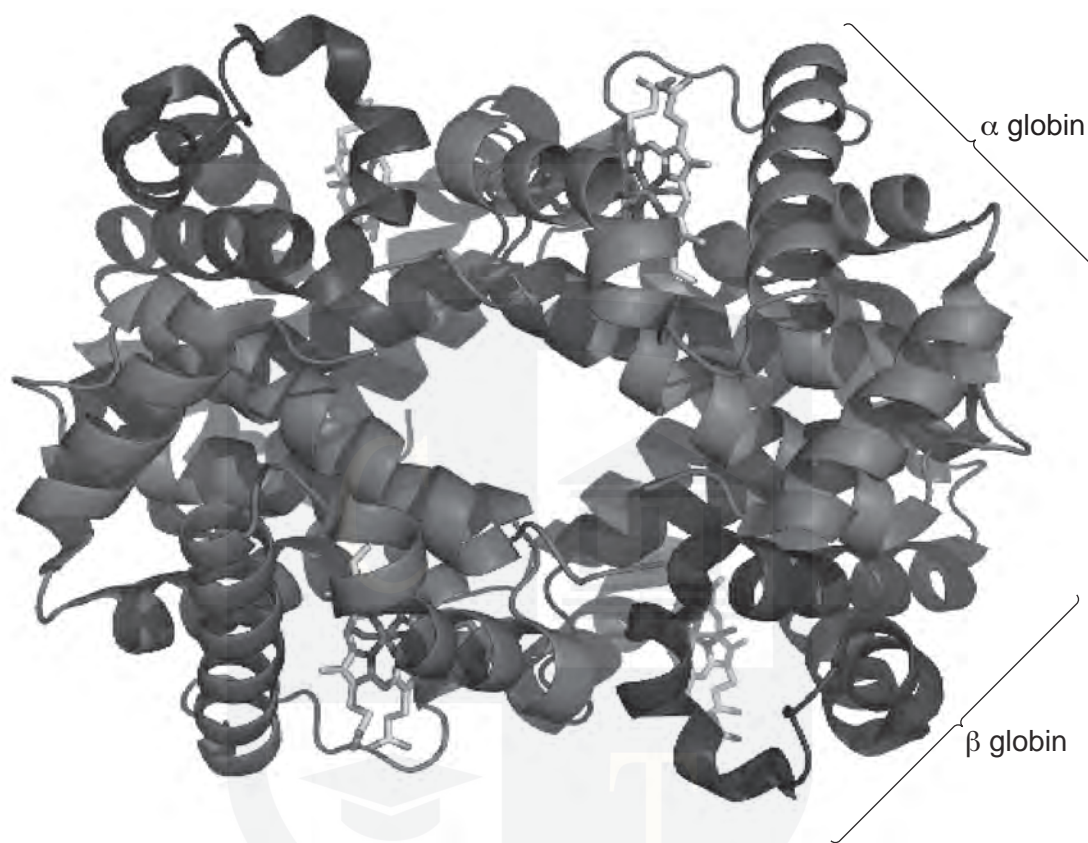


Fig. 3.1

- (a) Explain how a molecule of haemoglobin shows the four levels of organisation of protein molecules.

primary structure

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secondary structure

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tertiary structure

.....

quaternary structure

.....

[4]

There are many different variants of haemoglobin. The sequence of bases in DNA that code for the first seven amino acids in two variants of the β -globin polypeptide are shown in Fig. 3.2.

The genetic dictionary for some of the amino acids is in Table 3.1.

Variant 1

1	2	3	4	5	6	7
CAC	GTG	GAC	TGA	GGA	CTC	CTC

Variant 2

1	2	3	4	5	6	7
CAC	GTG	GAC	TGA	GGA	CAC	CTC

Fig. 3.2

Table 3.1

amino acid	abbreviation	DNA triplets on the coding polynucleotide
valine	val	CAA, CAC, CAG, CAT
proline	pro	GGA, GGC, GGG, GGT
threonine	thr	TGA, TGC, TGG, TGT
histidine	his	GTA, GTG
glutamic acid	glu	CTC, CTT
leucine	leu	AAC, AAT, GAA, GAC, GAG, GAT

- (b)** Use the genetic dictionary to describe the similarities and differences between the two variants of haemoglobin.

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.....

.....

.....[3]

(c) Collagen is a fibrous protein found in many tissues in animals.

(i) State the function of collagen in the walls of arteries.

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

(ii) State **one** way in which the **structure** of collagen differs from the structure of haemoglobin.

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

[Total: 9]



- 3 (a) Fig. 4.1 shows the structure of deoxyribose sugar.

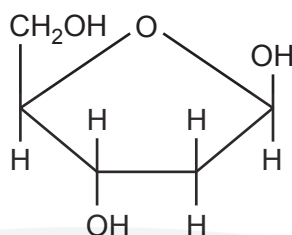


Fig. 4.1

State the differences between the structure of deoxyribose shown in Fig. 4.1 and the ring structure of α -glucose.

You may use the space below to help you in your answer.

.....

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.....

.....

[3]

- (b) Match the biological macromolecule with the type of bond that is formed when the molecule is synthesised. Choose from the list below.

amylose cell yceride otein ylopectin

type of bond(s)	biological macromolecule
β , 1-4 glycosidic	
α , 1-4 glycosidic and α , 1-6 glycosidic	
phosphodiester	
peptide	

[4]

Semi-conservative replication of DNA and transcription involve the formation of polynucleotide chains.

(c) State the type of reaction that occurs in the formation of a polynucleotide chain.

.....[1]

(d) Complete Table 4.1 to show **four** differences between DNA replication and DNA transcription.

Table 4.1

	replication	transcription
1		
2		
3		
4		

[4]

[Total: 12]

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4 Fig. 5.1 represents part of a DNA molecule.

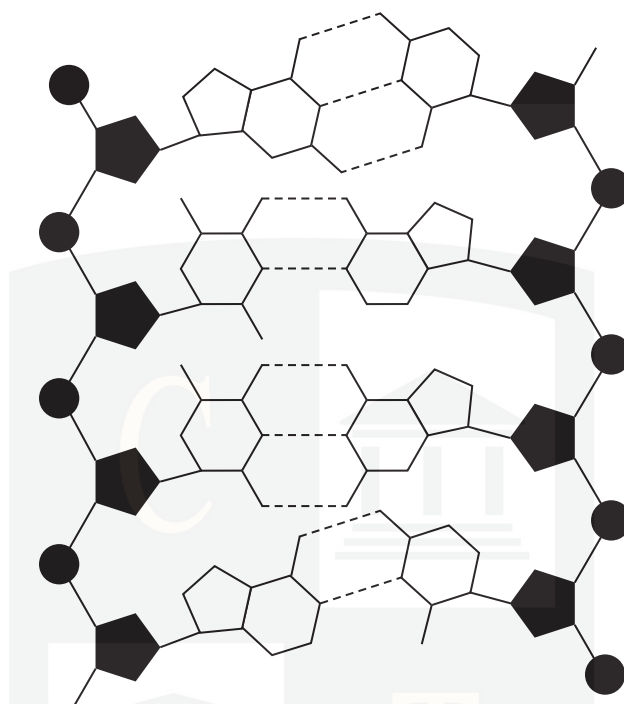


Fig. 5.1

(a) On Fig. 5.1

- (i) draw a box around a nucleotide
- (ii) label, with the letter **P**, a phosphate group.

[1]

[1]

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(b) Describe how a DNA molecule replicates.

The logo of the University of Cambridge is a large, light gray watermark centered on the page. It features a shield divided into four quadrants. The top-left quadrant contains a large letter 'C'. The top-right quadrant contains a depiction of a classical building with three columns and a pediment. The bottom-left quadrant contains a book with a diamond-shaped emblem on its cover. The bottom-right quadrant contains a large letter 'T'.

(c) DNA codes for polypeptides in cells. Transfer RNA (tRNA) is involved in this process.

Describe the role of tRNA in the production of polypeptides in cells.


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[3]

[Total: 10]