Protein synthesis

Question Paper 3

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 3

Time Allowed: 66 minutes

Score : /55

Percentage: /100

Grade Boundaries:

A*	А	В	С	D	Е	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

(a)	Bacteria in root nodules of leguminous pla	ants carry out nitrog	en fixation.
	Describe how nitrogen that is available to animal protein.	these bacteria can	eventually become part of
			[6]
/ L \			[5]
(b)	Fig. 2.1 shows the base sequence of a D the corresponding tRNA anticodon in the		a to produce mkina. Fili in
	Γ]
	DNA triplet	TAC	
	4DNIA anticodor		
	tRNA anticodon		
			[1]
	Fig. 2.	.1	
(c)	More mRNA molecules than tRNA molec	ules are synthesised	d in cells.
	Suggest a reason for this.		
			[1]

(d)	Describe the role of ribosomes in protein synthesis.
	[3]
	[Total: 10]

2	(a)	Explain what is meant by a gene mutation and outline the possible consequences of a gene mutation for an organism. [9]
	(b)	Explain how faulty CFTR proteins in cell surface membranes can lead to the symptoms of cystic fibrosis. [6]
		[Total: 15]

3	(a)	State the structural features of DNA that make it a stable molecule.
		[2]
	(b)	DNA has been described as a 'carrier of coded information'.
		Explain this statement.
		[2]
	(c)	State when, during a cell cycle, DNA replication occurs.
		[1]
	(d)	There are two alleles of the gene for the β-haemoglobin polypeptide:
		HbA (normal)HbS (sickle cell).
		Describe and explain the difference between the HbA and HbS alleles of this gene.
		[3]

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(e) DNA polymerase is an enzyme involved in the replication of DNA.

One of the substrates required by DNA polymerase is ATP.

ara-ATP is a chemical that affects DNA polymerase activity.

In an investigation, the effect of different concentrations of ATP on the rate of DNA synthesis was determined:

- with no ara-ATP
- with a low concentration of ara-ATP
- with a high concentration of ara-ATP.

The results of the investigation are shown in Fig. 5.1.

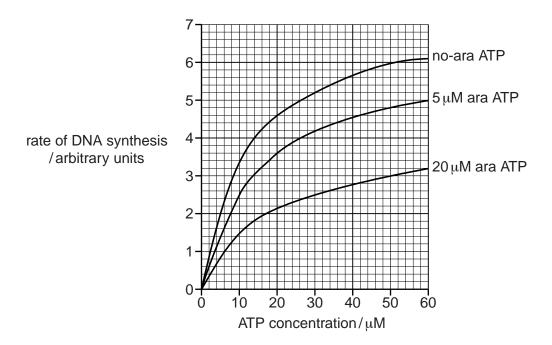


Fig. 5.1

vn in Fig. 5.1.	
	[3]

Explain, in terms of the mode of action of enzymes, the results of the investigation

[Total: 11]

(a)	Describe the role of the ribosome in translation.
	[4]
Fig.	5.1 is a diagram of a section of mRNA showing the sequence of three of the codons. CCGUAAGAU
	codon number: 1 2 3
	direction of polypeptide synthesis
	Fig. 5.1
(b)	State the base sequences of:
	(i) the tRNA anticodon complementary to codon 1
	[1]
	(ii) the DNA sequence which coded for codon 3 .
	[1]

(c)	The three codons in Fig. 5.1 are near the start of the sequence coding for a protein.
	Explain the consequence of a mutation which deletes the U from codon 2 .
	[3]
	[Total: 9

Fig. 3.1 is a photomicrograph of a transverse section through a leaf from a tea plant, Camellia sinensis.

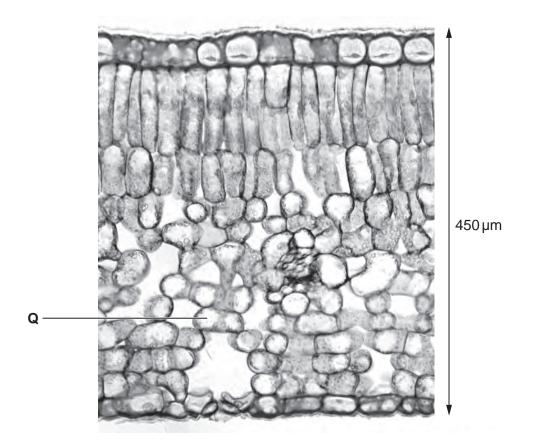


Fig. 3.1

- (a) Use label lines and the letters X, Y and Z to label the following features on Fig. 3.1.
 - X a cell of the upper epidermis
 - Υ a palisade mesophyll cell
 - Ζ a guard cell

(b)	Describe and explain how water moves from inside the leaf at point Q on Fig. 3.1 to the atmosphere outside the leaf during transpiration.
	[4]
(c)	The leaf of <i>C. sinensis</i> , shown in Fig. 3.1, has developed in a sunny position.
	State three features of the leaf, visible in Fig. 3.1 , which show that it has developed in a sunny position.
	1
	2
	3
	[3]
	[Total: 10]