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Level: HL IB in Biology

Subject: Biology

Topic: IB HL Biology

Type: Topic Question

2002

XVIII

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All International Baccalaureate IB Topic Questions HL Biology

BIOLOGY

HL - IB

Key skills



Question 1

A base substitution mutation has caused a single change to the mRNA transcript of a section of a gene, as shown below.

Original sequence: AUGGAAUACCGCCAGGA

Mutated sequence: AUGGAAUACUGCCAGGA

		Second letter				
		U	C	A	G	
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } UAA } Stop UAG } Stop	UGU } Cys UGC } UGA } Stop UGG } Trp	U C A G
	C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } CCA } CCG } Pro	CAU } His CAC } CAA } Gln CAG }	CGU } CGC } CGA } CGG } Arg	U C A G
	A	AUU } AUC } Ile AUA } AUG } Met	ACU } ACC } ACA } Thr ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U C A G
	G	GUU } GUC } Val GUA } GUG }	GCU } GCC } GCA } Ala GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } GGC } GGA } Gly GGG }	U C A G

Using the table above, what is the change in amino acid sequence caused by this mutation?

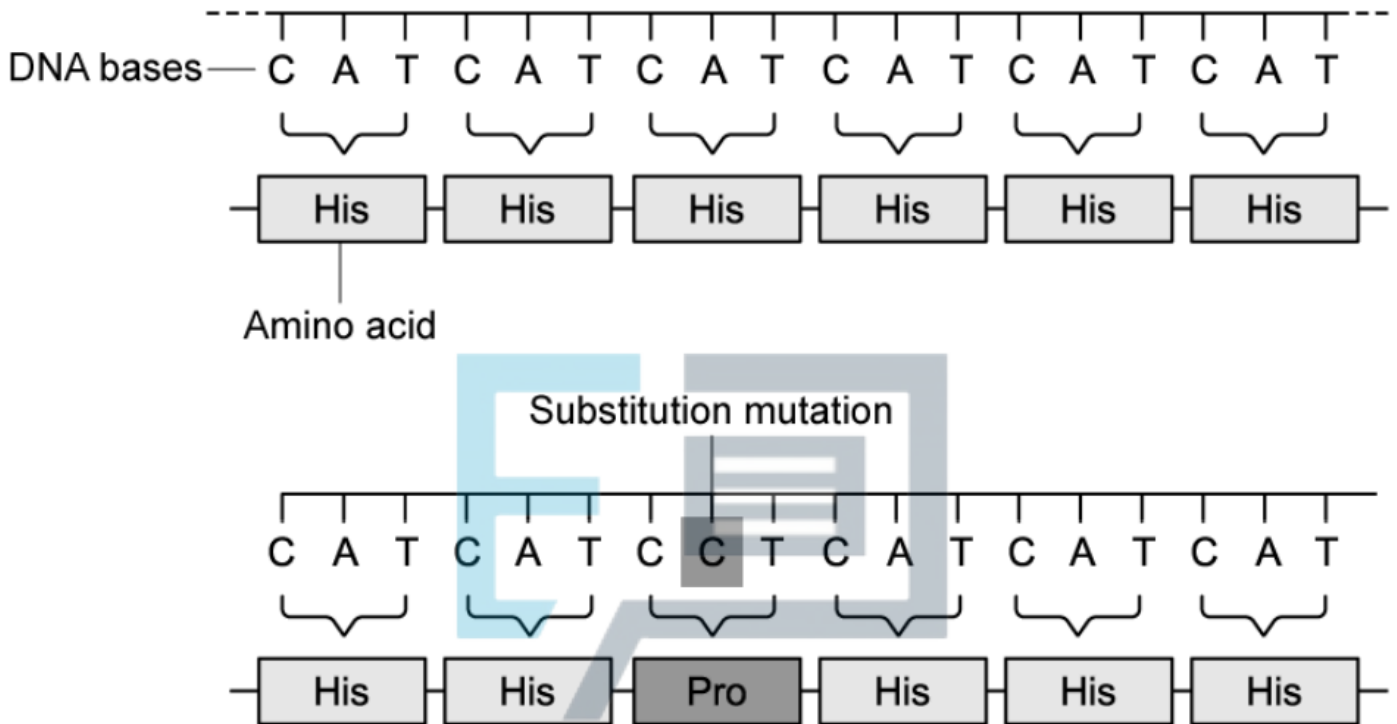
- A. Pro → Leu
- B. Met → Glu
- C. Pro → Gln
- D. No change

[1 mark]



Question 2

Which of the following statements correctly describes the impact of the substitution mutation shown below?



- A. The codon encoding an amino acid was changed to a stop codon, truncating the polypeptide
- B. The sequence of amino acids may code for a different protein structure
- C. The resulting polypeptide chain will be elongated
- D. There will be no change in the polypeptide chain

[1 mark]



Question 3

The risk of developing a cancerous tumour is increased by exposure to which of the following?

	Ultraviolet light	Benzo[a]pyrene	Carbon monoxide	X-rays
A.	✓	✓	x	✓
B.	✓	x	x	✓
C.	x	✓	✓	x
D.	✓	x	✓	x

Key: ✓ = increases risk, x = does not increase risk

[1 mark]

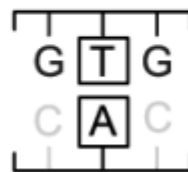
Question 4

Sickle cell anaemia is caused by the following mutation in the gene that codes for haemoglobin:

Normal haemoglobin gene



Mutated haemoglobin gene



Which of the following correctly explains how this mutation causes sickle cell anaemia?

- A. It causes valine to be replaced by glutamic acid, altering the structure of the haemoglobin protein.
- B. It produces an allele known as HbS.
- C. It causes glutamic acid to be replaced by valine, altering the structure of the final haemoglobin protein.
- D. It causes an amino acid substitution at the 6th position in the polypeptide.

[1 mark]