

2.6 Transcription & Translation

Question Paper

Course	DP IB Biology
Section	2. Molecular Biology
Topic	2.6 Transcription & Translation
Difficulty	Hard

Time allowed: 10
Score: /5
Percentage: /100

Question 1

A polypeptide has the following amino acid sequence:

alanine – alanine – valine – lysine – valine – serine

The table below gives the base sequences for the DNA triplets of each amino acid.

Amino acid	DNA triplet
serine	TCG
valine	GTA
lysine	AAA
alanine	GCT
stop	TAA

A mutation in the DNA coding for this polypeptide chain caused the tenth nucleotide to change from an **A** to a **T**.

Which of the following would represent the amino acid sequence in the polypeptide after the mutation occurred?

- A. alanine – alanine – valine – lysine – valine – serine
- B. alanine – alanine – valine – stop – valine – serine
- C. alanine – alanine – valine
- D. alanine – alanine – valine – serine – valine – serine

[1 mark]

Question 2

Which of the following processes involve **both** DNA and RNA?

- I. Replication
 - II. Transcription
 - III. Translation
 - IV. Protein synthesis
- A. I and II
 - B. I, II and IV
 - C. III only
 - D. II and IV

[1 mark]

Question 3

The following steps are involved in the process of replicating DNA by polymerase chain reaction (PCR).

1. The temperature is increased to 72°C to allow *Taq* polymerase to bind to DNA
2. A new complementary strand of DNA is produced
3. The temperature is raised to 95°C to cause denaturation of the DNA molecule
4. Primers attach to the ends of single strands of DNA by hydrogen bonding
5. The temperature is decreased to about 54°C

Which of the following represents the correct order of the steps?

- A. 1 → 3 → 4 → 5 → 2
- B. 3 → 5 → 4 → 1 → 2
- C. 1 → 3 → 5 → 4 → 2
- D. 3 → 4 → 5 → 1 → 2

[1 mark]

Question 4

A short section of mRNA that was produced after transcription occurred has the following base sequence:

AAACUUCUCAUAGAACGG

The following table shows the base sequence for codons and the corresponding amino acids that they code for.

		Second Base					
		U	C	A	G		
First Base	U	UUU } Phenylalanine (Phe/F)	CUU } Serine (Ser/S)	AUU } Tyrosine (Tyr/Y)	GUU } Cysteine (Cys/C)	Third Base	U
		UUC	CCU	ACU	GCU		C
		UUA } Leucine (Leu/L)	CAU	AAU - STOP	GAU - STOP		A
		UUG	CGU	AGU - STOP	GGU - Tryptophan (Trp/W)		G
	C	CUU } Leucine (Leu/L)	CUC } Proline (Pro/P)	AUC } Histidine (His/H)	GUC } Arginine (Arg/R)		U
		CUC	CCC	ACC	GCC		C
		CUA	CAC	AAC } Glutamine (Gln/Q)	GAC		A
		CUG	CGC	AGC	GGC		G
	A	AUU } Isoleucine (Ile/I)	CUA } Threonine (Thr/T)	AUA } Asparagine (Asn/N)	GUA } Serine (Ser/S)		U
		AUC	CCA	ACA	GCA		C
		AUA	CAA	AAA } Lysine (Lys/K)	GAA } Arginine (Arg/R)		A
		AUG - Methionine (Met/M)	CGA	AGA	GGA		G
	G	GUU } Valine (Val/V)	CUG } Alanine (Ala/A)	AUG } Aspartic acid (Asp/D)	GUG } Glycine (Gly/G)		U
		GUC	CCG	ACG	GCG		C
		GUA	CAG	AAG } Glutamic acid (Glu/E)	GAG		A
		GUG	CGG	AGG	GGG		G

Which of the following would represent the correct amino acid sequence coded for by this section of mRNA?

- A. Lysine - Leucine - Proline - Asparagine - Glycine - Alanine
- B. Lysine - Phenylalanine - Proline - Lysine - Glycine - Alanine
- C. Lysine - Leucine - Threonine - Asparagine - Arginine - Arginine
- D. Lysine - Leucine - Proline - Asparagine - Arginine - Alanine

[1 mark]

Question 5

A polypeptide has the following amino acid sequence:

histidine - glutamine - lysine - alanine - valine - histidine - valine

The table below gives the tRNA anticodons for each amino acid.

Amino acid	tRNA anticodons
histidine	CAU
valine	GUA
lysine	AAA
alanine	GCU
glutamine	CAG

A mutation causes the 18th base in the DNA sequence to be deleted.

Which of the following would represent the amino acid sequence after this deletion?

- A. histidine - glutamine - lysine - alanine - valine - histidine
- B. histidine - glutamine - lysine - alanine - valine
- C. histidine - glutamine - lysine - alanine - valine - glutamine
- D. histidine - glutamine - lysine - alanine - valine - histidine - valine

[1 mark]