

7.3 Translation

Question Paper

Course	DP IB Biology
Section	7. Nucleic Acids (HL Only)
Topic	7.3 Translation
Difficulty	Medium

Time allowed: 20
Score: /10
Percentage: /100

Question 1

What is the correct sequence of events during the initiation stage of translation in eukaryotes?

- I. Small subunit of the ribosome binds to the 5' end of mRNA
- II. Large ribosomal subunit binds to form the ribosome complex
- III. The ribosomal subunit moves along the mRNA until it locates a start codon
- IV. An initiator tRNA binds
- V. Elongation of the polypeptide chain can begin

	first	→	→	→	last
A	I	II	III	V	IV
B	II	I	IV	III	V
C	I	II	III	IV	V
D	I	IV	III	II	V

[1 mark]

Question 2

Which of the following is **not** a function of tRNA?

- A. Helps translate anticodons into amino acids
- B. Peptide bond formation linking amino acid to a polypeptide chain
- C. Carrying a specific amino acid to the ribosome
- D. Recognising codons on mRNA

[1 mark]

Question 3

During the **elongation** stage of translation the ribosome 'translocates' along the mRNA moving in a 5' → 3' direction.

What is the immediate effect of this directional movement?

- A. The tRNA occupying the P site moves to the A site
- B. The E site becomes free
- C. The tRNA occupying the A site moves to the P site
- D. The polypeptide chain is released from the ribosome

[1 mark]

Question 4

Which statements best describe ribosomes?

- I. They are composed of protein and ribosomal RNA
- II. They are found in both eukaryotes and prokaryotes
- III. Ribosomal RNA provides structure
- IV. They consist of two equal-sized subunits

- A. I only
- B. I and II
- C. I, II and III
- D. I, II and IV

[1 mark]

Question 5

In eukaryotic cells, ribosomes can be either free or bound.

Which of the following proteins would most likely be synthesised by bound ribosomes?

- A. Mitochondrial outer membrane protein
- B. Glyceraldehyde 3-phosphate dehydrogenase involved in glycolysis
- C. Lysosomal acid lipase
- D. Histone protein

[1 mark]

Question 6

In prokaryotes, the processes of transcription and translation are said to be coupled, which means they can proceed simultaneously.

Which is the **key** cellular feature of prokaryotes that allows this to happen?

- A. Circular chromosomal DNA
- B. Free ribosomes
- C. The lack of a nucleus
- D. The presence of introns in prokaryotic DNA

[1 mark]

Question 7

The bacterium *Staphylococcus aureus* (*S. aureus*) is one of the main human pathogens and can cause many serious infectious diseases. Mutations in the *mec A* gene has allowed *S. aureus* to become resistant to many antibiotics. The table below shows a (Clustal W) partial nucleotide sequence alignment of *mec A* for different isolates of *S. aureus*. The drug resistant strain has a base substitution mutation (shown in bold) which changes the amino acid residue from serine to threonine.

S. aureus isolate 1	AAC GGA ACC GGT AAG GAC GCG ATC ACC AGC
S. aureus isolate 2	AAC GGA ACC GGT AAG GAC GCG ATC ACC AGC
S. aureus isolate 3	AAC GGA ACC GGT AAG GAC GCG ATC ACC AGC
Drug resistant strain	AAC GGA ACC GGT AAG GAC GCG ATC ACC ACC

Which of the following statements **most likely** explains how an amino acid change can cause antibiotic resistance?

- A. Alteration of the drug target site which prevents binding
- B. Prevents the bacterial cell from synthesising the target protein
- C. Bacteria produce less of the target protein
- D. Can introduce a stop codon

[1 mark]

Question 8

Which interactions or features differentiate tertiary structure from secondary structure in proteins?

- I. Hydrogen bonds
- II. Disulphide bridges
- III. Hydrophobic interactions
- IV. Alpha-helices
- V. Interactions between R-groups of amino acids

- A. I and II
- B. II and V
- C. II, III and IV
- D. II, III and V

[1 mark]

Question 9

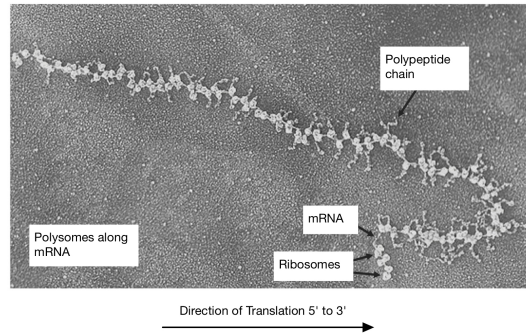
Which of the following best describes the quaternary structure of proteins?

- A. The three-dimensional structure of a polypeptide chain
- B. Arrangement of beta-pleated sheets
- C. The linear sequence of amino acids
- D. How polypeptide chains are arranged

[1 mark]

Question 10

The diagram below represents an electron micrograph of eukaryotic polysomes.



What is the main advantage that polysomes give to a eukaryotic cell?

- A. Translation can be initiated before transcription is complete
- B. Allows very long mRNA molecules to be translated
- C. They increase the overall rate of translation
- D. Allows structurally different polypeptides to be produced from the same mRNA

[1 mark]