

7.3 Translation

Question Paper

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

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

Question 1

Which of the following enables tRNA activating enzymes to link an amino acid to a tRNA molecule?

- A. The tertiary structure of the enzyme active site creates a complementary shape to both tRNA molecule and amino acid which allows them to bind together
- B. The tertiary structure of the enzyme active site creates a shape that is similar to both tRNA molecule and amino acid to allow the them to bind together
- C. The quaternary structure of the enzyme active site creates a shape that is complementary to the tRNA molecule in order for the amino acid to bind to the attachment site of tRNA
- D. The tertiary structure of the specific tRNA molecule creates a shape that is complementary to the active site of the enzyme and also allows the amino acid to bind to its attachment site

[1 mark]

Question 2

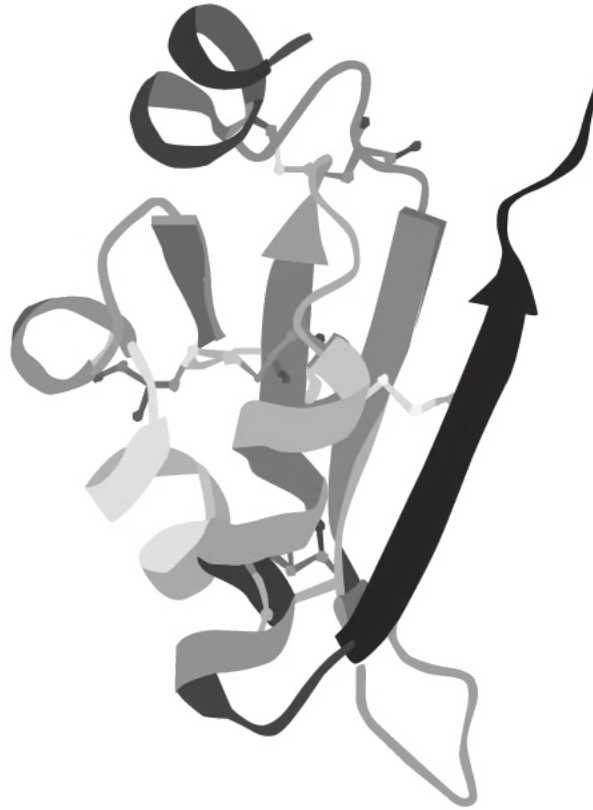
Which of the following applies to both free **and** bound ribosomes?

- I. They produce polypeptides that are destined to be used for processes occurring in the cytosol
 - II. Translation is interrupted and then re-initiated once movement of the ribosome is complete
 - III. They are found in all eukaryotic cells and may be either 70S or 80S
 - IV. They facilitate the binding of mRNA and tRNA and catalyse the formation of peptide bonds
 - V. They have four binding sites to allow the molecules involved with translation to attach to its subunits
- A. III. and IV. only
 - B. IV. and V. only
 - C. I., III. and IV.
 - D. II., IV. and V.

[1 mark]

Question 3

Ustilago maydis is a fungal pathogen affecting maize. It secretes toxins, known as killer toxins, with the best-characterised one being the KP6 toxin. This particular toxin consists of two small polypeptides that are not linked by covalent bonds. The diagram below shows the ribbon structure of **one** of the polypeptides of the KP6 toxin.



Which of the following is the most accurate description of the structure of this polypeptide?

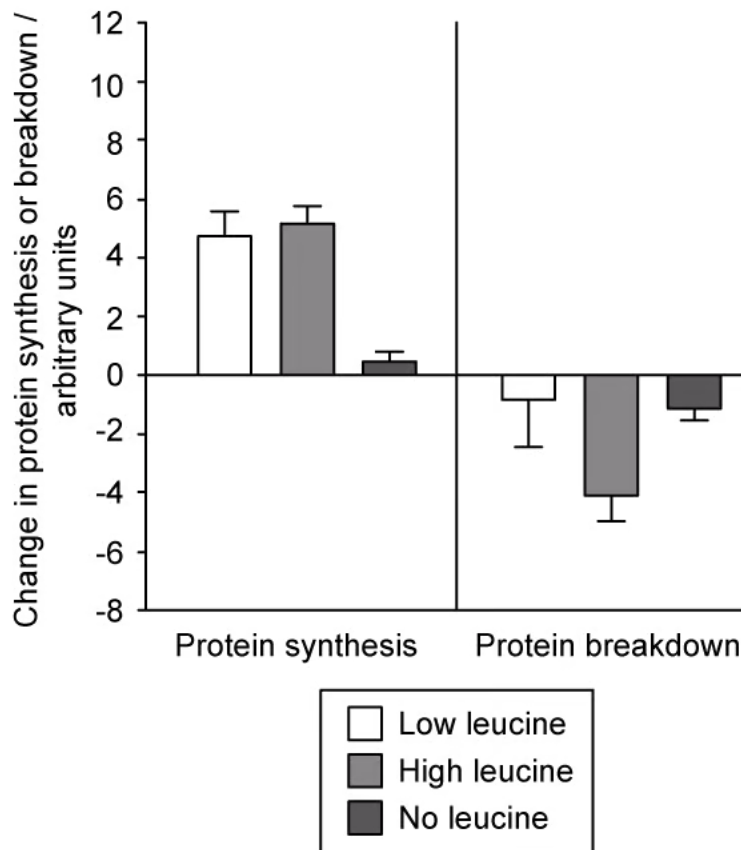
- A. This polypeptide represents the tertiary structure of a protein due to the hydrogen bonds that form between the carboxyl group of one R-group and the amino group of another amino acid
- B. This polypeptide represents the secondary structure of a protein due to the presence of hydrogen bonds that forms triple-helices and β -pleated sheets
- C. This polypeptide represents the quaternary structure of a protein due to the existence of more than one chain that can fit together to form the toxin
- D. This polypeptide represents the secondary structure of a protein due to the presence of hydrogen bonds that forms α -helices and β -pleated sheets

[1 mark]

Question 4

Leucine is an essential amino acid (EAA) that plays an important role in initiating the process of translation. Scientists investigated the effect of leucine on the process of protein synthesis and protein breakdown in muscles. Participants of the study were divided into three equal groups. Each group were given the same diet that was supplemented with different amounts of leucine (High, low and no added leucine) and the rate of protein synthesis and protein breakdown were monitored over time.

The diagram below shows the results of this study.



Which of the following provides the most plausible conclusion that can be drawn from the data?

- A. Leucine led to a significant increase in protein synthesis while it also increased the rate of protein breakdown in the muscles
- B. Low levels of leucine cause a significant increase in protein synthesis with no significant impact on the breakdown of protein in the muscles
- C. Supplementing the diet with high levels of leucine will lead to protein being broken down at a higher rate than it is being synthesised in the muscles
- D. A diet with no added leucine will have a negative impact on protein synthesis and may result in developing a protein deficiency

[1 mark]

Question 5

The following steps describes the events taking place during the elongation of a polypeptide in no particular order.

- I. Free tRNA molecules bind to their corresponding amino acids due to their specific anticodon and transport it to the ribosome
- II. A tRNA with a complementary anticodon binds to the "A" site bringing its specific amino acid along
- III. The initiator tRNA moves from the "P" to the "E" site on the ribosome where it initiates translation
- IV. The amino acid carried by the tRNA at the "P" site is linked to the polypeptide chain by a peptide bond
- V. tRNA carrying the peptide chain moves from the "A" site to the "P" site as the ribosome moves in the 5' → 3' direction along the mRNA molecule

Which of these steps contain incorrect information?

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

[1 mark]