



ANSWER BOOK

Translation: turning a message into a working protein

Nucleic acids, genomes and protein synthesis · Unit B05

AQA 3.4.2 · OCR A 2.1.3, 6.1.1 · Edexcel A Topic 2.9 · CAIE 6.2

6 questions · 21 marks

NAVY EDITION

SECTION A · Short, 1 to 2 marks

- A1** **B1** the P site holds the tRNA carrying the growing polypeptide chain. **B1** a peptide bond is formed between the two amino acids. [2]
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SECTION B · Standard, 3 to 5 marks

- B1** **B1** a tRNA whose anticodon is complementary to the codon in the A site binds there, held by hydrogen bonds between the paired bases. **B1** that tRNA carries the one specific amino acid corresponding to its anticodon. **B1** the two amino acids are now adjacent, and the ribosome catalyses the formation of a peptide bond between them by condensation. **B1** the first tRNA, now without its amino acid, leaves the ribosome. **B1** the ribosome moves along the mRNA by exactly one codon, so the remaining tRNA shifts into the P site and the A site is left free. [5]
- B2** **B1** the cell synthesises protein continuously and in very large quantities, so translation runs constantly. **B1** ATP is used to attach each amino acid to its tRNA, by the specific enzyme for that amino acid. **B1** further nucleoside triphosphates are hydrolysed to bring each tRNA into the ribosome and to move the ribosome along, roughly four high-energy bonds per amino acid added. **B1** mitochondria supply that ATP by aerobic respiration, so many are needed to keep pace with the demand. [4]
- B3** **B1** mitochondria contain their own ribosomes, and these are 70S rather than 80S. **B1** the antibiotic can therefore bind to the ribosomes inside the patient's own mitochondria. **B1** protein synthesis within the mitochondria is inhibited, so the proteins they need cannot be made. **B1** aerobic respiration and the supply of ATP fall, which affects the tissues that demand most ATP. [4]
- B4** **M1** divides the number of bases by three to give the number of codons: $927 \div 3 = 309$. **M1** subtracts the stop codon, which specifies no amino acid. **A1** 308 amino acids, joined by 307 peptide bonds. [3]
- B5** **B1** it folds into its secondary and tertiary structure, a process that begins as the chain emerges and is completed in the endoplasmic reticulum. **B1** vesicles carry it to the Golgi apparatus, where post-translational modification takes place. **B1** carbohydrate or lipid groups may be added and sections may be cut out, and the finished protein is packaged into a vesicle for export. [3]
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