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Level: SL IB in Biology
Subject: Biology
Topic: IB SL Biology
Type: Topic Question

All International Baccalaureate IB Topic Questions SL Biology

BIOLOGY

SL - IB

Key skills

Mark Scheme

Answer 1

The correct answer is C.

Each amino acid is coded for by three bases. That means that the 10th base will affect the 4th amino acid, which is lysine. The 10th amino acid will represent the first base of lysine and change it to a T. This will change the DNA base sequence for this amino acid from AAA to TAA. Using the table provided, we can see that TAA codes for a STOP codon, which will end translation after the third amino acid.

None of the base sequences after the STOP codon will be translated and the new polypeptide will only consist of the first three amino acids of the original polypeptide.

Answer 2

The correct answer is D.

Both DNA and RNA are involved in the processes of transcription and protein synthesis. During transcription, DNA serves as a template and RNA polymerase synthesises a complementary mRNA molecule using free RNA nucleotides. Protein synthesis is the complete process of creating a polypeptide from DNA and includes both transcription and translation which involves both DNA and RNA.

I. is incorrect as only DNA is involved in replication since two molecules of DNA is created from the original DNA molecule.

III. is incorrect as only RNA is involved in the process of translation, where the codons on messenger RNA are translated by ribosomes (made of ribosomal RNA) into a sequence of amino acids brought to the ribosomes by transfer RNA.

Answer 3

The correct answer is D.

The first step is to split the mRNA sequence into triplets:

AAA CUU CUC AUA GAA CGG

Use the table to find the amino acid that corresponds with each codon:

AAA	CUU	CUC	AUA	GAA	CGG
Lys	Leu	Leu	Ile	Glu	Arg

Answer 4

The correct answer is B. Ribosomes are responsible for catalysing the formation of peptide bonds between amino acids during translation. This is made possible by the binding sites that allows tRNA to bind to the correct part of the mRNA molecule to bring specific amino acids into close contact for a peptide bond to form. They have three binding sites for tRNA and one binding site for mRNA to allow this to happen.

Statement I only applies to free ribosomes that produces polypeptides that are mainly used inside the cell.

Statement II applies to bound ribosomes only. The process of translation will be paused once the signalling sequence on the growing polypeptide is reached. The sequence will signal the ribosome to move to the ER and bind to a receptor protein before translation is re-initiated.

Statement III applies mainly to free ribosomes. 80S ribosomes are found in the cytoplasm of all eukaryotic cells, while 70S ribosomes can be located inside chloroplasts and mitochondria. It is however, only the 80S ribosomes in the cytoplasm that will bind to ER.

Answer 5

The correct answer is C.

Statement I is incorrect since the tRNA molecule will bind to its corresponding amino acid at its attachment site, not at the anticodon. The anticodon is complementary to the corresponding codon on the mRNA molecule.

Statement III is incorrect as the initiator tRNA will be released once it reaches the "E" site, it will not initiate translation at this point.

Statement IV is incorrect because the amino acid is linked to the polypeptide chain when the tRNA occupies the "A" site, not the "P" site.

Answer 6

The correct answer is A. In eukaryotic cells, gene expression can be regulated at the level of mRNA processing by adding a 5' cap and a poly-A tail.

B cannot be concluded because methylation of cytosine residues affects DNA structure and gene expression but is not a direct modification of mRNA processing.

C cannot be concluded because chromatin remodeling affects DNA accessibility but is not directly related to mRNA processing.

D cannot be concluded because proteolytic cleavage of polypeptides occurs after translation, not during mRNA processing.

Answer 7

The correct answer is C. A nonsense mutation changes a single nucleotide in the DNA sequence to create a premature stop codon, leading to the termination of translation.

A cannot be concluded because a silent mutation does not change the amino acid sequence of the protein.
B cannot be concluded because a missense mutation results in a different amino acid being incorporated, not a premature stop codon.
D cannot be concluded because a frameshift mutation involves the insertion or deletion of nucleotides, altering the reading frame but not directly causing a premature stop codon.