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BIOLOGY

GENETICS, BIODIVERSITY & CLASSIFICATION

Level & Board	AQA (A-LEVEL)
TOPIC:	Transcription & Translation
PAPER TYPE:	Solution - 1
TOTAL QUESTIONS	6
TOTAL MARKS	39

Transcription and Translation - 1

1.

(a)

Complementary base pairs: Hydrogen bonds

Adjacent nucleotides in a DNA strand: Phosphodiester bonds

(b)

1.7/5 = 0.34nm per base pair

0.34 x (4.38×10^3) = 1489.2

(c)

- tRNA is 'clover leaf shape', mRNA is linear
- tRNA has hydrogen bonds, mRNA does not
- tRNA has an amino acid binding site, mRNA does not
- tRNA has anticodon, mRNA has codon

(d)

DNA of eukaryotic cell has non-coding regions/introns within gene OR pre-mRNA contains non-coding regions/introns

These regions/introns are removed from pre mRNA

2.

(a) Each amino acid added to the growing end of a polypeptide chain is selected by complementary base-pairing between the anticodon on its attached tRNA molecule and the next codon on the mRNA chain.

OR

- tRNA brings specific amino acid to ribosome
- Anticodon on tRNA binds to codon on mRNA
- Amino acids join by condensation reaction using ATP

I am Sorry !!!!!

3.

(a) RNA nucleotides are attracted to the exposed bases and they are joined together by RNA polymerase. The resulting pre-mRNA molecule is then

spliced to remove introns, and the resulting single stranded mRNA can then be used for translation into a protein molecule.

OR

- Free nucleotide come and do complementary base pairing with exposes template strand of DNA
- RNA polymerase joins bases together through condensation form phosphodiester bond, pre- mRNA produced
- Introns removed exons spliced together form mature mRNA

(b) Serine Alanine Glycine Proline

4.

(a)

- An enzyme called DNA helicase unzips the two strands of DNA by breaking hydrogen bonds between the DNA bases.
- One strand of DNA acts as the 'template strand' and is used to make the mRNA.
- Free RNA nucleotides bind to the exposed template strand to form the mRNA.

OR

mRNA is formed in the nucleus of eukaryotic cells, where DNA helicase breaks the hydrogen bonds between the two DNA strands and parallel nucleotides, causing the two DNA strands to unwind and the double helix to break. RNA polymerase then attaches to one DNA strand that acts as the template strand and joins free flowing nucleotides to the exposed nucleotides on the template strand by complementary base pairing and creating phosphodiester bonds between adjacent nucleotides to form the pre-mRNA strand. Base A joins to T, base U to A, and bases C and G to G and C respectively. The RNA polymerase then stops this production of the pre-mRNA strand once it reaches a stop codon on the template strand. The pre-mRNA then undergoes splicing as the double helix of the DNA reforms. The introns are removed and mRNA is formed, where it can leave the nucleus through the nuclear pores.

(b) During translation, ribosomal subunits assemble together like a sandwich on the strand of mRNA, where they proceed to attract tRNA molecules tethered to amino acids (circles). A long chain of amino acids emerges as the ribosome decodes the mRNA sequence into a polypeptide, or a new protein.

OR

- mRNA attaches to ribosome
- Codon on mRNA
- Binds to an anti-codon on tRNA
- Each tRNA brings a specific amino acid
- Sequence of codons / bases on mRNA determines order of amino acids
- Formation of peptide bonds / amino acids joined by condensation Reactions

5.

(a) A proteome is the complete set of proteins expressed by an organism. The term can also be used to describe the assortment of proteins produced at a specific time in a particular cell or tissue type. The proteome is an expression of an organism genome.

(b)

- mRNA has a linear structure and carries genetic information copied from DNA.
- tRNA has an L shaped 3D structure.
- It is specific to each amino acid and carries an amino acid to the growing chain of a polypeptide during the translation process.

OR

- mRNA does not have hydrogen bonds / base pairing, tRNA does
- mRNA does not have an amino acid binding site, tRNA does
- mRNA has more nucleotides
- Different mRNAs have different lengths, all tRNAs are similar /
- same length
- mRNA has codons, tRNA has an anticodon

(c)

mRNA attaches to ribosome

Codon on mRNA

Binds to an anti-codon on tRNA

Each tRNA brings a specific amino acid

Sequence of codons / bases on mRNA determines order of amino acids

Formation of peptide bonds / amino acids joined by condensation reactions

OR

During translation, ribosomal subunits assemble together like a sandwich on the strand of mRNA, where they proceed to attract tRNA molecules tethered to amino acids (circles). A long chain of amino acids emerges as the ribosome decodes the mRNA sequence into a polypeptide, or a new protein.

6.

(a)

- More than one codon codes for a single amino acid
- Suitable example selected from Table 1

(b) 465 x 3 = 1395

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