

## 6.2 Protein Synthesis

### Question Paper

Course	CIE A Level Biology (9700) exams from 2022
Section	6. Nucleic Acids & Protein Synthesis
Topic	6.2 Protein Synthesis
Difficulty	Hard

**Time allowed:** 10

**Score:** /10

**Percentage:** /100

### Question 1

Ribosomes exist as two separate subunits that join together during protein synthesis.

What do these subunits consist of?

- A rRNA and protein
- B rRNA and lipid
- C rRNA and mRNA
- D rRNA and tRNA

[1 mark]

### Question 2

Here is a section of DNA

TTGTCGCTACTC

AACAGCGATGAG

template strand

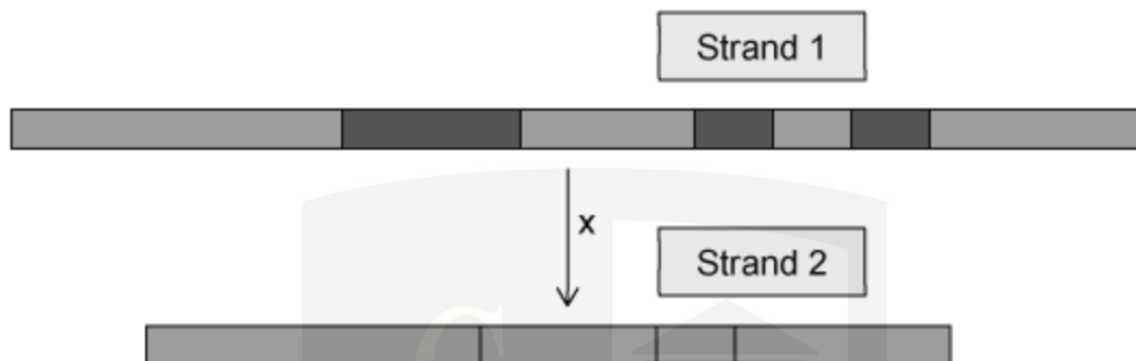
What would the corresponding anticodon sequence be for the third DNA triplet?

- A GAT
- B CTA
- C CUG
- D GAU

[1 mark]

### Question 3

Here are two sections of RNA



Which row is correct?

	process <b>X</b> is needed to make a functional protein	strand <b>1</b> is mRNA	strand <b>2</b> is mRNA	process <b>X</b> removes exons	strand <b>1</b> contains introns and exons
<b>A</b>	X	✓	X	X	✓
<b>B</b>	✓	X	✓	X	✓
<b>C</b>	X	X	✓	✓	✓
<b>D</b>	✓	✓	✓	X	X

[1 mark]

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#### Question 4

A polypeptide has the amino acid sequence:

alanine – alanine – valine – lysine – valine – serine

The table gives the DNA triplets for each amino acid.

amino acid	DNA triplets
serine	TCG
valine	GTA
lysine	AAA
alanine	GCT
stop	TAA

A substitution mutation in the DNA coding for this polypeptide chain caused the tenth nucleotide to swap from an A to a T

How would the amino acid sequence in the polypeptide now look?

- A** alanine – alanine – valine – lysine – valine – serine
- B** alanine – alanine – valine – stop – valine – serine
- C** alanine – alanine – valine
- D** alanine – alanine – valine – serine – valine – serine

**[1 mark]**

### Question 5

Some antibiotics work by preventing protein synthesis in bacteria by binding to their ribosomes.

Which statement explains why these antibiotics kill bacterial cells but not human cells?

- A** ribosomes in human cells have a different structure to those in bacterial cells
- B** antibiotics recognize human antigens on the cell membrane
- C** both DNA and ribosomes are located in the cytoplasm in bacteria
- D** bacterial cells have different nucleotides to human cells

**[1 mark]**

### Question 6

Which statement is not a description of a gene?

- A** Any section of a double stranded DNA molecule with a sequence of complementary nucleotides held together by hydrogen bonding.
- B** A sequence of nucleotides that can be transcribed using a polymerase enzyme and free activated nucleotides, which results in the formation of mRNA.
- C** A length of DNA which carries coded information as a sequence of nucleotides that can result in the formation of a polypeptide chain.
- D** A sequence of nucleotides which can be copied by complementary base pairing and then be translated at a ribosome.

**[1 mark]**

**Question 7**

Which row in the table correctly shows situations in which both DNA and RNA are involved?

	replication	transcription	translation	protein synthesis
<b>A</b>	✓	✓	X	X
<b>B</b>	✓	X	✓	X
<b>C</b>	X	X	✓	X
<b>D</b>	X	✓	X	✓

key

✓ involved

X not involved

**[1 mark]**

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### Question 8

If a gene produces a pre-RNA that is 1450 bases in length and has the following intron-exon structure:

**Exon 1 - 250 bp**

**Intron 1 - 150 bp**

**Exon 2 - 50 bp**

**Intron 2 - 250 bp**

**Exon 3 - 750 bp**

How many bases would the mRNA have?

- A** 400
- B** 1050
- C** 1250
- D** 1400

**[1 mark]**

### Question 9

In eukaryotes, which of the following statements is true with regards to introns and exons?

- A** mature mRNA contains a mix of introns and exons
- B** failure to remove introns can lead to production of faulty protein
- C** exons in protein coding genes are removed by spliceosomes
- D** exons are repeating sequences that are typically found at the end of a gene

**[1 mark]**

### Question 10

A polypeptide has the amino acid sequence:

histidine – glutamine – lysine – alanine – valine – histidine – valine

The table gives the tRNA anticodons for each amino acid.

amino acid	tRNA anticodons
histidine	CAU
valine	GUA
lysine	AAA
alanine	GCU
glutamine	CAG

A mutation causes the 18<sup>th</sup> base in the DNA sequence to be deleted. What would the amino acid sequence now look like?

- A** histidine – glutamine – lysine – alanine – valine – histidine
- B** histidine – glutamine – lysine – alanine – valine
- C** histidine – glutamine – lysine – alanine – valine – glutamine
- D** histidine – glutamine – lysine – alanine – valine – histidine – valine

**[1 mark]**