

Nucleic acids and protein synthesis – AS 9700 Biology June 2022

1. June/2022/Paper_11/No.22

Bacterial cells with DNA containing only the 'heavy' isotope of nitrogen (^{15}N) are allowed to reproduce for three generations in a culture medium containing the normal isotope of nitrogen (^{14}N).

Which percentage of the DNA molecules produced contain strands with the heavy isotope of nitrogen?

	first generation %	second generation %	third generation %
A	50	25	12.5
B	75	50	25
C	100	50	25
D	100	75	50

2. June/2022/Paper_11/No.23

A bacterial circular DNA molecule is 2 600 150 base pairs long. 26% of the bases are adenine.

How many cytosine bases would be in the DNA molecule?

- A** 624 036 **B** 676 039 **C** 1 248 072 **D** 1 352 078

3. June/2022/Paper_11/No.24

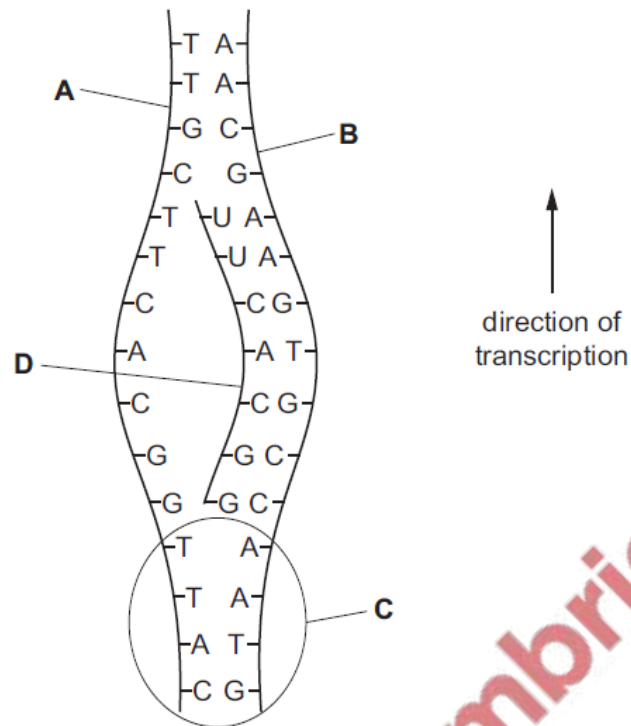
Which statement relating to the structure of DNA is correct?

- A** Two DNA strands are joined to each other by phosphodiester bonds.
B The alignment of bases to form a double helix is only achieved between antiparallel strands.
C Three hydrogen bonds are formed between all base pairs containing purines.
D The number of cytosine bases always equals the number of thymine bases.

4. June/2022/Paper_11/No.25

A student sketched a diagram to represent the process of transcription.

Which part of their diagram shows the non-transcribed strand?



5. June/2022/Paper_12/No.21

Which statement describes the structure of ATP?

- A It is a DNA nucleotide with two extra phosphates.
- B It is a DNA nucleotide with three extra phosphates.
- C It is an RNA nucleotide with two extra phosphates.
- D It is an RNA nucleotide with three extra phosphates.

6. June/2022/Paper_12/No.23

The table shows the DNA triplet codes for some amino acids.

amino acid	DNA triplet code	amino acid	DNA triplet code
arginine	GCA	glycine	CCA
arginine	GCC	glycine	CCG
arginine	GCG	glycine	CCT
asparagine	TTA	lysine	TTC
asparagine	TTG	lysine	TTT
cysteine	ACA	proline	GGA
cysteine	ACG	proline	GGC
STOP	ATC	valine	CAC

The base sequence on the template DNA strand coding for part of a polypeptide is shown.

CCA ACG GCG TTA TTC GCA

Two mutations occur in this sequence during DNA replication.

Which mutated template DNA strand would result in a shorter polypeptide?

- A CCA ACA GCA TTA TTC GCA
- B CCA ACG CCG TTA TTC GCC
- C CCA ACG GCG TTG ATC GCA
- D CCT ACG GCG TTA TTC GGA

7. June/2022/Paper_13/No.12

RNA polymerase and peptidyl transferase are both enzymes involved in protein synthesis.

Which statements describe similarities between these two enzymes?

- 1 They are both globular proteins.
- 2 They both have the same tertiary structure.
- 3 They are both intracellular enzymes.

- A 1 and 2
- B 1 and 3
- C 1 only
- D 2 and 3

8. June/2022/Paper_13/No.22

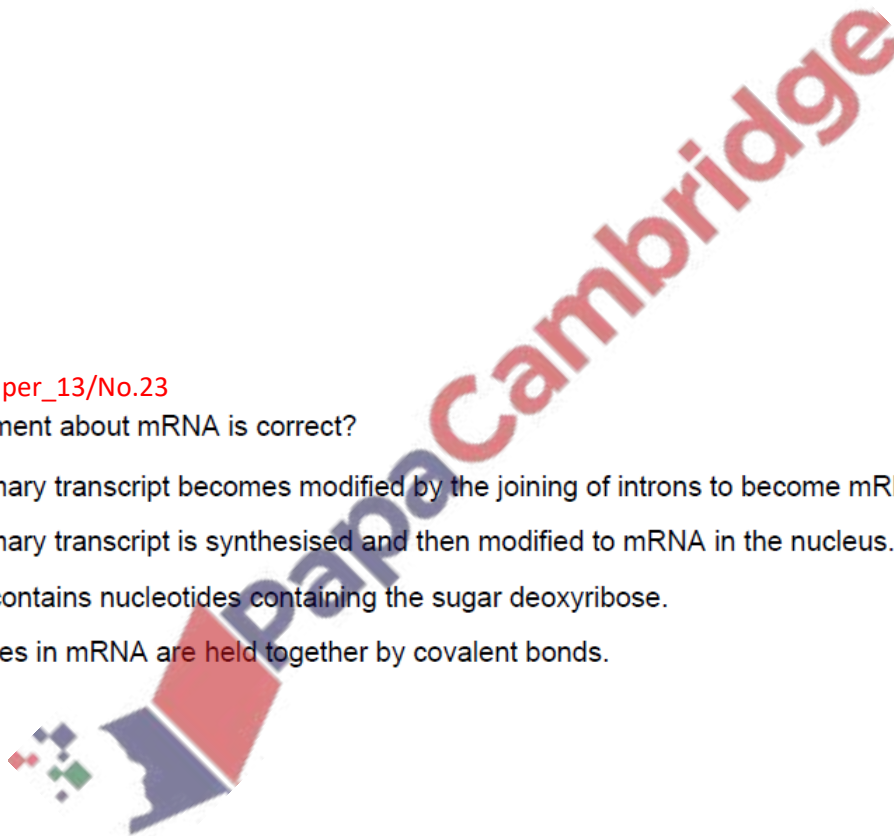
Which statement about the transcription and translation of a gene is correct?

- A The non-transcribed strand of DNA has a base sequence that is identical to the mRNA produced in transcription.
- B The template strand of DNA has a base sequence that is identical to the mRNA produced in transcription.
- C The non-transcribed strand of DNA has a base sequence that is complementary to the tRNA molecules required in translation.
- D The template strand of DNA has a base sequence that is complementary to the tRNA molecules required in translation.

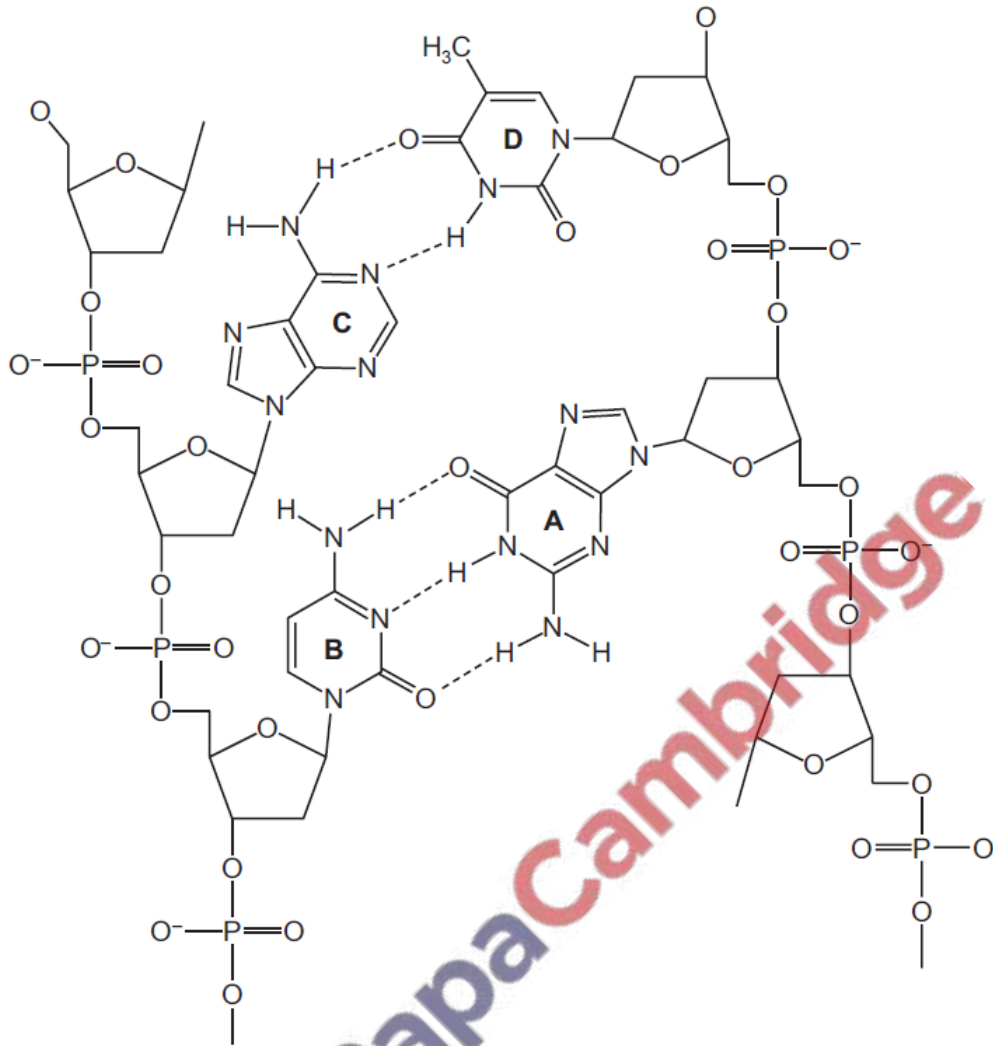
9. June/2022/Paper_13/No.23

Which statement about mRNA is correct?

- A The primary transcript becomes modified by the joining of introns to become mRNA.
- B The primary transcript is synthesised and then modified to mRNA in the nucleus.
- C mRNA contains nucleotides containing the sugar deoxyribose.
- D The bases in mRNA are held together by covalent bonds.



The diagram shows part of a DNA molecule.



Which label is correct?

- A adenine
- B guanine
- C cytosine
- D thymine

11. June/2022/Paper_13/No.25

The sequence of bases in DNA coding for the first eight amino acids in the β -polypeptide of adult haemoglobin is:

CAC GTG GAC TGA GGA CTC CTC TTC

However, in haemoglobin C, which is a cause of haemolytic anaemia, it becomes:

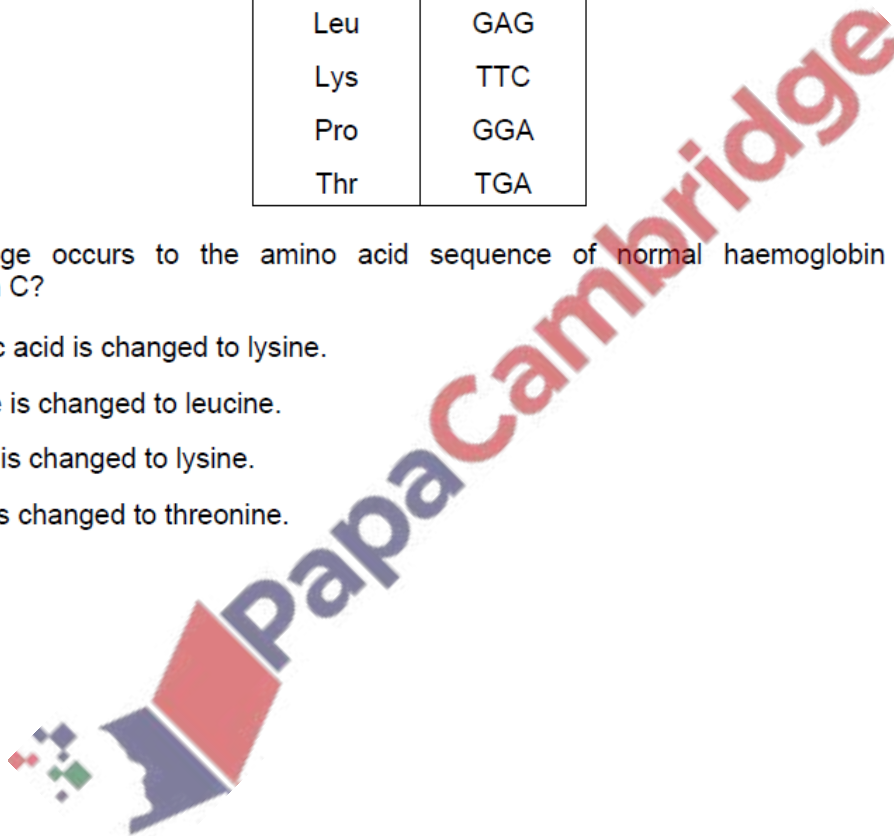
CAC GTG GAC TGA GGA TTC CTC TTC

Some of the DNA triplets that code for the amino acids are listed in the table.

amino acid	DNA triplet
Glu	CTC
His	GTG
Leu	GAG
Lys	TTC
Pro	GGA
Thr	TGA

Which change occurs to the amino acid sequence of normal haemoglobin to make it haemoglobin C?

- A Glutamic acid is changed to lysine.
- B Histidine is changed to leucine.
- C Leucine is changed to lysine.
- D Proline is changed to threonine.



12. June/2022/Paper_21/No.6

The sinoatrial node, atrioventricular node and the Purkyne tissue have important roles in the cardiac cycle.

(a) State the precise location in the heart of the sinoatrial node.

..... [1]

(b) State the part of the cardiac cycle that is directly initiated by the wave of excitation sent out by the sinoatrial node.

..... [1]

(c) Part of the control of the cardiac cycle involves the contraction of the ventricle walls after the walls of the atria have finished contracting.

Outline how this control is achieved.

.....
.....
.....
.....
..... [2]

(d) Name the valves of the heart that **open** soon after the Purkyne tissue has received an impulse from the atrioventricular node.

..... [1]

[Total: 5]

