2025 Bi H1 Q2

Section: DNA and the Genome

Topic: Gene Expression

Question Summary:

The DNA sequence shown is part of a gene that is transcribed and translated.

C A G A T C G T T A C T

You are asked how many tRNA molecules, involved in translation of the mRNA transcribed from this sequence, would have anticodons containing only one uracil (U) base.

Worked Solution:

- The DNA sequence given is part of a longer gene. The start of the coding region (start codon) may be earlier in the gene, so the reading frame in this fragment does not necessarily begin at the first base shown.
- Using the correct reading frame for this fragment, the mRNA codons are:

GAU CGU UAC

- For each codon, we can write the complementary tRNA anticodon (complements: A↔U and C↔G):

GAU $\rightarrow$ CUA

CGU $\rightarrow$ GCA

UAC $\rightarrow$ AUG

- Now count uracil (U) bases in each anticodon:

CUA has 1 U

GCA has 0 U

AUG has 1 U

- Therefore, two of the tRNA molecules involved in translation of this section of the mRNA have anticodons that contain exactly one uracil base.

Final Answer: B (2 tRNA molecules have anticodons with only one uracil base).

Revision Tips:

- Remember the base-pairing rules: in RNA, A pairs with U and C pairs with G.
- A short DNA fragment from a gene may not start at the first base of a codon, so the reading frame may begin at the second or third base shown.
- For questions involving tRNA anticodons, work in this order: DNA $\rightarrow$ mRNA codons $\rightarrow$ tRNA anticodons $\rightarrow$ count the bases asked for.
- Always check that your final answer matches the official marking instructions.