**TRANSCRIPTION AND TRANSLATION**

You have the following bacterial DNA sequence that is going to make a short mRNA molecule.

TACTAAGAAGGATCATCGAGACCAACCCTTGTTAAATACACCCCCTCGTAGGTATTTCAACACAACCCTGATACAACT

What is the sequence of the mRNA that will be transcribed from this DNA?

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| DNA | T | A | C | T | A | A | G | A | A | G | G | A | T | C | A | T | C | G | A | G | A | C | C | A | A | C | C | C | T | T | G | T | T |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | A | A | A | T | A | C | A | C | C | C | C | C | T | C | G | T | A | G | G | T | A | T | T | T | C | A | A | C | A | C | A | A | C |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| DNA | C | C | T | G | A | T | A | C | A | A | C | T |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Convert the RNA sequence to codons, and using the genetic code on the last page, translate the codons into amino acids

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| CODON |  |  |  |  |  |  |  |  |  |  |  |
| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |
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| CODON |  |  |  |  |  |  |  |  |  |  |  |
| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |
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| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |

**POINT MUTATIONS**

One type of mutation is a point mutation, where just a single nucleotide is changed.

How would the following mutation affect your protein? (the changed nucleotide is underlined, all others are the same).

TACTAGGAAGGATCATCGAGACCAACCCTTGTTAAATACACCCCCTCGTAGGTATTTCAACACAACCCTGATACAACT

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| DNA | T | A | C | T | A | G | G | A | A | G | G | A | T | C | A | T | C | G | A | G | A | C | C | A | A | C | C | C | T | T | G | T | T |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | A | A | A | T | A | C | A | C | C | C | C | C | T | C | G | T | A | G | G | T | A | T | T | T | C | A | A | C | A | C | A | A | C |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | C | C | T | G | A | T | A | C | A | A | C | T |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Convert the RNA sequence to codons, and using the genetic code on the last page, translate the codons into amino acids

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| CODON |  |  |  |  |  |  |  |  |  |  |  |
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| CODON |  |  |  |  |  |  |  |  |  |  |  |
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| CODON |  |  |  |  |  |  |  |  |  |  |  |
| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |

Do you think this would majorly affect the function of your protein? Why?

**POINT MUTATIONS**

One type of mutation is a point mutation, where just a single nucleotide is changed.

How would the following mutation affect your protein? (the changed nucleotide is underlined, all others are the same).

TACTAAGAAGGATCATCGAGACCAAC**T**CTTGTTAAATACACCCCCTCGTAGGTATTTCAACACAACCCTGATACAACT

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| DNA | T | A | C | T | A | A | G | A | A | G | G | A | T | C | A | T | C | G | A | G | A | C | C | A | A | C | T | C | T | T | G | T | T |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | A | A | A | T | A | C | A | C | C | C | C | C | T | C | G | T | A | G | G | T | A | T | T | T | C | A | A | C | A | C | A | A | C |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | C | C | T | G | A | T | A | C | A | A | C | T |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Convert the RNA sequence to codons, and using the genetic code on the last page, translate the codons into amino acids

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| CODON |  |  |  |  |  |  |  |  |  |  |  |
| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |
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| CODON |  |  |  |  |  |  |  |  |  |  |  |
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| CODON |  |  |  |  |  |  |  |  |  |  |  |
| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |

Do you think this would majorly affect the function of your protein? Why?

**FRAMESHIFT MUTATIONS**

Frameshift mutations are caused by additions or deletions of nucleotides.

How would the following addition change your protein? (addition is underlined).

TACTACTAAGAAGGATCATCGAGACCAACCCTTGTTAAATACACCCCCTCGTAGGTATTTCAACACAACCCTGATACAACT

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| DNA | T | A | C | T | A | C | T | A | A | G | A | A | G | G | A | T | C | A | T | C | G | A | G | A | C | C | A | A | C | T | C | T | T |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | G | T | T | A | A | A | T | A | C | A | C | C | C | C | C | T | C | G | T | A | G | G | T | A | T | T | T | C | A | A | C | A | C |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | A | A | C | C | C | T | G | A | T | A | C | A | A | C | T |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Convert the RNA sequence to codons, and using the genetic code on the last page, translate the codons into amino acids

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| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |

Do you think this would majorly affect the function of your protein? Why?

**FRAMESHIFT MUTATIONS**

Frameshift mutations are caused by additions or deletions of nucleotides.

How would the following addition change your protein? (addition is underlined). Do you think this would majorly affect the function of your protein?

TACTAAGAAGGATCATCGAGACCAACCCCTTGTTAAATACACCCCCTCGTAGGTATTTCAACACAACCCTGATACAACT

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| DNA | T | A | C | T | A | A | G | A | A | G | G | A | T | C | A | T | C | G | A | G | A | C | C | A | A | C | C | C | C | T | T | G | T |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | T | A | A | A | T | A | C | A | C | C | C | C | C | T | C | G | T | A | G | G | T | A | T | T | T | C | A | A | C | A | C | A | A |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | C | C | C | T | G | A | T | A | C | A | A | C | T |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Convert the RNA sequence to codons, and using the genetic code on the last page, translate the codons into amino acids

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| CODON |  |  |  |  |  |  |  |  |  |  |  |
| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |

**FRAMESHIFT MUTATIONS**

Frameshift mutations are caused by additions or deletions of nucleotides.

How would the following addition change your protein? (deletion is in parentheses). Do you think this would majorly affect the function of your protein?

TACTAAGAAGGATCATCGAGACCAACCCTTGTTAAATACACCCCCTCGTAGGTATTTCAACACAACCCTGAT(ACA)ACT

What is the sequence of the mRNA that will be transcribed from this DNA?

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| DNA | T | A | C | T | A | A | G | A | A | G | G | A | T | C | A | T | C | G | A | G | A | C | C | A | A | C | C | C | T | T | G | T | T |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | A | A | A | T | A | C | A | C | C | C | C | C | T | C | G | T | A | G | G | T | A | T | T | T | C | A | A | C | A | C | A | A | C |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | C | C | T | G | A | T | A | C | T |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Convert the RNA sequence to codons, and using the genetic code on the last page, translate the codons into amino acids

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| CODON |  |  |  |  |  |  |  |  |  |  |  |
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| CODON |  |  |  |  |  |  |  |  |  |  |  |
| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |

Do you think this would majorly affect the function of your protein? Why?

**FRAMESHIFT MUTATIONS**

Frameshift mutations are caused by additions or deletions of nucleotides.

How would the following addition change your protein? (deletion is in parentheses).

TACTAAGAAGGATCA(T)CGAGACCAACCCTTGTTAAATACACCCCCTCGTAGGTATTTCAACACAACCCTGATACAACT

What is the sequence of the mRNA that will be transcribed from this DNA?

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| DNA | T | A | C | T | A | A | G | A | A | G | G | A | T | C | A | C | G | A | G | A | C | C | A | A | C | C | C | T | T | G | T | T | A |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | A | A | T | A | C | A | C | C | C | C | C | T | C | G | T | A | G | G | T | A | T | T | T | C | A | A | C | A | C | A | A | C | C |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |
| DNA | C | T | G | A | T | A | C | A | A | C | T |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RNA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Convert the RNA sequence to codons, and using the genetic code on the last page, translate the codons into amino acids

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| CODON |  |  |  |  |  |  |  |  |  |  |  |
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| CODON |  |  |  |  |  |  |  |  |  |  |  |
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| CODON |  |  |  |  |  |  |  |  |  |  |  |
| AminoAcid |  |  |  |  |  |  |  |  |  |  |  |

Do you think this would majorly affect the function of your protein? Why?

