Cracking the Final Code

Are mutations always considered to be harmful to organisms? Justify your reasoning with examples from the lesson.

Below is the “code” from a previous mission, along with the scrambled code. Analyze the code, determine what mutation was used to scramble it, and state how you know.

ATCGAATCCGGCATTATGCGC

ATCGAATCCGGCATTAGCGC

Challenge!

Another spy has questioned your codebreaking skills. They’ve given you a DNA sequence to translate and transcribe, then mutate with a nonsense mutation. Time to show who’s the best spy around! As an added show of your abilities, tell your spy friend how the mutation will affect a protein.

GCATCCATACTAGGCCTA

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Key

Are mutations always considered to be harmful to organisms? Justify your reasoning with examples from the lesson.

Answers from students should state that mutations are not always harmful, but sometimes beneficial and often do not affect organisms. The students can use examples from the Explore portion of the lesson or from Elaborate, where they investigated mutations such as those that make dog fur wrinkly or give people red hair.

Below is the “code” from a previous mission, along with the scrambled code. Analyze the code, determine what mutation was used to scramble it, and state how you know.

ATCGAATCCGGCATTATGCGC

ATCGAATCCGGCATTAGCGC

A frameshift mutation, specifically a deletion, was used to scramble the code. The last T from the original DNA strand is missing.

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|  |  |
| --- | --- |
| DNA Sequence | GCA TCC ATA CTA GGC CTA |
| Transcribed DNA to RNA | CGU AGG UAU GAU CCG GAU |
| Translated RNA to Amino Acids | Arg Arg Tyr Asp Pro Asp |

Answers may vary depending on student interpretation, but nonsense mutations result in the formation of a STOP codon. The mutation should cause UAA or UGA to be produced. The most likely answer will be the students through UAU into UGA or UAA. The formation of a STOP codon in the mutation will result in the protein not forming correctly as the amino acid chain will not be completely created by the ribosome.