

Determining the Traits of a “Mystery Organism” Through Protein Synthesis

Introduction:

Genes determine what characteristics an organism will have. Genes are segments of DNA molecules that determine what proteins the cell will make. The sequence of nucleotides in DNA determines the sequence of amino acids in the proteins. In a process called transcription, which takes place in the nucleus of the cell, messenger RNA (mRNA) is made from DNA and carries the instructions for how to make certain proteins. These instructions must be taken to the ribosomes where proteins are made. mRNA carries the instructions from the nucleus to the ribosomes. Once at the ribosome, transfer RNA (tRNA) reads the message, gathers the necessary amino acids, and brings them to the ribosome. The amino acids are lined up, and connected together by peptide bonds to form a protein. This process is known as translation.

In this lab, you will be creating a “mystery organism”. You must determine which proteins must be made to produce your mystery organism. You will be simulating the process of protein synthesis to determine the traits this organism will inherit. Your mystery organism belongs to the Animal Kingdom. It is made up of 6 different genes (A, B, C, D, E, and F). Each of these genes is responsible for a certain trait.

Purpose:

1. To see how the genes on a chromosome determine the characteristics of an organism.
3. To simulate transcription and translation from a DNA template.

Materials: Colored Pencils Paper

Safety Precautions: None

Procedure:

Procedure is omitted in this preview.

Amino Acid	Codons for this Amino Acids
Alanine	GCA, GCC, GCG, GCU
Arginine	AGA, AGG, CGA, CGC, CGG, CGU
Asparagine	AAC, AAU
Aspartic Acid	GAC, GAU
Cysteine	UGC, UGU
Glutamic Acid	GAA, GAG
Glutamine	CAA, CAG
Glycine	GGA, GGC, GGG, GGU
Histidine	CAC, CAU
Isoleucine	AUA, AUC, AUU
Leucine	UUA, UUG, CUA, CUC, CUG, CUU
Lysine	AAA, AAG
Initiator - Methionine	AUG
Phenylalanine	UUC, UUU
Proline	CCA, CCC, CCG, CCU
Serine	AGC, AGU, UCA, UCC, UCG, UCU
Threonine	ACA, ACC, ACG, ACU
Tryptophan	UGG
Tyrosine	UAC, UAU
Valine	GUA, GUC, GUG, GUU
Stop Codons	UAA, UAG, UGA

4. To determine what traits are present in your mystery organism, refer to the table below. Use the amino acid sequences from your data table to determine what characteristic is being called for.

AMINO ACID SEQUENCE	TRAIT
Alanine – Histidine – Lysine	Walks on four legs
Proline – Serine – Phenylalanine – Glycine	Freckles
Tryptophan – Proline – Isoleucine	Walks upright on two legs
Serine – Tryptophan – Lysine	Small purple ears
Cysteine – Alanine	Blue hair, very hairy
Arginine – Histidine – Threonine	Yellow eyes
Histidine – Valine	Very little red hair
Alanine – Glycine – Proline – Serine	No Freckles
Serine – Lysine	Short orange nose
Lysine – Leucine	Long red nose
Tyrosine – Isoleucine – Aspartic Acid	Blue eyes
Proline – Alanine – Alanine	Green elephant ears

The completed document contains 7 pages.