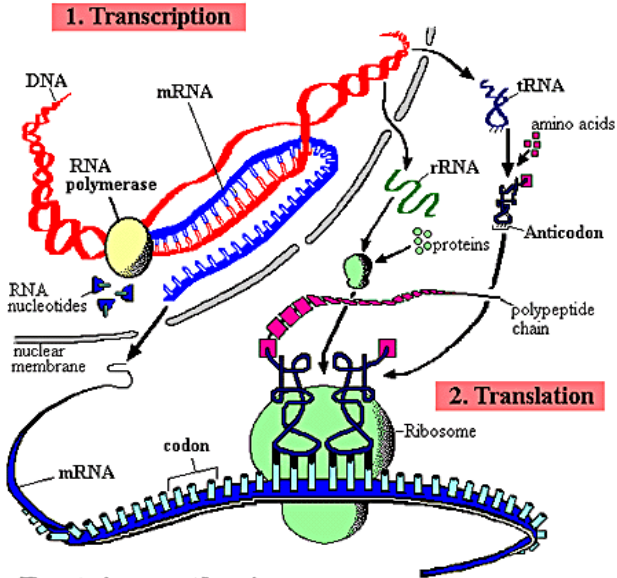


Simulating Protein Synthesis Name _____

Background

Genes are the units that determine inherited characteristics, such as hair color, blood type, and the ability to roll the tongue. Genes are lengths of DNA molecules consisting of four nucleotides; Adenine (A), Thymine (T), Cytosine (C), and Guanine (G). The sequence of these nucleotides determine the order of amino acids being linked together, thus ultimately assembling the structure for a specific polypeptide (one chain) or protein (one or more chains linked together). Below you will find a guide to show you how all of this takes place.



Protein synthesis

Transcription

- takes place in the nucleus
- messenger RNA (mRNA) is made from the DNA strand

Translation

- takes place at the ribosome
- mRNA codons are read and the corresponding transfer RNA (tRNA) carries the amino acid to be added to the polypeptide chain

We love DNA! Made of Nucleotides ...

Conclusion and Analysis:

Re-read the pre-activity background section before answering the questions.

- 1) Genes are the units that determine inherited characteristics such as hair color and blood type. Genes are pieces of _____ that determine the structure of proteins.
- 2) What is a polypeptide?
- 3) List the units from smallest to biggest: amino acid, nucleotide, protein, polypeptide (Think about this, don't try to use the picture...it's not to scale.)
- 4) Transcription takes place in the _____ of the cell where _____ copies the DNA strand to make mRNA. The mRNA carries this information to the _____ where protein synthesis takes place.
- 5) The mRNA code is read by the ribosomes where _____'s arrive and carry amino acids to build the _____ chain. This process is called _____.
- 6) What do genes code for (create) in an organism?
- 7) Does gene size vary? Fill in the data table to show your point.

Gene	A	B	C	D	E	F
# of triplets (codons)						
Trait	Hair	# of Legs	Freckles	Skin Color	Nose Size	Sex

Use your text or class notes to look up the following:

- 8) What is a codon? What does mRNA codon code for?
- 9) What is an anticodon? What part of the cell can they be found?
- 10) What is a trait? How many traits are shown by your CHNOPS?

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Determining Traits by Using the Code for Life ... DNA!

Activity

In this investigation you will simulate the mechanism of protein synthesis and thereby determine the traits inherited by fictitious organisms called CHNOPS. CHNOPS, whose cells contain only one chromosome, are members of the kingdom Animalia. A CHNOPS chromosome is made up of six genes (A, B, C, D, E, F), each of which is responsible for a certain trait. CHNOPS usually make sounds like “shnarf-shnarf.”

Use the information in the data tables to figure out the traits of the CHNOPS. DNA template strands (“sense” strands) are shown below.

Gene A	Gene B	Gene C
DNA Compl. _____ DNA template ACC GGT TAT mRNA _____ tRNA _____	DNA Compl. _____ DNA template AGC CGA mRNA _____ tRNA _____	DNA Compl. _____ DNA template TTT AAC mRNA _____ tRNA _____
a.a. sequence _____	a.a. sequence _____	a.a. sequence _____
trait _____	trait _____	trait _____
Gene D	Gene E	Gene F
DNA Compl. _____ DNA template GGA CGC CGA mRNA _____ tRNA _____	DNA Compl. _____ DNA template GGG AGG AAA CCC mRNA _____ tRNA _____	DNA Compl. _____ DNA template TCC CAG ATC mRNA _____ tRNA _____
a.a. sequence _____	a.a. sequence _____	a.a. sequence _____
trait _____	trait _____	trait _____

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CHNOPS Traits

amino acid sequence	trait
Trp – Pro – Ile	hairless
Trp – His – Ile	hairy
Arg – Val	male
Arg – Glu	female
Ser – Ala	4-legged
Leu – Ser – Phe – Gly	long nose
Pro – Ser – Phe – Gly	short nose
Lys – Phe	no freckles
Lys – Leu	freckles
Pro – Ala – Ala	blue skin
Pro – Ala – Asp	orange skin
Tyr – Tyr – Val	plump
Tyr – Tyr – Phe	skinny

Sketch your CHNOPS creature here:

We love DNA! Made of Nucleotides ...