

Experiment: Simulating Protein Synthesis  
(B. Science 10-12-3e)

Purpose: To simulate the mechanism of protein synthesis and thereby determine the traits inherited by a fictitious organism called CHNOPS.

Materials: brain pencils (blue, orange)

Methods:

1. To determine the trait for Gene A of your CHNOPS (fictitious organism), fill in the information in the box labeled Gene A in the data table. Notice the sequence of nucleotides in DNA. On the line provided, write the sequence of nucleotides of m RNA that are complementary to DNA.

- In order to determine the sequence of amino acids, match each m RNA triplet codon with the specific amino acid in figure 1. Using a - (hyphen) to separate each amino acid number, record this information in the appropriate place in the data table.
- Using figure 2, find the trait that matches the amino acid sequence. Record this information in the appropriate place in the data table.
- Repeat steps 1 through 3 for the remaining genes (B through F)
- Using all the inherited traits, sketch your CHNOPS in the space provided.

m RNA triplet	AA number	AA sequence	trait
UGG	20	20-11-13	hairless
UCC	16	20-12-13	hairy
GCU	2	20-21-21	plump
UUG	4	13-14-15	skinny
GCG	3	16-2	4-legged
CCC	5	12-7-8-1	long nose
UCG	7	5-7-8-1	short nose
UUU	8	9-8	no freckles
AAA	9	9-4	freckles
CCA	12	11-3-2	blue skin
AUA	13	11-3-3	orange skin
GGG	1	6-6-10	male
UAG	6	6-6-14	female
GAU	10		
CCU	11		

Results:

Gene A			Gene B			Gene C		
DNA	ACC	GGT TAT	IDNA	AGG	CGA	IDNA	TTT	AAC
RNA	_____	_____	IRNA	_____	_____	IRNA	_____	_____
AA	_____	_____	IAA	_____	_____	IAA	_____	_____
trait	_____	_____	Itrait	_____	_____	Itrait	_____	_____

Porkc

Gene D				Gene E				Gene F				
DNA	GGA	CGC	CGA	DNA	ATC	ATC	CTA	DNA	GGG	AGC	AAA	CCC
RNA	_____	_____	_____	RNA	_____	_____	_____	RNA	_____	_____	_____	_____
AA	_____	_____	_____	AA	_____	_____	_____	AA	_____	_____	_____	_____
trait	_____	_____	_____	trait	_____	_____	_____	trait	_____	_____	_____	_____

sketch (keep sketch appropriate)

Conclusions:

1. Distinguish between translation and transcription.

2. What is the specific site for transcription and translation in the cell?  
transcription

translation

- How many m RNA nucleotides form a codon?
- How was the m RNA formed?
- Which organelle of the cell are protein molecules formed?

Discussion:

- Suppose you knew the makeup of a specific protein in a cell. How would you determine the particular DNA code that coded for them?
- How could one change (switching a base, not deleting) in a DNA nucleotide alter the formation of the translated protein? (An example would be the difference between normal and sickle-cell hemoglobin).
- What is the role of DNA in protein synthesis?
- What is the role of m RNA in protein synthesis?
- How do DNA replication and DNA transcription differ?
- How would the addition of one more DNA nucleotide (than what is normally there) alter the formation of the translated protein?
- 7a. Read Psalm 139:13. This text suggest that God is even in control of transcription of DNA in a certain phase of our life. Write out the portion of the text that makes this suggestion.
- 7b. Read I Cor. 15: 51 - 54 and record a possible time in our life where God will supernaturally intervene and change our DNA, as well as alter the transcription process in our cells?