

Alien DNA

Overview: This paper based central dogma simulation has students transcribe mRNA, decode the amino acid sequence and connect sequences to simulated 'alien traits'. Students then draw and compare the traits in the class developed 'alien' population. Teachers are cautioned to remind students that in actuality, genes are much longer than the short sequences used in this activity.

Adapted from AHSGE activity by Kim Miller, Fairhope High School, Fairhope, AL.

Materials:

Copies of Alien DNA handout (four options are included O- III)

Copies of Alien DNA Student Directions

Paper/Markers/Colored pencils- to draw aliens or materials to construct aliens, such as:

- Half sheets of construction paper for background to glue alien body to
- Glue and Scissors
- Green and Blue colored paper – to cut alien body from
- Googly eyes or beads – for eyes
- Cut segments of pipe cleaners – for limbs or antennae
- Cut segments of straws – for limbs or antennae
- Paper hole punches for spots
- Easter grass clippings – for hair

Suggestions:

1. Write the DNA sequence for "plump" or "skinny" on the board and use as an introduction to the activity. Provide students with the activity directions and ask them to determine the trait that the DNA sequence (gene) on the board codes for. Provide help where needed. When students are comfortable, give each student an Alien DNA handout and have them begin their work on Part A. Instruct students to record their Alien DNA number on their papers.
2. The traits "plump" or "skinny" are not included in any of the alien DNA sequences (genes) that students receive so that these genes can be used as examples for introducing the lesson. Thus, students must decode six genes on their own. Students have the freedom to choose the shape/size of their aliens. Warn them to make it school appropriate!
3. Remind students to abbreviate the names of the amino acids by using the first three letters of its name.
4. For Part B, students are given the trait and must work backwards to determine the DNA. Because there are multiple codons for most amino acids, students may get "stuck" when they reach the mRNA step. Use this teachable moment to illustrate the flexibility in the 'code' and ask students to predict the impact of having multiple codes for a single amino acid. You may want to demonstrate Part B on the board using the trait "plump" or "skinny".

Student Directions:

Part A

1. Write the mRNA base sequence that would be transcribed from the DNA sequence provided for each gene.
2. Use a codon chart and list the amino acids that the mRNA codes for. (Remember amino acids linked together form proteins.)
3. Use the chart on this page to find the trait that each amino acid sequence (protein) determines.
4. "Build" an alien that has the traits your DNA coded for using provided materials.

Amino Acid Sequence	Trait
Cys-pro-iso	Hairless
Try-pro-iso	Hairy
Try-gly-gly	Plump
Iso-pro-phe	Skinny
Arg-ala	Four-limbs & four eyes
Arg-glu	Three-limbs & three eyes
Pro-ser-phe-gly	Long nose
Glu-ser-phe-gly	Short nose
Lys-phe	No spots
Lys-leu	Spots
Pro-ser-ala	Blue skin
Pro-ser-ser	Green skin
Thr-thr-asp	Antennae (2)
Thr-thr-pro	No antennae

Part B

Using your charts, work backwards from the trait given to find the amino acids, mRNA, and DNA for each trait listed.

Part C

Answer the questions in complete sentences.

Name _____
 DNA _____
 Date _____

Alien
 0

Part A

Data Table 1:

Gene A	Gene B	Gene C
DNA- ACCGGTTAT	DNA-GCACGA	DNA- TTTAAC
mRNA-	mRNA-	mRNA-
Amino Acids-	Amino Acids-	Amino Acids-
Trait-	Trait-	Trait-
Gene D	Gene E	Gene F
DNA- GGAAGACGA	DNA- CTTAGGAAACCC	DNA- TGTTGTCTA
mRNA-	mRNA-	mRNA-
Amino Acids-	Amino Acids-	Amino Acids-
Trait-	Trait-	Trait-

Part B

Data Table 2:

Gene A	Gene B	Gene C
Trait-Hairless	Trait- 3 limbs	Trait- No spots
Amino Acids	Amino Acids	Amino Acids
mRNA-	mRNA-	mRNA-
DNA-	DNA-	DNA-
Gene D	Gene E	Gene F
Trait- Green skin	Trait- Plump	Trait- No antennae
Amino Acid -	Amino Acid -	Amino Acid -
mRNA-	mRNA-	mRNA-
DNA-	DNA-	DNA-

Part C

Questions:

1. Explain the role of transcription and translation in building the proteins for your alien.
2. The proteins determined the _____ of your alien.
3. What molecules bring amino acids to the ribosomes during protein production?
4. How many tRNA molecules would be involved in building Protein A of Part A? List their anticodons.
5. What would happen to the protein for alien skin color if the DNA sequence was changed from GGATCAAGA to GGATCACGA?
6. In the above situation, what type of mutation occurred?

Name _____
 DNA _____
 Date _____

Alien

I.

Part A

Data Table 1:

Gene A	Gene B	Gene C
DNA- ACC GGT TAT	DNA-GCACTT	DNA- TTTAAA
mRNA-	mRNA-	mRNA-
Amino Acids-	Amino Acids-	Amino Acids-
Trait-	Trait-	Trait-
Gene D	Gene E	Gene F
DNA- GGAAGAAGA	DNA- GGTAGGAAACCC	DNA - TGTTGTCTA
mRNA-	mRNA-	mRNA-
Amino Acids-	Amino Acids-	Amino Acids-
Trait-	Trait-	Trait-

Part B

Data Table 2:

Gene A	Gene B	Gene C
Trait-Hairy	Trait- 4 limbs	Trait- Spots
Amino Acids	Amino Acids	Amino Acids
tRNA-	tRNA-	tRNA-
mRNA-	mRNA-	mRNA-
DNA-	DNA-	DNA-
Gene D	Gene E	Gene F
Trait- Blue Skin	Trait- Skinny	Trait- No antennae
Amino Acids –	Amino Acids -	Amino Acids-
mRNA-	mRNA-	mRNA-
DNA-	DNA-	DNA-

Part C

Questions:

1. Explain the role of transcription and translation in building the proteins for your alien.
2. The proteins determined the _____ of your alien.
3. What molecules bring amino acids to the ribosomes during protein production?
4. How many tRNA molecules would be involved in building Protein A of Part A? List their anticodons.
5. What would happen to the protein for alien skin color if the DNA sequence was changed from GGATCAAGA to GGATCACGA?
6. In the above situation, what type of mutation occurred?

Name _____
 DNA _____
 Date _____

Alien

II.

Part A

Data Table 1:

Gene A	Gene B	Gene C
DNA- ACCGGATAT	DNA- GCACTT	DNA- TTTAAC
mRNA-	mRNA-	mRNA-
Amino Acids-	Amino Acids-	Amino Acids-
Trait-	Trait-	Trait-
Gene D	Gene E	Gene F
DNA- GGAAGAAGA	DNA- GGTAGGAAACCC	DNA- TGTTGTCTA
mRNA-	mRNA-	mRNA-
Amino Acids-	Amino Acids-	Amino Acids-
Trait-	Trait-	Trait-

Part B

Data Table 2:

Gene A	Gene B	Gene C
Trait- Hairy	Trait- 4 limbs	Trait- no spots
Amino Acids –	Amino Acids -	Amino Acids -
mRNA-	mRNA-	mRNA-
DNA-	DNA-	DNA-
Gene D	Gene E	Gene F
Trait- plump	Trait- green skin	Trait- no antennae
Amino Acids	Amino Acids	Amino Acids
mRNA-	mRNA-	mRNA-
DNA-	DNA-	DNA-

Part C

Questions:

1. Explain the role of transcription and translation in building the proteins for your alien.
2. The proteins determined the _____ of your alien.
3. What molecules bring amino acids to the ribosomes during protein production?
4. How many tRNA molecules would be involved in building Protein A of Part A? List their anticodons.
5. What would happen to the protein for alien skin color if the DNA sequence was changed from GGATCAAGA to GGATCACGA?
6. In the above situation, what type of mutation occurred?

Name _____
DNA _____
Date _____

Alien

III.

Part A

Data Table 1:

Gene A	Gene B	Gene C
DNA- ACCGGATAT	DNA-GCACGA	DNA- TTTAAC
mRNA-	mRNA-	mRNA-
Amino Acids-	Amino Acids-	Amino Acids-
Trait-	Trait-	Trait-
Gene D	Gene E	Gene F
DNA- GGAAGACGA	DNA- CTTAGGAAACCC	DNA- TGTTGTGGC
mRNA-	mRNA-	mRNA-
Amino Acids-	Amino Acids-	Amino Acids-
Trait-	Trait-	Trait-

Part B

Data Table 2:

Gene A	Gene B	Gene C
Trait- Hairy	Trait- 3 Limbs	Trait- No spots
Amino Acid -	Amino Acid -	Amino Acid -
mRNA-	mRNA-	mRNA-
DNA-	DNA-	DNA-
Gene D	Gene E	Gene F
Trait- Green skin	Trait- No antennae	Trait- Skinny
Amino Acids-	Amino Acids-	Amino Acids-
mRNA-	mRNA-	mRNA-
DNA-	DNA-	DNA-

Part C

Questions:

1. Explain the role of transcription and translation in building the proteins for your alien.
2. The proteins determined the _____ of your alien.
3. What molecules bring amino acids to the ribosomes during protein production?
4. How many tRNA molecules would be involved in building Protein A of Part A? List their anticodons.
5. What would happen to the protein for alien skin color if the DNA sequence was changed from GGATCAAGA to GGATCACGA?
6. In the above situation, what type of mutation occurred?