**Bug Lab Project**

**Purpose:**

To create an “original bug” by transcribing and translating its DNA code. Your “bug” must be genetically correct according to the code you are assigned. All other creative embellishments are allowed (see your actual project packet for your options). No matter which option you choose to represent your finished “bug”, be sure that your “bug” ACCURATELY MATCHES the DNA code you are assigned.

**Protein Synthesis: Transcribing and Translating the DNA Code**

**Coded traits: Circle the trait that your DNA codes for**

Start Codon: AUG Methionine

1. Wing

Lysine, Arginine = smooth wing

Lysine, Serine = wrinkled wing

2. Eye color

Asparagine, Arginine = red eye

Asparagine, Serine = other color

3. Abdomen shape

Phenylalanine, Tyrosine = circle

Phenylalanine, Cysteine = square

4. Thorax coloring

Leucine, Proline = striped thorax

Leucine, Histidine = solid color thorax

5. Head Shape

Isoleucine, Aspartic acid = pointed head

Isoleucine, Asparagine = rounded head

6. Antennae

Proline, Glycine = straight antennae

Proline, Glutamic acid = wavy antennae

7. Leg length

Tryptophan, Histidine = long legs

Tryptophan, Phenylalanine = short legs

8. Thorax shape

Valine, Glutamine = elongated thorax

Valine, Methionine = square thorax

9. Leg hair

Alanine, Glycine = hairy legs

Alanine, Cysteine = smooth legs

10. Voice

Lysine, Leucine = chirp voice

Lysine, Methionine = peep voice

11. Stinger

Threonine, Valine = stinger

Threonine, Trytophan = no stinger

12. Feet and claws

Cysteine, Histidine = feet with claws

Cysteine, Asparagine = feet, no claws

13. Wing coloration

Glycine, Arginine = spotted wings

Glycine, Isoleucine = striped wings

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DNA Codes

Cut out and give to students!

1. TACTTTGCATTAGCAAAAACAGACGGT

TATCTAGGGCCCACCGTGCAGTACCGACC

GTTTTACTGCACCACGTTGCCTTAGATT

2. TACTTCTCATTGAGCAAGACGGACGTG

TATTTGGGCCTCACCAAGCACTACCGCACG

TTCTACTGCACCACGTTGCCCTATATC

3. TACTTTGCTTTGGCCAAAATAGAAGGA

TAACTAGGACCAACCGTACAGGTTCGACCA

TTTGATTGACATACAGTACCAGCGACT

4. TACTTCGCGTTGAGTAAAATGGAAGGGTAT

CTGGGCCCTACCGTACATTACCGTTTT

TTCAACTGGATAACGTTACCGTAGTAA

5. TACTTTAGCTTAGCAAAAACGGAAGGGT

AACTAGGGCCCACCAAGCATGTTCGTACG

TTCGATTGTACCACAGTGCCATAGATC

6. TACTTTGCATTAGCAAAAACAGACGGGT

ATCTAGGGCCCACCGTGCAGTACCGACCG

TTTTACTGCACCACGTTGCCTTAGATT

7. TACTTCTCATTGAGCAAGACGGACGTGT

ATTTGGGCCTCACCAAGCACTACCGCACG

TTCTACTGCACCACGTTGCCCTATATC

8. TACTTTGCTTTGGCCAAAATAGAAGGAT

AACTAGGACCAACCGTACAGGTTCGACCA

TTTGATTGACATACAGTACCAGCGACT

9. TACTTCGCGTTGAGTAAAATGGATGTGTA

TCTGGGGCTCACCGTGCATGTCCGCCCATT

TTACTGGCAGACATTGCCTGCTATT

10. TACTTTAGCTTAGCAAAAACGGAAGGG

TAACTAGGGCCCACCAAGCATGTTCGTA

CGTTCGATTGTACCACAGTGCCATAGATC

**Bug Lab Project**

**Procedure:**

1) You will be given the DNA of your bug. When you receive this, paste the code into the following space:

Transcription: *Describe below; be sure to refer to mRNA, DNA, RNA polymerase, and codon*

2)Transcribe the above strand of DNA into the “language” of mRNA. Remember, RNA contains uracil instead of thymine.

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1. Now, go back and divide the above mRNA into codons (three bases each) using vertical lines.

Translation: *Describe below; refer to start codon, ribosome, tRNA, mRNA, amino acid, and anticodon*

4) Using the amino acid chart in your book, determine the name of the amino acid that each codon codes for. One specific amino acid can correspond to more than one codon. For this reason, the genetic code is said to be degenerate or redundant. Write the abbreviation of the amino acids (in their proper order) in the area below.

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5) Using the polypeptide chain (protein) made by the DNA of your bug, determine the particular coded traits your bug will express. Use the provided key to do this, writing below the traits your bug will have. Hint: All DNA codes given begin with AUG. To decipher which traits your bug will have, begin grouping the amino acids in groups of two after the start codon. For example, you will have either lysine, argine, OR lysine, serine coding for either a smooth wing or a wrinkled wing.

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6) Now, for your options! Pick one of the following options to represent the traits of your bug. You will present your bug to the class, so make sure that you pick the option that best showcases your strengths in completing this project! Have fun! Whichever option you select, you need to be sure you find a way to clearly represent *every one* of the traits your DNA coded for.

1. In a well-developed story, explain the traits of your bug. It may help to think about how your bug would interact with its environment (diet, habitat, personality) given its characteristics. You may want to tell us about something that has happened in this bug’s life, or in a typical “day in the life” of your bug.
2. With or without musical accompaniment, write and share a song or rap about the traits of your bug, Use your creativity to include other characteristics of your organism (habitat, diet, personality, etc.).
3. Get with another actor and discuss both of your bugs’ traits. Then, perform a skit as your bugs and show how these two bugs would interact with each other.
4. But wait! You’re not done yet! Transfer RNA is a single strand of RNA that loops back on itself. Each transfer RNA molecule has two important sites of attachment. One site, called the anticodon, binds to the codon on the messenger RNA molecule. The other site attaches to a particular amino acid. During protein synthesis, the anticodon of a transfer RNA molecule base pairs with the appropriate messenger RNA codon. On the lines below, indicate what the tRNA sequence would be for your bug. Use the mRNA that you decoded in #3 to do this.

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**Follow-Up Questions:**

1) Oxytocin is a hormone that helps to regulate blood pressure and stimulates the uterus to contract during childbirth. Following is a DNA sequence that could code for a part of a molecule of oxytocin. Write the sequence of mRNA codons that would result from the transcription of this portion of DNA. Then decipher the amino acid sequence.

DNA: ACA ATA TAG CTT TTG ACG GGG AAC CCC ATT

mRNA:

a.a. sequence:

2) Mutations arise when DNA is changed, deleted or added. We are going to delete one base in the above DNA. Decipher the rest.

DNA: ACA ATA AGC TTT TGA CGG GGA ACC CCA TTA

mRNA:

a.a. sequence:

3) Look at the amino acids that you deciphered in #2 and compare them to those from #1. How are they different? What effect might this have? (Remember what oxytocin is!)

4) If a mutation were to happen in the DNA of your bug, discuss briefly what effect this might have had on the outcome of the bug you created.