INTERNET ACTIVITY – DNA and Protein Synthesis

You will be visiting multiple websites. At each website, read the material and answer the questions that coincide with that section.

**Part 1: DNA and Protein Synthesis**

**Go to** <http://learn.genetics.utah.edu>

**Under Basic Genetics, select More about DNA and Genes. Then select Build a DNA Molecule Activity**

1. Draw the strand of DNA you created (letters only, both strands.) You will need to write down the bases as you drag them to the complementary base pair.

**Go BACK by clicking the back arrow. Then select More About Proteins and choose Transcribe and Translate a Gene**

Scroll down the page and read the information on transcription and translation. Then answer the questions below.

1. What is a gene?
   1. How many genes does the human genome contain?
2. In which organelle does transcription occur?
   1. What is the role of mRNA?
   2. Which base is thymine replaced by?
3. Where are proteins made?
   1. DESCRIBE what happens in translation.
   2. Identify the “start” codon.
   3. What are the 3 “stop” codons?
4. Now scroll back up to the top of the page. Transcribe and translate the DNA sequence (gene) given following the directions of the simulation. Then write down the amino acid sequence that makes up your protein.

**PART 2: Fireflies - Go back to More About Proteins and click on What makes a Firefly Glow?**

1. What does the *LUC* gene specify?
2. The RNA polymerase makes a copy of the *LUC* gene in what form?
   1. Once transcription is complete, where does the nRNA go next?
3. What is the cell’s protein-making machine?
4. What is being made through the string of amino acids?
5. What must happen in order for the *LUC* gene to become active?
6. In order for the firefly to produce visible light, how many luciferase enzymes must be produced at once?
7. What chemical does the luciferase seek to bind with?
8. What molecule is the luciferin combining with to form oxyluciferin?
9. Why does the firefly emit the light produced in this reaction?

**PART 3: DNA Game**

**Go to** <http://www.nobelprize.org/educational/medicine/dna_double_helix/> **and click on “Play DNA Game”.**

Read through the introduction. Once you get to the game portion, click on “Organism #1” The goal is to match the complementary mRNA base pairs on BOTH sides as fast as you can. DRAW and Fill out the table once you have completed each portion of the game.

***NOTE:***

1. ***You may find this hard but do your best!!***
2. ***Not all results are alike; your results may be different from your classmates.***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Organism # | How many chromosomes? | How many base pairs? | How many genes? | What is the organism? |
| # 1 |  |  |  |  |
| # 2 |  |  |  |  |
| # 3 |  |  |  |  |

**PART 4: MUTATIONS - Go to…..**

<http://lab.concord.org/embeddable.html#interactives/sam/DNA-to-proteins/4-mutations.json>

1. Click on the icon “Show DNA”
2. Then click the icon “Transcribe”
3. After a few moments, select “Translate” and then “Show Protein”.
4. Write the 11 amino acid sequence that makes up the protein….
5. Press the “reset” button. On the DNA strand, select any nitrogen base. This will bring up a menu of several different types of mutations.
   1. First select “Substitution Mutation” and repeat steps 2 and 3
   2. Write the new 11 amino acid sequence of the new protein
6. Press the “reset” button again. Select a different nitrogen base on the DNA strand then select the “Insertion Mutation” and repeat steps 2 and 3.
   1. Write the new 11 amino acid sequence of the new protein
7. Finally, repeat step 5 but select “Deletion Mutation”.
   1. Write the new 11 amino acid sequence of the new protein
8. Identify the differences AND similarities between each mutated protein compared to the original protein.