WEBQUEST – DNA and Protein Synthesis

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

PART 1: DNA and Protein Synthesis
Go to: http://learn.genetics.utah.edu. Under Genetics, select Molecules of Inheritance. Then select Build a DNA Molecule Activity.

1. In the space below, 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 to the Molecules of Inheritance page by clicking the back arrow. Then select Transcribe and Translate a Gene (on the right hand side under Central Dogma)

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

2. a. What is a gene? ____________________________________________________
   b. How many does the human genome contain? ___________________

3. a. In which organelle does transcription occur in? _________________
   b. What is the role of mRNA? _________________________________________________________
   c. Which base is thymine replaced by? __________________

4. a. Where are proteins made? __________________
   b. Briefly describe what happens in translation.

   c. Identify the “start” codon. ______________
   d. What are the 3 “stop” codons? ______________

5. 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 Molecules of Inheritance and click on What Makes a Firefly Glow?

6. What does the LUC gene specify? ___________________

7. a. The RNA polymerase makes a copy of the LUC gene in what form? ______________
   b. Once transcription is complete, where does the mRNA go next? ________________

8. What is the cell’s protein-making machine? ______________

9. What is the being make through the string of amino acids? ________________

10. What must happen in order for the LUC gene to become active?

11. In order for the firefly to produce visible light, how many luciferase enzymes must be produced at once? ___________

12. What chemical does the luciferase seek to bind with? ______________

13. What molecule is the luciferin combing with to form oxyluciferin? ________________

14. 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. Fill out the table below once you have completed each portion of the game.

Note:
1) You may find this hard but do your best!!
2) Your results may be different from other classmates

<table>
<thead>
<tr>
<th>Organism #</th>
<th>How many chromosomes?</th>
<th>How many base pairs?</th>
<th>How many genes?</th>
<th>What is the organism?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tbody>
</table>
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”.

Write the 11 amino acid sequence that makes up the protein on the line below:

4) Press the “reset” button. On the DNA strand, select any nitrogen base. This will bring up a menu of different types of mutations. First select “Substitution Mutation” and repeat steps 2 and 3.

Write the new 11 amino acid sequence of the new protein on the line below.

5) Press the “reset” button. Select a different nitrogen base on the DNA strand then select the “Insertion Mutation” and repeat steps 2 and 3.

Write the new 11 amino acid sequence of the new protein on the line below.

6) Finally, repeat step 5 but select “Deletion Mutation”.

Write the new 11 amino acid sequence of the new protein on the line below:

How similar/different were each protein compared to the original protein?