Amoeba Sisters Video Recap of Mutations: The Potential Power of a Small Change

Note: You will need an mRNA chart for many of these questions. If you don’t have one, they are easy to find online with your favorite search engine.

1. Mutations can be harmful, helpful (unlikely), or neutral in their effect. Often a neutral mutation will not change the amino acid that it codes for. Using your mRNA chart, give another mRNA codon that this CUU could mutate to and still code for Leucine.

The mRNA codon CUU could mutate to C________ and still code for Leucine, which could be a neutral mutation.

2. It is important to understand that in mutations, a specific part of a nucleic acid experiences the mutation. In the below cartoon, fill in the blank that describes the part of the DNA molecule that is experiencing the mutation. Then label where that part is found on the DNA in the picture below.

3. Even a gene mutation that is a point mutation, meaning it affects one nucleotide base, can still make a major change. Sickle Cell Anemia is caused by a point mutation known as a substitution. Complete the following example of a substitution:

If the following is for normal hemoglobin:

<table>
<thead>
<tr>
<th>PORTION OF HEMOGLOBIN DNA</th>
<th>GGA CTC CTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>mRNA</td>
<td>CCU GAG GAG</td>
</tr>
<tr>
<td>Amino Acids</td>
<td>Proline-Glutamic Acid-Glutamic Acid</td>
</tr>
</tbody>
</table>

Show what would occur if the first T (“thymine”) DNA base in the portion shown above mutated to an A (“adenine”). Sickle Cell Hemoglobin:

Portion of mutated hemoglobin DNA: ______________________

mRNA: __________________________________________________

Amino Acids: ____________________________________________

4. An insertion or deletion can result in a frameshift mutation. To demonstrate this, complete the following:

Normal Strand:

DNA: GCA ATG CAC
mRNA: __________________________________________
Amino Acids: ______________________________________

Deletion (causing a frameshift):

Taking out the first “G” in the original DNA above results in:

DNA: CAA TGC AC
mRNA: ___________________________
Amino Acids: _______________________

How did the frameshift change the amino acids that were coded?
_________________________________________
What do you remember about mutations?

For the following, place an “X” if it is true statement.

_____ Mutations are random.  
_____ Mutations are mostly beneficial and useful for an organism.  
_____ Mutations can occur in both DNA and RNA.  
_____ Mutations can only occur during interphase.  
_____ Not all DNA codes for proteins.  
_____ Not all genes are “turned on” or activated.  
_____ Substitution mutations typically result in frameshift.  
_____ Mutations can be genetically inherited.

Illustrate That Chromosome Mutation

Sketch your own cartoon for the following chromosome mutations. Creativity is encouraged!

<table>
<thead>
<tr>
<th>Duplication</th>
<th>Deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inversion</td>
<td>Translocation</td>
</tr>
</tbody>
</table>