Fishy Code Slips

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Fish 1 GGTTATAGAGGTACTACC

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Fish 2 GGCTTCAGAGGTACTACC

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Fish 3 CATAGCAGAGGTACTACC

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Fish 4 GGTTATTCTGTCTTTATTG

----------------------------------
Fish 5 GGCTTCTCTGTCTTTATTG

----------------------------------
Fish 6 CATAGCGCTGCAACTACC
<table>
<thead>
<tr>
<th>Codon</th>
<th>Amino Acid</th>
<th>Codon</th>
<th>Amino Acid</th>
<th>Codon</th>
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<td>Ser</td>
<td>UAU</td>
<td>Tyr</td>
<td>UGU</td>
<td>Cys</td>
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<tr>
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<td>Ser</td>
<td>UAC</td>
<td>Tyr</td>
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<td>Ser</td>
<td>UAA</td>
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<td>UGA</td>
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<td>Leu</td>
<td>UCG</td>
<td>Ser</td>
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<td>UGG</td>
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<td>CCU</td>
<td>Pro</td>
<td>CAU</td>
<td>His</td>
<td>CGU</td>
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<td>Arg</td>
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<td>CCA</td>
<td>Pro</td>
<td>CAA</td>
<td>Gln</td>
<td>CGA</td>
<td>Arg</td>
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<tr>
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<td>Leu</td>
<td>CCG</td>
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<td>CAG</td>
<td>Gln</td>
<td>CGG</td>
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<td>Ile</td>
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<td>Thr</td>
<td>AAU</td>
<td>Asn</td>
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<td>Thr</td>
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<td>Arg</td>
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<td>ACG</td>
<td>Thr</td>
<td>AAG</td>
<td>Lys</td>
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<td>GAU</td>
<td>Asp</td>
<td>GGU</td>
<td>Gly</td>
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<td>GCA</td>
<td>Ala</td>
<td>GAA</td>
<td>Glu</td>
<td>GGA</td>
<td>Gly</td>
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<tr>
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<td>Val</td>
<td>GCG</td>
<td>Ala</td>
<td>GAG</td>
<td>Glu</td>
<td>GGG</td>
<td>Gly</td>
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Fishy Traits

<table>
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<tr>
<th>Trait</th>
<th>Amino acid</th>
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<tbody>
<tr>
<td>Color</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>Gly-Tyr</td>
</tr>
<tr>
<td>Blue</td>
<td>Gly-Phe</td>
</tr>
<tr>
<td>Green</td>
<td>His-Ser</td>
</tr>
<tr>
<td>Rainbow</td>
<td>Any other pair</td>
</tr>
<tr>
<td>Tail fin</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>Arg-Gly</td>
</tr>
<tr>
<td>Medium</td>
<td>Ala-Ala</td>
</tr>
<tr>
<td>Large</td>
<td>Ser-Val</td>
</tr>
<tr>
<td>No fin</td>
<td>Any other pair</td>
</tr>
<tr>
<td>Teeth</td>
<td></td>
</tr>
<tr>
<td>Big, sharp</td>
<td>Thr-Thr</td>
</tr>
<tr>
<td>Little, square</td>
<td>Leu-Leu</td>
</tr>
<tr>
<td>No teeth</td>
<td>Any other pair</td>
</tr>
</tbody>
</table>

Draw your team’s fish here.
Fishy Answer Key (what each fish should look like)

Fish 1: GGUUAU  AGAGGU  ACUACC
   Gly-Tyr  Arg-Gly  Thr-Thr
   Red, small tail fin, and big sharp teeth

Fish 2: GGCUUC  AGAGGU  ACUACC
   Gly-Phe  Arg-Gly  Thr-Thr
   Blue, small tail fin, and big sharp teeth

Fish 3: CAUAGC  AGAGGU  ACUACC
   His-Ser  Arg-Gly  Thr-Thr
   Green, small tail fin, and big sharp teeth

Fish 4: GGUUAU  UCUGUC  UUAUUG
   Gly-Tyr  Ser-Val  Leu-Leu
   Red, large tail fin, and small square teeth

Fish 5: GGCUUC  UCUGUC  UUAUUG
   Gly-Phe  Ser-Val  Leu-Leu
   Blue, large tail fin, and small square teeth

Fish 6: CAUAGC  GCUGCA  ACUACC
   His-Ser  Ala-Ala  Leu-Leu
   Green, medium tail fin, and small square teeth
Pass the DNA, Please,
Assessment

Name_______________________ Date_____________ Period__________

1. What does DNA stand for? RNA? (5 points)

2. What is DNA composed of? (5 points)

3. What is transcription? Translation? (5 points)

4. What is an amino acid? (5 point)

5. How many letters were best to pass along? Why? (10 points)

6. What was more important in this activity, speed or accuracy? Why? (15 points)

7. What happens when a letter is changed in a sequence? What is your evidence? (15 points)

8. Does the incorrect letter always result in a mutation? What about a missing or extra letter? How do you know? What is your evidence? (20 points)

9. Were all three traits on your fish correct? Were there any traits on the handout that might affect the ability of your fish to survive in its environment? How? (20 points)
Pass the DNA, Please  
Assessment Answer Key

Name________________________________________ Date_____________ Period__________

1. What does DNA stand for? RNA? (5 points)  
   *DNA stands for deoxyribonucleic acid. RNA stands for ribonucleic acid.*

2. What is DNA composed of? (5 points)  
   *DNA is composed of base pairs and a sugar phosphate backbone.*

3. What is transcription? Translation? (5 points)  
   *Transcription is the creation of RNA from DNA. Translation is the creation of proteins from RNA.*

4. What is an amino acid? (5 points)  
   *An amino acid is a building block of protein.*

5. How many letters were best to pass along? Why? (10 points)  
   *Answers may vary.*

6. What was more important in this activity, speed or accuracy? Why? (15 points)  
   *Accuracy was more important because getting the right fish was the goal of the game. If the right letters were passed along, our team got the right fish traits. If the wrong letters were passed along, our team got the wrong fish traits.*

7. What happens when a letter is changed in a sequence? (15 points)  
   *A change in the sequence usually results in a mutation.*

8. Does the incorrect letter always result in a mutation? What about a missing or extra letter? (20 points)  
   *Sometimes an incorrect letter will not result in a mutation. This is called a silent mutation. A missing or extra letter will always result in a mutation. An example of a mutation is a point mutation.*

9) Were all three traits on your fish correct? Were there any traits on the handout that might affect the ability of your fish to survive in its environment? (20 points)  
   *Answers will be both yes and no for the first question. Yes, a change in type of tail fin can affect the ability of the fish to move properly. If a fish has no teeth, it will change what the fish can eat.*
Pass the DNA, Please: A Telephone Relay Race!

Background

Deoxyribonucleic nucleic acid (DNA) is the macromolecule that contains all genetic information and is essential for life. It is composed of two helical strands containing a sugar-phosphate backbone with nitrogenous bases in between. The bases are guanine (G), adenine (A), thymine (T), and cytosine (C). The DNA sequence is converted from DNA into ribonucleic acid (RNA) in a process known as transcription. During transcription, G is converted to C, C is converted to G, T is converted to A, and A is converted to uracil (U). The next step after transcription is translation, the conversion of RNA into protein. During translation, G is converted to C, C is converted to G, T is converted to A, and A is converted to U to create the appropriate amino acid. Amino acids are the building blocks of protein and are created based on three-letter base codes. A protein is a macromolecule made of many amino acids. A trait is a characteristic of an organism, such as eye color, and is the end result of the original DNA sequence. Any change from the original DNA sequence can result in a different trait than expected, which is known as a mutation. Today, we will see the importance of passing along the DNA message by competing in a relay race using the game Telephone. We will split into teams, play Telephone, and race to see which team can pass along the right message the fastest.

Materials

- Paper
- Pen or pencil
- Markers or colored pencils
- Slips of paper with Fishy Code

Instructions

1. After you have been placed in a team, the teacher will distribute the Fishy Code. Keep it face down until the teacher tells you to turn it over. Decide as a group how many of the 18 letters will be passed along at a time.
2. Line up as a team.
3. The student at the end of the line should have a paper and pencil ready to write down the letters that he/she hears.
4. When the teacher tells you to begin round 1, the first student in your line can begin to whisper the letters from the Fishy Code slip to the teammate next to him or her.
5. You can only whisper letters to the teammate next to you.
6. Once all of the letters in the Fishy Code have been passed down, the student at the front of the line should return the Fishy Code to the teacher and the student at the end of the line should use his or her knowledge of transcription to convert the code from DNA to RNA without help from his or her team and then write down the corresponding base (G→C, C→G, A→U, T→A).
7. After converting all of the letters, the student at the end of the line should walk to the front of the line and begin round 2 immediately by whispering the converted code down the line, just as in round 1.
8. The new student at the end of the line should write down the letters he or she hears, just as in round 1.
9. Once all of the letters have been passed in round 2, gather as a team and use your knowledge of translation to convert the code from RNA to a new RNA sequence and write down the corresponding bases (G→C, C→G, A→U, U→A).

10. Now, convert the new RNA code to an amino acid code. For example, GGC→Gly.

11. Match the amino acid code to the corresponding trait. For example, Gly-Tyr→ red fish.

12. Lastly, each person in the team must draw or describe his/her team’s fish in the box in the Fishy Traits handout provided.

13. Let your teacher know when you are finished.

14. If other teams are still working, begin working on the assessment entitled Pass the DNA, Please.