Fishy Code Slips

Fish 1 GGTTATAGAGGTACTACC

Fish 2 GGCTTCAGAGGTACTACC

Fish 3 CATAGCAGAGGTACTACC

Fish 4 GGTTATTCTGTCTTATTG

Fish 5 GGCTTCTCTGTCTTATTG

Fish 6 CATAGCGCTGCAACTACC

Fishy Amino Acid Codon

UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys
UUC	Phe	UCC	Ser	UAC	Tyr	UGC	Cys
UUA	Leu	UCA	Ser	UAA	Stop	UGA	Stop
UUG	Leu	UCG	Ser	UAG	Stop	UGG	Typ
CUU	Leu	CCU	Pro	CAU	His	CGU	Arg
CUC	Leu	CCC	Pro	CAC	His	CGC	Arg
CUA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CUG	Leu	CCG	Pro	CAG	Gln	CGG	Arg
AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser
AUC	Ile	ACC	Thr	AAC	Asn	AGC	Ser
AUA	Ile	ACA	Thr	AAA	Lys	AGA	Arg
AUG	Met	ACG	Thr	AAG	Lys	AGG	Arg
GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly
GUC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GUA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GUG	Val	GCG	Ala	GAG	Glu	GGG	Gly

Fishy Traits

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

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 point)
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 of 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 ($G \rightarrow C$, $C \rightarrow G$, $A \rightarrow U$, $T \rightarrow A$).
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.