Student Sheet Name_____

**Title: Origami DNA**

**Introduction:** Origami is an art form based on paper folded into elaborate designs that often look like a real object. To make the designs, detailed instructions must be provided. For example, “fold the paper in half twice”. Is this a good description? Why or why not? In living things, the detailed directions for cells to make the proteins that control and compose the organism must be very precise. The code found in DNA is the basis for forming proteins. In this activity you will see how the proteins are formed through an amazing set of cell processes we call protein synthesis.

**Materials:** cut-outs (See below), scissors, 1.5 m butcher paper, markers, paper clips

**Procedure:**

1. Cut out your strands of DNA and tape together into one long strand. Label the base pairs on the left side (under the darkened base) with one of the four following codes. Your teacher will assign you one of them:

Student A : ATG AGC CGA GGG ACA CTA GCA ATA TAG

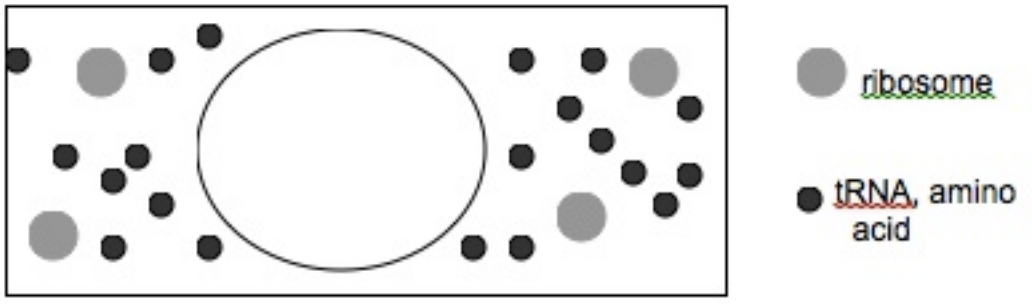
Student B: GTC AGC CGA ATG GGG ACA CTA ATA TAG

Student C: GUC ATA GCA ATG CGA ACA CTA AGC TAG

Student D: AGC GGG CGA ATA ATG GCA ACA CTA TAG

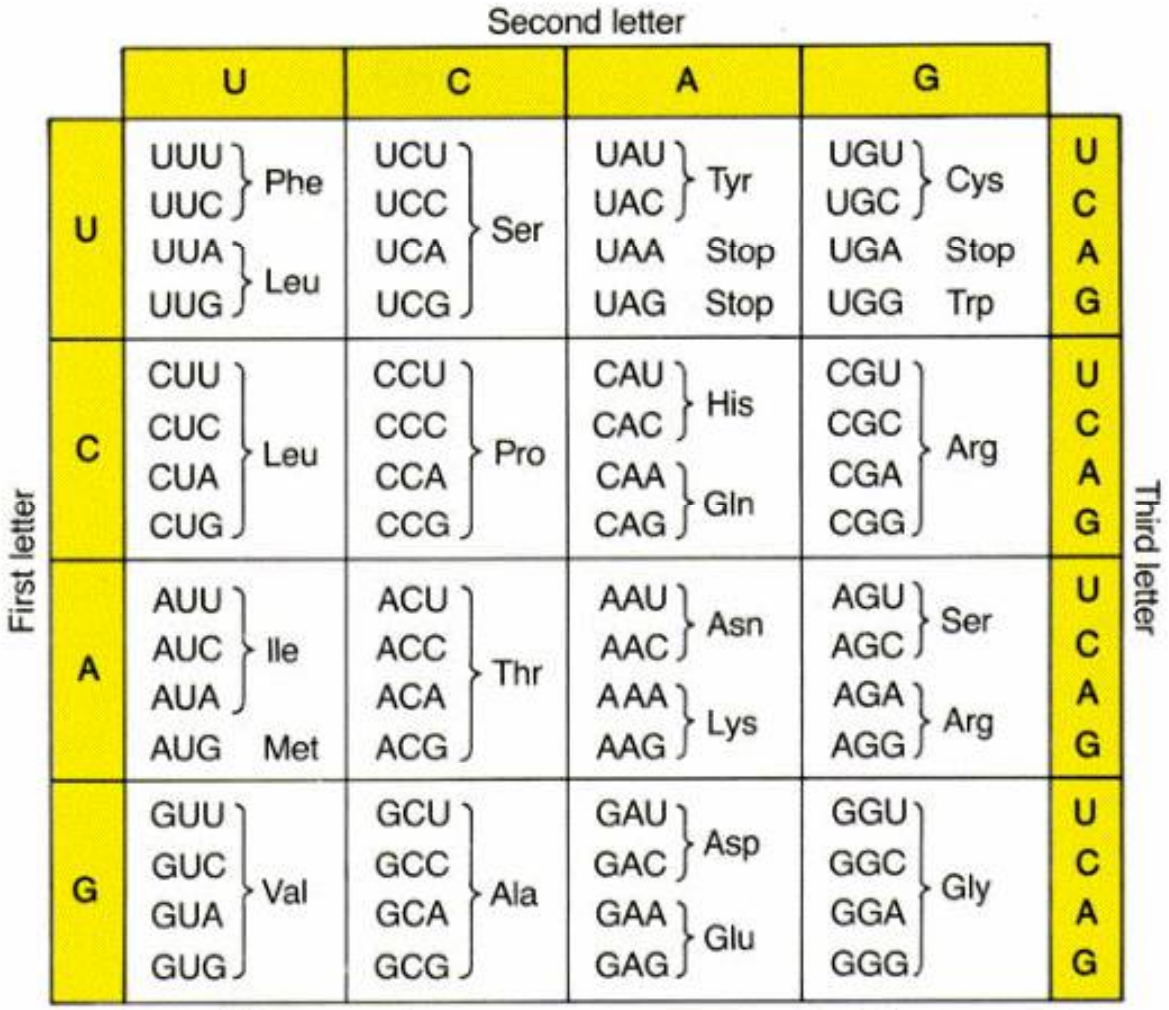
2. Write the matching code on the right hand side.

3. Cut out the mRNA strand. You to not need to cut out in between the bases. The darkened nucleotide on the top right models the “promoter” site that allows the transcription of the DNA to begin. In this model, the right hand side of the DNA will be transcribed. DO NOT WRITE ON THE mRNA YET.
4. Cut out the tRNA codons.
5. On your butcher paper, outline a big cell and nucleus. Draw in 4 ribosomes (or whatever number is in your group) For this activity the nucleus will be a little large to make it easier to work with. Place your tRNA and amino acids randomly around the cytoplasm. Your cell should look like this:



6. When your group is ready, everyone should place their “DNA” in or mostly inside the nucleus. Have the mRNA nearby and when your group is ready, say “go” and begin to transcribe your mRNA. When you are finished with that, drag the mRNA outside the nucleus to the ribosome. Begin lining up the amino acids along the mRNA and tear them off the tRNA. Paperclip the chain of amino acids together as you go.

7. If you have time, trade DNA sequences and play again. Try to beat the winner of the first round.




**Analysis:**

1. What happens during transcription?

2. How can you remember that?

3. What happens during translation?

4. How can you remember that?

5. The amino acids linked together form a protein. Why are proteins important?

6. Why are enzymes important?

7. What are enzymes made from?

8. How does DNA control how a cell functions?

9. How does DNA control what substances are produced in a cell, like bone or muscle fiber?

10. Where does DNA come from?

**Conclusion:**