Name___________________________

Krispy Synthesis

DNA and Gene Expression

In this lab, students will perform the roles of mRNA, tRNA and rRNA in order to create a protein (rice krispie treats) from amino acids (ingredients). The DNA code is posted in the nucleus **and is not to leave the nucleus!** Students will transcribe the DNA at the nucleus and then translate it into a protein at their ribosome.

Purpose: to make a non-mutated protein

Roles of the Team Members:

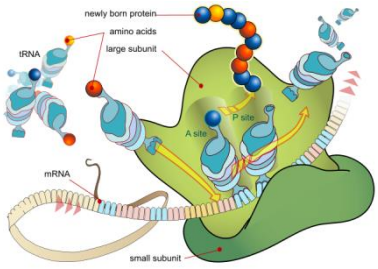
rRNA- the **director** for the group. This person will **manage the tRNA's** and ensure that they deliver their amino acids in order

mRNA- the **transcribers** of the gene. These people are the **only** ones allowed into the nucleus and are responsible for correctly transcribing the DNA into mRNA.

tRNA- the amino acids **delivery people**. These people are responsible for correctly matching their anti-codon to the mRNA codons and delivering the ingredients to the ribosome.

<u>Procedure:</u>

Day 1:



1. Divide class into 3 groups (group 1=blue, group 2=pink, group 3=yellow)
2. Assign roles of rRNA, mRNA (2), and tRNA
3. **mRNA's**:

   -go to the nucleus and copy the DNA sequence onto the data sheet

   -transcribe the **RIGHT STRAND** into the mRNA **at the nucleus**

   -return to your group and read it off for the others to copy

4. **Everybody else**:

   -work on part 1 of the analysis
   -when the mRNAs return, copy down their data and **translate** the mRNA into tRNA

Day 2:

1. rRNA passes out anti-codon cards to tRNA's
2. rRNA directs the tRNA's to carry out the responsibilities listed on their card **in order**
3. mRNA is responsible for keeping track of the order in which tRNA's should act out their responsibilities and for copying down directions

Your goal is to create a **non-mutated** protein. **You will be graded according to your group's ability to work cooperatively and according to what your protein looks like by the end of the period!**

List your group members first and last names:

rRNA:_____

mRNA: 1._____ 2._____

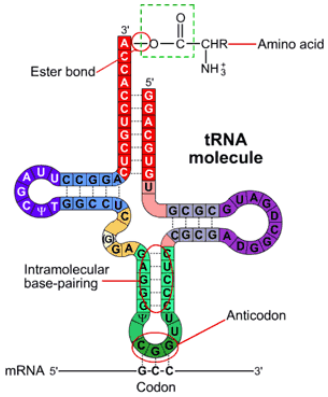
tRNA: 1. _____ 2._____

3. _____ 4._____

5. _____ 6._____

7. _____ 8._____

9. _____ 10._____



Analysis:

Part I: For each molecule or process listed below, the simulation equivalent is given. Identify what role the simulated item plays in the process of protein synthesis.

Simulation Item	Role in Protein Synthesis
Code on cards	
Ingredients	
Rice Krispie Treats	
People going to nucleus	
Table with ingredients on it	
Lab station (your table)	
Group leader	
Students with cards	
Table with utensils on it	

Part II: Analysis Questions (food for thought)

A. ***Answer the following questions on your data sheet:***

1. Write out the amino acids(ingredients) from the simulation next to each tRNA anti-codon
2. Use the table provided to fill in the actual amino acids that would be transcribed by this polypeptide

B. ***Answer the following questions on a separate sheet of paper:***

1. Describe the "protein" that you created in this simulation
2. Check with the other groups and describe what other variations of this gene exist
3. What type of DNA mutation may have caused these differences (deletion, substitution, point mutation)? Explain how each mutation might affect the protein created (rice krispie treat)
4. Can a specific tRNA pick up different ingredients that what they are told to? Explain
5. Were all the tRNA molecules used? Give examples

6. If an important amino acid is missing from a person's diet, can all necessary proteins be made? Why? Give an example of an amino acid in the lab that had to be present before the polypeptide could be produced

Evaluation: Your lab will be graded according to the following point distribution:

1. Producing the correct polypeptide and showing it to me **<u>BEFORE</u>** ingesting it: ______pts
2. Cleaning up your lab station and the utensils that you used: ______pts
3. Lab write up: ______pts

DNA		mRNA	tRNA	Directions from Lab Simulation	Amino Acids

Cracking the Genetic Code Using mRNA

First Letter	Second Letter U	C	A	G	Third Letter
U	**PHE** **PHE** **LEU** **LEU**	**SER** **SER** **SER** **SER**	**TYR** **TYR** **END** **END**	**CYS** **CYS** **END** **TRP**	**U** **C** **A** **G**
C	**LEU** **LEU** **LEU** **LEU**	**PRO** **PRO** **PRO** **PRO**	**HIS** **HIS** **GLN** **GLN**	**ARG** **ARG** **ARG** **ARG**	**U** **C** **A** **G**
A	**ILE** **ILE** **ILE** **MET** (start)	**THR** **THR** **THR** **THR**	**ASP** **ASP** **LYS** **LYS**	**SER** **SER** **ARG** **ARG**	**U** **C** **A** **G**
G	**VAL** **VAL** **VAL** **VAL**	**ALA** **ALA** **ALA** **ALA**	**ASP** **ASP** **GLU** **GLU**	**GLY** **GLY** **GLY** **GLY**	**U** **C** **A** **G**

KEY

PHE Phenylalanine	**TRP** Tryptophan	**LEU** Leucine	**ARG** Arginine
ILE Isoleucine	**GLY** Glycine	**MET** Methionine	**GLN** Glutamine
VAL Valine	**ASN** Asparagine	**SER** Serine	**LYS** Lysine
PRO Proline	**ASP** Aspartate	**THR** Theonine	**GLU** Glutamate
ALA Alanine	**CYS** Cystine	**TYR** Tyrosine	**HIS** Histadine