**Modeling Protein Synthesis**

CLASS

COPY

**Part I – Original Amino Acid Sequence**

Answer questions in complete sentences in your journal.

**Part A: DNA Replication**

1. On your desk in dry erase marker, write where **replication takes place**.
2. Record the number of your assigned Original Strand of DNA in the space provided at the top of your stamp sheet.
3. Pair your **complete DNA** (pink sheet with bases) to a blank sheet
4. Using a **dry erase marker,** create the complimentary DNA strand.
   1. **Get a stamp when you complete this stage!**
5. Answer DNA replication analysis questions on your own sheet of paper in **complete sentences** under the title “DNA Replication Analysis Questions”.

**DNA Replication Analysis Questions**

1. Write the sequence of bases for your Template DNA Strand and the Complementary DNA Strand.
2. Draw and label a DNA nucleotide
3. What does “complementary” mean?

**Part B: Transcription**

1. On your desk in dry erase marker, write where **transcription takes place.**
2. Using your dry erase marker, **transcribe** the mRNA nucleotides (green strip) from the **pre-printed DNA strand** (Template Strand).
   1. **Get a stamp when you complete this stage!**
3. Answer transcription analysis questions on your own sheet of paper using **complete sentences** under the title “Transcription Analysis Questions”.

**Transcription Analysis Questions**

1. Record the sequences of bases in your mRNA molecule.
2. Draw a mRNA nucleotide
3. List the 3 major structural differences between RNA and DNA.
4. What is the main objective of transcription?
5. What is the purpose of mRNA?
6. What do we call a sequence of 3 mRNA bases that code for an amino acid?

**Part C: Translation**

1. On your desk in dry erase marker, write where **translation takes place**
2. Using your dry erase marker, write the complementary anticodons on the tRNA.
3. Place the ribosome over the first codon of the mRNA
4. Using the tRNA, translate the nucleotides of the mRNA into an amino acide
   1. **Read each codon at a time, moving the ribosome from left to right!**
5. Read the entire message, creating the polypeptide chain (chain of amino acids).
6. **RECORD YOUR COMPLETED AMINO ACID SEQUENCE ON YOUR STAMP SHEET. Find groups to fill in the entire amino acid sequence.**
   1. *(Ex. If you had DNA #2, your amino acids should be written in the boxes 2-1, 2-2, 2-3, 2-4, 2-5. The first number denotes the strand of DNA you got).*
   2. **Get a stamp when you complete this stage!**
7. Answer translation questions on your own sheet of paper using **complete sentences** under the title Translation Analysis Questions.

**Translation Analysis Questions**

1. What is the difference between transcription and translation?
2. What is the purpose of the tRNA?
3. On which type of RNA is the codon located? Which type of RNA is the anticodon located?
4. Does the codon or the anticodon code for the amino acids? What does the other one do?
5. What sequence codes for the amino acid valine?
6. What amino acid is brought in by the codon AGA?
7. What does rRNA do? How does the rRNA know where to start reading and where to stop reading the mRNA?
8. On what organelle does translation take place? Do these organelles have membranes?
9. Which type of cells, eukaryotic and/or prokaryotic, have these organelles?
10. Clean off all dry erase markings.

**Part II – Mutated Amino Acid Sequence**

**Part D: Mutations**

1. You will be assigned nucleotide changes to your original DNA sequences. Bring your Template Strand DNA sequence up to your teacher for your nucleotide changes.
2. Using all the materials from Parts I, synthesize the new protein.
   1. **Get a stamp when you complete this stage!**
3. Answer mutations questions on your own sheet of paper using **complete sentences** under the title Mutations Analysis Questions.

**Mutations Analysis Questions**

1. What is a mutation?
2. What causes mutation (in a general sense)?
3. What kind of mistake(s) can happen during DNA replication?
4. Why could changing one nucleotide cause a mutation?
5. How does a misplaced stop codon due to mutation influence translation?
6. Compare the original and mutated amino acid sequences; how do the sequences compare and what changes have occurred?
7. **RECORD YOUR COMPLETED MUTATED AMINO ACID SEQUENCE ON YOUR STAMP SHEET. Find groups to fill in the entire amino acid sequence.**

|  |  |
| --- | --- |
| Participation & Mastery | STAMP |
| Replication |  |
| Transcription |  |
| Translation |  |
| Mutations |  |
| Clean up |  |
| (2) Correct sequences |  |

**Modeling Protein Synthesis**

**Original DNA Sequence: #\_\_\_\_\_**

By the end of the activity, you should be able to:

* Explain how **DNA** and **proteins** are related.
* Describe and understand the roll of all types of **RNA**
* Model and demonstrate the process of **protein synthesis**

**Materials you will need to complete this activity**:

* 1 nucleus/cytoplasm + codon table sign
* 1 ribosome
* 1 of the pre-printed DNA sequences (Template Strand)
* 1 blank complementary DNA strand (blank)
* 1 green RNA strand
* 5 blue tRNA molecules
* 1 yellow polypeptide strand
* Dry erase marker, towels

\*\*All materials must be properly cleaned and organized before you leave your lab station. You must ask to get a clean-up stamp before you leave your station\*\*

**You will need to be stamped off on the following** (both partners will be responsible for achieving the stamp):

* Built model correctly
* Demonstrate the process correctly
* Analysis questions answered on separate sheet of paper in COMPLETE SENTENCES
* Oral questions answered correctly (questions will be asked to both partners, BOTH must answer correctly to achieve the stamp)

**Part I**

**Original** Amino Acid Sequence **(you will need to get the parts you don’t have from other groups)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1-1 | 1-2 | 1-3 | 1-4 | 1-5 | 2-1 | 2-2 | 2-3 | 2-4 | 2-5 |
| 3-1 | 3-2 | 3-3 | 3-4 | 3-5 | 4-1 | 4-2 | 4-3 | 4-4 | 4-5 |

**Part II**

**Mutated** Amino Acid Sequence **(you will need to get the parts you don’t have from other groups)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1-1 | 1-2 | 1-3 | 1-4 | 1-5 | 2-1 | 2-2 | 2-3 | 2-4 | 2-5 |
| 3-1 | 3-2 | 3-3 | 3-4 | 3-5 | 4-1 | 4-2 | 4-3 | 4-4 | 4-5 |