LEARNING ACTIVITY SHEETS
Grade 10 - Science

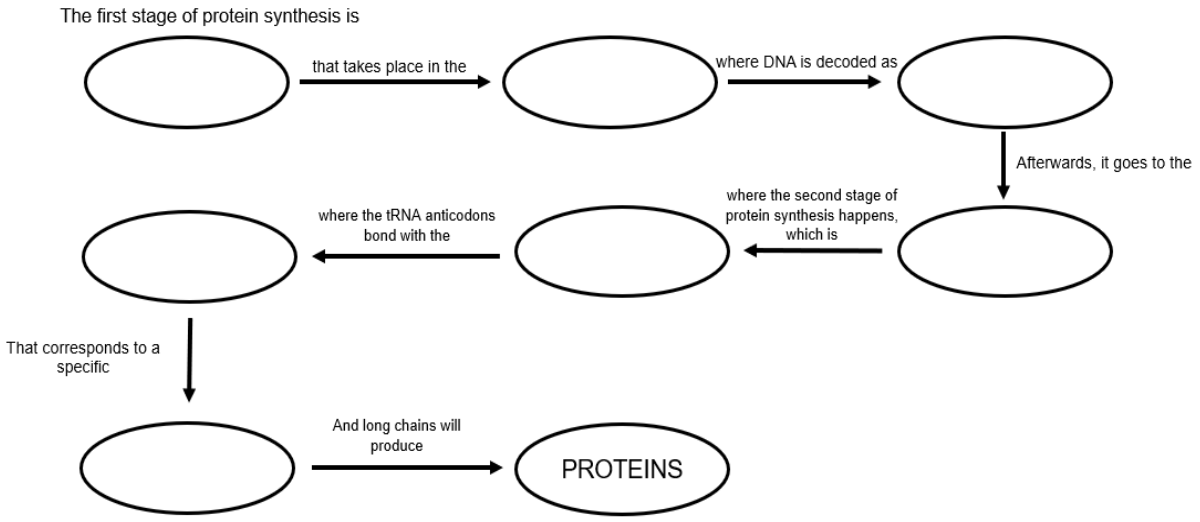
Name: _____ Date: _____ Rating/Score: _____

TRANSCRIPTION… TRANSLATION… MUTATIONS?!

DIRECTIONS: This Learning Activity Sheet is about transcription, translation, and mutations. Follow the instructions in each part and answer the guide questions that follow.

Part A: **Follow the Flow**

Fill in the flow chart with the words inside the box below to correctly trace the process of protein synthesis. Afterward, make a paragraph to summarize the process using the frame below.



POOL OF WORDS

Amino acids, mRNA, mRNA codon, nucleus, ribosomes, transcription, translation

Summary:

The process of protein synthesis may be summarized into this,

First, _____

Then, _____

Afterwards, _____

Next, _____

Finally, _____

Part B: **Let's See the Process!**

5' TACGGCGTAAATCGATCGGGAATC 3'

1. If the above sequence represents one strand of a DNA molecule, called the *leading strand*, what would be the **complementary strand**?

   What do you call the process of producing a complementary strand?

   _____

2. If the leading strand will be **transcribed**, what type of genetic material would be produced? _____

   Write the transcribed sequence below. Also, divide the sequence into groups of three.

   What do you call the groups of three letters in the sequence?

   _____

   How many **codons** are there in the problem? _____

3. If the mRNA strand in item # 2 will be **translated,** what will be the anticodon sequence of the tRNA?

   What is the function of codon? _____

   What is the function of anti-codon? _____

   _____

   Write the amino acid sequence corresponding to the mRNA.

   What tool did you use to translate the mRNA sequence? _____

4. What is the process where one of the letters of the original DNA strand is changed?

5. Look at the mutated DNA strand below from the original DNA strand from #1:

5' TACGGCGTAAATGGATCGGGAATC 3'

a. Encircle the base that was changed from the original strand.

b. Will there be a significant change in the amino acid sequence because of the mutation?

c. Many of the amino acids are coded by more than one codon as shown in the Genetic Code Table from the Learner's Material (page 281). One of the examples is *alanine*, which is coded by GCU, GCC, GCA, and GCG. Is this an advantage or disadvantage? Why?

Part C: Read, Relate, and Reflect

In this part, you will read an article about the relationship between the concept of mutation and COVID-19. Read the article and answer the questions that follow.

SARS-COV-2: The Virus and the Variants
by Don King O. Evangelista

Severe acute respiratory syndrome coronavirus 2, commonly known as SARS-COV-2, is the pandemic's causative agent known as COVID – 19. The virus is a *positive-strand single-stranded RNA* virus or +ssRNA virus that is believed to be of animal origin but has been contagious in humans. The structure of the SARS-COV-2 includes four proteins – spike, envelope, membrane, and nucleocapsid. Among these four, the spike protein is responsible for the virus to attach and fuse itself to the host cell's cell membrane. Their genetic material can then be directly translated into proteins in the host cell by the ribosomes.

Over time, SARS-COV-2 mutated into various variants. It has been recorded that there have been over 4,000 mutations that happened in the spike protein alone. Some of the mutations are of particular concern over the others because it has a more significant effect. These variants are determined using genetic sequencing. Variant **D614G** affected the virus's spike protein as the nucleic acid G (glycine) replaced D (aspartic acid) in the sequence, making it more adhesive to the cell membrane, which made the transmission of the virus faster. Variant **E484K** is a mutation where glutamic acid (E) is replaced by lysine (K) in the 484'th position. The latest variant and concern in the Philippines is the UK variant – VOC 202012/01, also known as **B.1.1.7**, where there have been 23 mutations: 14 of them are non-synonymous, 3 are deletions of a section of the genetic material, and 6 are synonymous mutations. This has increased the transmissibility of the virus to around 75 – 80%.

1. After reading the article, write down all unfamiliar words that you encountered and try to search their meaning on the dictionary/internet.

Unfamiliar Word/s	Meaning	Source of Definition

2. According to the article, what happens when there is a change in a single amino acid in the sequence of a virus, specifically SARS-COV-2?

3. What is the effect of mutation of SARS-COV-2 (D614 and B.1.1.7) on its spike proteins?

4. Amidst the rampant disinformation, fake news, and stigma that is spreading on social media regarding the new variants and mutations of SARS-COV-2, how will you, as a student, help in correcting disinformation and fake news?