**Gene expression: Central dogma of protein synthesis **

**A virtual and fun way to learn gene expression, while staying with the rules of inquiry based learning.**

**Pre-assessment**

1. What are genes?
2. What is transcription?
3. Which enzyme is involved in transcription?
4. Name the three types of RNA’s involved in transcription?
5. What is translation?

Now let’s examine the process of transcription and translation virtually

**\*Click and open the following link:** <https://phet.colorado.edu/sims/html/gene-expression-essentials/latest/gene-expression-essentials_en.html>

\*Enter by clicking the “Expression” tab.

1. Examine the “Gene 1” shown in the picture. What type of biomolecule make up “Gene 1”? Justify your statement.
2. What are the two regions of “gene 1”? Discuss with your group and predict the role of these regions in “gene expression” based on their names.
3. \* Drag the “RNA polymerase” from the tool box and place it on the dotted spot on the gene. Record your observation.

1. \*Drag the “negative transcription factor to the regulatory region of “gene 1” and drag the RNA polymerase again to the gene. Record you observation.
2. Discuss with your group about the significance of regulatory region found in the gene. Record you discussion
3. \* Drag the “ RNA polymerase” back to the tool box.
4. \*Drag the “positive transcription factor” from the tool box and fit it in its appropriate location in the gene. \* After fixing the “positive transcription factor” in the gene, drag the “ RNA polymerase “ again and fit it the dotted spot.
5. \* Keep dragging the “RNA polymerase” to its location on the “gene 1” five more times, while the “positive transcription factor” still in the regulatory region.
6. Record your observation.
7. Discuss with your group, about the significance of regulatory region, positive transcription factor, and RNA polymerase in the process of transcription. Record your discussion.
8. \* Drag the positive transcription factor and RNA polymerase back to the tool box
9. \* Drag the “ribosome” from the tool box to the mRNA molecule.

13. Record your observation. What type of molecule is produced? What is the name of the process?

14.\*Click and drag the mRNA destroyer to mRNA. Record your observations.

15. With your group discuss: What is the significance of mRNA destroyer in this process? What will be consequence of the absence mRNA destroyer?

\*Click the “Next Gene”

1. What difference do you observe in the tool box?
2. Predict the significance of the second “positive transcription factor”
3. Discuss with your group about the advantageous and disadvantageous of 2 “positive transcription factors”
4. \*Click and drag the first “positive transcription factor” to the gene.
5. \* Click and drag the “RNA polymerase” to the gene.
6. Observe and record your results.
7. \* Click and drag the second “positive transcription factor” to the gene.
8. \* Again drag the “RNA polymerase to the gene.
9. Observe and drag the results.
10. Discuss with your group about one type of gene that would require 2 “positive transcription factors” to function effectively and economically.

\*Click “gene 3” repeats the steps in your own pace. Summarize the events and the results.

**Extension questions:**

1. Why is it important to destroy the mRNA after making sufficient amount of protein?
2. How will the positive and negative transcription factor help maintain the homeostasis of the body system. Explain with an example.
3. Give an example a situation where gene expression without regulation could potentially harm the organism.