

TNT: Protein Production

Cell Molecular Stories Booklet: Chapter #3

GOAL: students will create a booklet (chapter #3) which explains how a DNA gene is used to make one specific “student selected” protein through the processes of Transcription and Translation. After downloading the scrambled pictures and text, students will first organize the 18 text in the correct sequence and then match and sequence the corresponding TNT pictures. This booklet could be created in a variety of ways: use word processing (e.g., MS Word) or slide show software (e.g., MS PowerPoint), or design an interactive web page.

PROJECT DIRECTIONS:

- 1) Download the scrambled pictures and text from the Weebly webpage: **geneticsraypec.weebly.com**
 - I recommend using **Copy-N-Paste** to more easily work with the pictures and text on your own computer
- 2) Arrange the **18 “text”** scenes of TNT in the CORRECT SEQUENCE (included below)

18 “TEXT” SCENES OF TNT (Protein Production)

- The primary mRNA is processed by adding a poly-adenine tail to the 3’ of the mRNA to protect it from destruction by ribonuclease enzymes
- At last, the _____ protein is finished and ready to be used by the cell
- The mature mRNA leaves the nucleus through a nuclear pore and enters the cytoplasm
- The tRNA slides over to the “P” site and passes its AA “passenger” to the growing protein chain as the next tRNA attaches at the “A” site
- RNA Polymerase enzyme binds to the coding DNA strand at the Promoter sequence just in front of the gene code
- The mature mRNA binds to a ribosome using its RRS in the cap
- Once activated from “red light to green light,” RNA Polymerase reads the coding strand letters and builds a complementary mRNA strand
- This is a close up overview of the _____ gene located in the nucleus of the _____ cell
- The tRNA attaches to the ribosome at the “A” site using its ANTICODON “password” which is complementary to the CODON
- The primary mRNA is processed by adding a cap containing a ribosome recognition site (RRS) to the 5’ end of the mRNA
- The mature mRNA has been processed and is ready to carry the code out of the nucleus
- Transcription continues until RNA Polymerase arrives at the terminator sequence on the DNA coding strand
- The tRNA “taxi” picks up the amino acid (AA) requested by the CODON at the cytoplasm “warehouse”
- One or several transcription factors arrive at the Promoter sequence, giving RNA Polymerase permission to begin DNA transcription
- Helicase enzymes “unwind” the DNA and then open the DNA for transcription by breaking the H-bonds to “unzip” the coding and noncoding strands
- The Primary mRNA is processed by the removal of INtrons and the joining together of Exons
- The first CODON is read by the ribosome
- Translation continues as one tRNA after another delivers the requested AA until a STOP CODON is read

- 3) **Match** each of the pictures of TNT with the appropriate text scene
 - Some text will have more than one picture that will match with it
 - For scenes with multiple pictures, all pictures should be organized in the correct sequence and then connected in the proper sequence with **arrows (→)**
- 4) **LABEL** (and draw an arrow → to ID) the following **22** items at least once in your TNT booklet.....
also use circles and brackets as needed to help clearly ID each of the **22** concepts below:
 - DNA Helicase, RNA Polymerase, primary mRNA, mature mRNA, Intron, Exon, ribosome, DNA Terminator, AntiCODON, Cap, polypeptide, DNA Promoter, CODON, Poly-A-Tail, amino acid, DNA coding strand, tRNA, nuclear pore, ribonuclease, ribosome “A” & “P” sites, STOP CODON, Activator molecule

EC) Things to do for EXTRA CREDIT:

- Include a 3-D picture of the protein in your story
- Research and explain in your story how the production of your protein would be REGULATED ?
 - Activation ? repression ? ... what transcription factors would activate or repress your gene ???
- Add some “extra narration” to make your story more interesting and/or humorous, provide smooth transitions

- 5) Turn in your booklet (with the SELF-GRADED SCORING GUIDE) by the **due date** =

- Bring a **PRINTED** copy of your booklet chapter 3 to class

OR

- **UPLOAD** your file to the **Weebly** link: **geneticsraypec.weebly.com**
- **Plan B** = send Mr. Roberts your file by email (mike.roberts@raypec.org) or **SHARE** your TNT Booklet file that is stored on your Google Drive

TNT Chapter 3 Name _____

Scoring Guide (30 pts)

CRITERIA: **5 pts** **3 pts** **1 point** **0 pts**

1. TNT Text Correct? <ul style="list-style-type: none"> • Include 18 replication text? • text matched to correct picture? • Correct sequence? 	ALL	MOST	SOME	NONE
2. Includes <u>Required Pictures</u> ?	ALL	MOST	SOME	NONE
3. Picture ACCURACY <ul style="list-style-type: none"> • Correct Picture SEQUENCE? • 32 pictures matched to correct text • For scenes with multiple pictures, all pictures connected in correct sequence with arrows 	ALL 10	MOST 9 8 7 6	SOME 5 4 3	NONE 2 1 0
4. 22 LABELED picture items <ul style="list-style-type: none"> • Identified correctly & CLEAR? • use arrows, brackets, circles 	ALL	MOST	SOME	NONE
5. Followed project directions?	YES	-----	-----	NO

Subtotals

FINAL SCORE