Name: _____ **Date:** _____

Section: _____

Epigenetics Activity

Exploring the Central Dogma Through Interactive Modeling

Phase 1: ENGAGE (5 minutes)

Getting Started: Open peebedu.com and navigate to Epic Genetics

Click '`Tutorial to review the interface, then Generate DNA`' to begin.

Essential Questions: How does genetic information flow from DNA to proteins? _____ What molecular mechanisms ensure accurate gene expression? _____ How do mutations and RNA processing create protein diversity? _____

Initial Analysis: Examine your generated DNA sequence:

- Number of exons: _____

- Start codon (TAC in DNA → AUG in RNA) present? Yes / No

Phase 2: EXPLORE (20 minutes)

Part A: Transcription Process

Promoter Addition:

- Select '`Promoter`' and execute

- Why is this necessary? _____

RNA Synthesis:

- Select '`RNA Polymerase`' alone and execute

- Now select both '`RNA Polymerase + Transcription Factor`'

- Effect of transcription factor: _____

Transcript Analysis: Record the RNA sequence for one transcript:

- ———

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Regulatory Predictions:

If a mutation occurred in the promoter region:

- Effect on transcription: _____

- Clinical significance: _____

Phase 5: EVALUATE (5 minutes)

Assessment Questions

Process Understanding: Explain why both 5' cap and poly-A tail are required for translation in eukaryotes. Include their molecular functions. (3 pts)

Data Analysis: You observe a protein that's shorter than expected. List three possible molecular explanations based on your simulation experience. (3 pts)

Systems Integration: Design an experiment using the simulation tools to test whether a specific exon is essential for protein function. Include:

- Tools needed: _____

- Expected results: _____

(4 pts)

Model Evaluation:

- Most accurate representation: _____

- Missing element: _____

Research Challenge: Investigate one disease caused by:

- Splicing defects (e.g., -thalassemia)
- Nonsense mutations (e.g., DMD)
- Promoter mutations (e.g., some cancers)

Explain how the simulation helps understand the molecular basis: _____