Name: _____ **Date:** _____

Section: _____

Epigenetics Activity

DNA: The Ultimate Instruction Manual!

Phase 1: ENGAGE (5 minutes)

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

Watch the Tutorial, then click '`Generate DNA`' - you just created a gene!

The Mystery: Your cells are like factories that need instructions to build things. DNA has those instructions, but it's stuck in the nucleus (the cell's control center). How do the instructions get to the factory floor? _____

First Observations: Look at your DNA:

- Green parts = Instructions that matter (exons)
- Gray parts = Instructions to skip (introns)

Quick Question: If DNA is so important, why does it have parts we don't use (introns)? Your guess: _____

Phase 2: EXPLORE (18 minutes)

Building Proteins Step by Step

Think of this like following a recipe to bake cookies!

Step 1: Turn on the Gene Click the '`Promoter`' card Click '`Execute`'

What happened? _____

This is like turning on the oven before baking!

Step 2: Copy the Recipe (Transcription) Click '`RNA Polymerase`' Click '`Execute`'

What appeared below? _____

You just made RNA - a working copy of DNA!

Step 3: Edit the Instructions Click '`Spliceosome`' Click '`Execute`' Click on one of your RNA copies

What disappeared? _____ (introns/exons) What's left? _____ (introns/exons)

It's like removing the notes from a recipe, keeping only the steps!

Step 4: Protect Your Message Add these to your edited RNA:

- Click '`5' Cap`' → Like putting a cover on your recipe
- Click '`Poly-A Tail`' → Like laminating the back

Why protect RNA? So it doesn't fall apart!

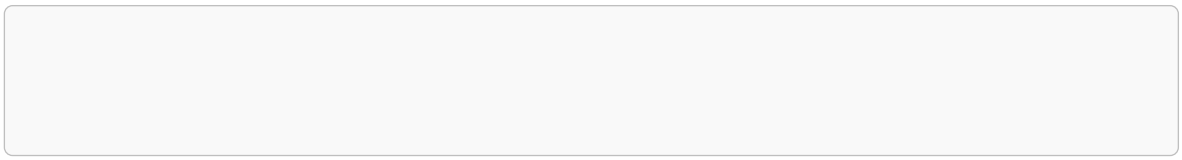
Step 5: Make the Protein! Select BOTH:

- '`tRNA`' (the delivery trucks)
- '`rRNA`' (the factory workers)

Click '`Execute`' and select your protected RNA

Your Results:

- Protein made? Yes / No



Phase 3: EXPLAIN (12 minutes)

Understanding What Just Happened

The Journey: Number these in order (1-5): ___ Remove the gray parts (introns) ___ Make protein from RNA ___ Copy DNA to RNA ___ Add protective caps ___ Add promoter to start

The Workers: Match each tool to its job:

RNA Polymerase • Cuts out introns Spliceosome • Copies DNA tRNA • Makes the ribosome rRNA • Brings amino acids

Color Code the Process: Draw arrows and color each step:

DNA (blue) → RNA (red) → Edited RNA (orange) → Protein (green)

What If? Mutations!

Click '`Mutagen`' - it changes one letter in DNA

Original letter: _____ New letter: _____

Like changing '`add sugar to add salt`' in a recipe!

Phase 4: ELABORATE (10 minutes)

Cool Connections

A. Alternative Splicing = Different Products Like making chocolate OR vanilla cookies from one recipe!

Try '`Alt Spliceosome`' on another RNA:

- Regular splicing kept exons: _____

- Same DNA, different protein!

B. CRISPR = Gene Editing Like using white-out to fix a typo in your recipe!

Click '`CRISPR`' and try it:

- What could you change? _____

C. Real-Life Examples: Sickle Cell Disease:

- One letter change: A → T
- Changes protein shape
- Red blood cells become sickle-shaped

Lactose Tolerance:

- Mutation keeps gene '`on`'
- Adults can digest milk
- Evolution in action!

Design Your Own: If you could edit any gene, what would you change? _____

- Gene for: _____

- Result: _____

Phase 5: EVALUATE (5 minutes)

Show What You Learned

Fill in the Blanks: DNA contains the _____ for making proteins. First, RNA _____ copies the instructions. Then _____ removes the introns. Finally, _____ and _____ work together to build the protein.

True or False (circle):

- T / F: DNA leaves the nucleus
- T / F: All of DNA codes for proteins
- T / F: One gene can make different proteins
- T / F: Mutations always cause problems

Draw the Journey: Make a simple comic strip (4 panels) showing DNA → Protein:

[Panel 1] [Panel 2] [Panel 3] [Panel 4]

Explain to a Friend:

Your friend asks: '`Why can't cells just use DNA directly?`' Your answer: _____

Rate This Simulation: Confusing Okay Cool Awesome!

One Question I Still Have:

Fun Challenge: Count how many different proteins you can make from your one DNA sequence using different combinations!

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Genetics Vocabulary:

- **Gene:** Instructions for one trait
- **Transcription:** Copying DNA to RNA
- **Translation:** Making protein from RNA
- **Mutation:** Change in DNA sequence
- **CRISPR:** Tool for editing genes

Key Vocabulary

See activity for vocabulary specific to this topic.