6.3 - DNA & Proteins Unit, Packet 3

Score
□ Above & Beyond
□ Meets Expectations
□ Near Expectations
□ Incomplete – *fix the following pages:*

First & Last Name: _____ Period/Hour:_____

NOTE: Packets are due after completing Part 5. Check each page to be sure <u>all</u> blanks are completed.

Driving Question: What is DNA and how does it work? How does DNA affect protein assembly?

Anchoring Phenomenon: Throughout this unit, we have explored what DNA is made from, and how its structure determines its function. We have also explored how transcription & translation produce proteins within a cell. We will now put all the pieces together to develop sophisticated explanations for the phenomena we have encountered in this unit.

Deeper Questions

1. What determines the traits of an organism?
2. How are traits inherited from parents?
3. Can we predict traits?

Schedule

Part 1: Introduction
- Summative Check-in Questions

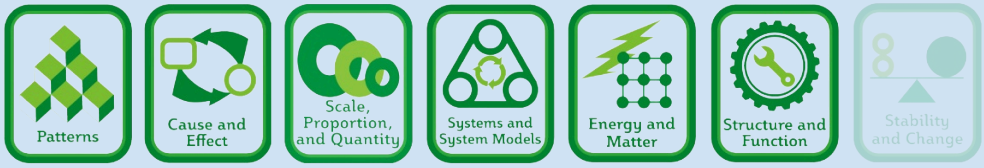
Part 2: Core Ideas
- Evaluating Sample Responses
- Writing a "Level 3" Response

Part 3: Life Connections
- Mammoth Cloning

Part 4: Review Game
- Jeopardy Review Game

Part 5: Final Review
- Final Q&A

NGSS Standards (*PEs* & *CCCs are summarized below. SEPs are noted throughout the packet*).
HS-LS1-2. Organization of interacting systems in multicellular organisms. HS-LS1-6. How carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. HS-LS1-5. How photosynthesis transforms light energy into stored chemical energy. HS-LS1-7. Cellular respiration is a chemical process whereby food molecules and oxygen molecules form new compounds resulting in a net transfer of energy.



Semester Schedule

5. Traits & Genes
5.1: What determines the traits of an organism?
5.2: How are traits inherited from parents?
5.3: Can we predict traits?
5.4: Unit Assessment

6. DNA & Proteins
6.1: What is DNA and how does it work?
6.2: How does DNA affect protein assembly?
6.3: Unit Assessment
6.4: How are genes modified? *(mini-unit)*

7. Mutations & Change
7.1: How does a protein get its shape & function?
7.2: How do mutations change genes & proteins?
7.3: How can mutations create new traits & species?
7.4: Unit Assessment
7.5: How Does Antibiotic Resistance Occur?

8. Biodiversity
8.1: How does biodiversity affect ecosystems? Why is biodiversity being lost?

These materials were partly developed with assistance from artificial intelligence.

Resource Links: Class Website; Part 1 Check-in Form; Jeopardy Review; Unit Summary; Practice Test; Unit Objectives;

Part 1: Introduction – Check-in Questions (6.3.1)

Overview: Show your readiness and demonstrate your understanding from this unit by completing this form.

Part 2: Critiquing Responses (6.3.2)

Directions: For each of the following, provide a brief written justification for why you think they earned a 1 (*still learning*), 2 (*acceptable*), or 3 (*sophisticated*). See below for a summary of each criteria for grading.
3 2 1 Complete: Do they fully address the entire question and explain all changes to matter & energy?
3 2 1 Accurate: Is every aspect of the written response factually correct?
3 2 1 Precise: Are they effectively using terms from the course in a clear and specific manner?

Q: How does DNA determine the observable traits of living organisms?

Oscar: *DNA has genes in it. The cell forms chromosomes in the cell and then divides using helicase.*

Overall Score: _____/3 Comments: _____

Nina: *DNA has an order for its bases. This provides the instructions for a protein and the order in which the amino acids are assembled.*

Overall Score: _____/3 Comments: _____

Bristol: *DNA stores information. It has sugars and bases. The order of sugars and bases determines the traits.*

Overall Score: _____/3 Comments: _____

Chandra: *DNA is made from phosphate, sugar, and base molecules. Phosphate and sugar provide structure; base molecules (A, C, G, T) store information. The order of codons (3 bases) in DNA determines the order of amino acids in a protein, which determines the shape and function of the protein, which determines the trait.*

Overall Score: _____/3 Comments: _____

Part 3: Life Connections - Mammoth Cloning (6.3.3)

Directions: Using your prior knowledge, you'll consider how blood types work in humans.

Background: A new company, backed by $15 million in funding, aims to bring back woolly mammoths using DNA recovered from frozen specimens. The company plans to use gene-editing technology to splice mammoth DNA into that of an Asian elephant. This would create a hybrid species that has DNA from both (a "mammophant") that would look and act like a mammoth. This process could potentially revive the extinct species and contribute to combating climate change.

1. If elephants and mammoths share 99% of the same DNA, how does adding mammoth DNA to an elephant create mammoth-like traits? Explain how DNA codes for proteins.

2. How can genes from one species work in another species' cells? Discuss transcription & translation.

3. Do you think this is a good idea? Is it ethical to revive a species that went extinct thousands of years ago? Create evidence-based arguments for both sides of this debate. *(Article & Image source: NPR)*

Part 4: Jeopardy Review (6.3.4)

Directions: In this activity, you'll play a Jeopardy-style game to review course concepts. Rules are in the presentation. You can also use this for test preparation. Your instructor may use an alternative option like Gimkit or Kahoot.

Game URL: DNA & Proteins Jeopardy

Part 5: Final Q&A (6.3.5)

Directions: For each objective, rank it as a 1 (*cannot understand or explain*), 2 (*understand but can't explain*), or 3 (*can understand & fully explain*). Review any content that is still unfamiliar and ask questions as needed. Pay special attention to items that are **bold**.

1. How are traits used to classify different species from each other? How do these traits relate to cells, DNA, and proteins?
2. **What is the primary purpose of DNA?** How does DNA enable a cell to function?
3. **What three molecules are found in DNA? What is the purpose of each molecule?**
4. What is a *nucleotide*? How does it relate to DNA and what DNA is made from?
5. How are the molecules in DNA similar to the components of a spiral notebook?
6. **What are *complementary base pairs*? What are examples of complementary base pairs?**
7. **Explain two reasons why nucleotide bases always combine in specific ways.**
8. **What are *codons*? How do codons in DNA provide instructions for making a protein?**
9. What determines the start and end of a gene?
10. What is the function and purpose of *helicase* and *DNA polymerase*?
11. **How do complementary base pairs, helicase, and DNA polymerase each enable DNA to be duplicated?**
12. What provides a sense of direction within DNA as it is being copied? Explain.
13. **What is RNA? What is the purpose of RNA?**
14. How is RNA similar & different from DNA?
15. RNA and DNA are similar macromolecules Why does a cell need both RNA and DNA?
16. **Summarize what occurs during transcription.**
17. **Summarize the purpose of each of these for transcription: *mRNA*, *RNA polymerase*.**
18. Create the complementary mRNA sequence for this DNA sequence: 3' TAC-GCT-ATG 5'
19. **Summarize what occurs during translation.**
20. **Summarize the purpose of each during translation: *ribosomes, tRNA, amino acids*.**
21. Explain transcription & translation using a simple analogy or a metaphor.
22. What would happen if the following became dysfunctional? *RNA polymerase; ribosomes.*
23. **How does tRNA deliver amino acids in the correct order to build a specific protein?**
24. Some antibiotics deactivate RNA polymerase in bacteria. How does this prevent infections?
25. **What would happen if a regular codon was changed into a stop codon by a mutation?**

