5.4 - Traits & Genes Unit, Packet 4

First & Last Name: _____ Period/Hour:_____

NOTE: Packets are due after completing Part 5. Check each page to be sure __all__ blanks are completed.

Driving Question: How do plants grow and function? How do plants acquire the matter and energy their cells need to function?

Anchoring Phenomenon: Throughout this unit, we have explored how DNA and proteins determine traits, and how this information is passed between cells as they divide and from parents to offspring. 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
- Predicting Blood Types

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.

| Patterns | Cause and Effect | Scale, Proportion, and Quantity | Systems and System Models | Energy and Matter | Structure and Function | Stability and Change |

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;

Part 1: Introduction – Check-in Questions (5.4.1)

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

Part 2: Critiquing Responses (5.4.2)

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 <u>Complete</u>: Do they fully address the entire question and explain all changes to matter & energy?
3 2 1 <u>Accurate</u>: Is every aspect of the written response factually correct?
3 2 1 <u>Precise</u>: Are they effectively using terms from the course in a clear and specific manner?

Question: What determines the observable traits of living organisms?

Oscar: Cells make proteins from DNA. Differences in DNA result in different proteins. Proteins make traits.

Overall Score: _____ /3 Comments: _____

Nina: Traits are determined by how proteins are assembled. Instructions for these proteins are found in chromosomes inherited from their parents' gametes. Chromosomes are tightly packed DNA.

Overall Score: _____ /3 Comments: _____

Bristol: Proteins produce the genes that make the traits. Genes come from parents during meiosis.

Overall Score: _____ /3 Comments: _____

Chandra: Traits are determined by the assembly of proteins, which, in turn, is influenced by genes (DNA segments). Typically, you inherit one gene copy from each parent, and these genes can be dominant or recessive. Dominant genes are always expressed; recessive genes are only expressed if no dominant genes are present.

Overall Score: _____ /3 Comments: _____

Part 3: Life Connections (5.4.3)

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

Background: Marisol discovered her blood type is AB. This aligns with her mom having type A and her dad having type B. However, her brother has type O blood. In biology, she learned blood type relates to surface proteins on blood cells that act as signals. For example, type A blood can't receive type B. Marisol wonders how her family has varied blood types. Do you agree with each claim?
<u>Marisol</u>: "If your cells make a protein, you must have a gene for that protein.
So I must have genes for both A and B proteins in my DNA."
<u>Oscar</u>: "I believe O is recessive to other blood types, suggesting both your parents might be carriers without expressing the O gene."
<u>Ali</u>: "Sometimes genes are incompletely dominant, or co-dominant. There are also polygenic traits. Maybe that explains it somehow."
Make a claim. Use the Punnett square at the right to justify your ideas.

Part 4: Jeopardy Review (5.4.4)

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: [Traits & Genes Jeopardy](#)

Part 5: Final Q&A (5.4.5)

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. What are traits? What are examples of traits? **What determines an organism's traits?**
2. **What is DNA? What is a gene? What is a chromosome? How are these terms similar and different?**
3. What is the primary purpose or function of packing DNA into a chromosome?
4. Explain how the steps of mitosis ensure that duplicated cells each receive a complete copy of DNA.
5. What would happen if a typical cell did not receive a copy of an organism's DNA?
6. **How do spindles and histones ensure that every cell receives a copy of an organism's DNA?**
7. **How can trillions of cells with thousands of different varieties of cell types emerge from a single cell?**
8. **What are the advantages and disadvantages of both sexual and asexual reproduction?**
9. How was limited genetic diversity a cause of the Irish Potato Famine?
10. **What is a gamete? What is meiosis? How do these affect sexual reproduction?**
11. What is the difference between a diploid and haploid cell? Why must gametes be haploid?
12. What is the difference between mitosis and meiosis? How are they similar and how are they different?
13. **What is crossing over? How does it increase the genetic diversity of an organism's offspring?**
14. **How are traits inherited from parents to offspring?**
15. Briefly summarize Gregor Mendel's work and his findings.
16. **What determines whether a dominant or a recessive gene is expressed as a trait?**
17. **What is indicated by the terms homozygous dominant, homozygous recessive, and heterozygous?**
18. **What is a genotype? What is a phenotype?** How are these terms related?
19. **Demonstrate how to use a Punnett square to predict the traits of offspring.**
20. **Summarize each of the following: codominant traits; incompletely dominant traits; polygenic traits.**
21. How is coat color in Labrador retrievers an example of how genes can sometimes affect the expression of each other?
22. **Why do parents sometimes give birth to offspring with different traits?**