Module 15: Darwin and Evolution

Comprehension & Critical Thinking Questions

Part 1: Understanding Core Concepts

1. **Darwin's Big Idea**
    - Define **Natural Selection**.
    - What is "Descent with Modification"?
    - Does an *individual* evolve, or does a *population* evolve?
2. **The Requirements**
    - Natural selection isn't magic; it requires specific conditions. Explain why **Heritable Variation**, **Competition/Overproduction**, and **Differential Survival** are necessary for evolution to occur.
3. **Fitness**
    - In evolutionary biology, "Survival of the Fittest" doesn't mean the strongest. What does **Fitness** actually mean? (Hint: Offspring).

Part 2: Applying Biological Principles

1. **Evidence: Anatomy**
    - Differentiate between **Homologous Structures** (e.g., human arm vs bat wing) and **Analogous Structures** (e.g., bird wing vs insect wing). Which one suggests a common ancestor?
    - What is a **Vestigial Structure**? Give a human example (Appendix? Tailbone?).
2. **Evidence: Biochemical**
    - All life on Earth uses DNA and the same 20 amino acids. How is this strong evidence for a universal common ancestor?

- If Human hemoglobin is more similar to Chimpanzee hemoglobin than to Dog hemoglobin, what does that imply about our evolutionary history?

Part 3: Analyzing & Evaluating

1. **Mechanisms of Change**
    - **Scenario**: A farmer sprays a pesticide on his corn. 99% of the bugs die. Next year, he sprays again, but only 50% die.
    - **Analysis**: Did the bugs "learn" to survive? Did the pesticide cause mutations? Explain how **Natural Selection** created this resistant population.
2. **Artificial Selection**
    - Humans bred wolves into Chihuahuas and Great Danes. How is **Artificial Selection** similar to Natural Selection? How is it different?