Module 17: Speciation and Macroevolution

Comprehension & Critical Thinking Questions

Part 1: Understanding Core Concepts

1. **Species Concepts**
    - Define the **Biological Species Concept**. What is the key criterion? (Reproduction).
    - Why is this concept hard to apply to fossils or asexual bacteria? What is the **Morphological Species Concept**?
2. **Reproductive Barriers**
    - Barriers prevent species from mixing. Classify the following as **Pre-zygotic** or **Post-zygotic**:
        - Two birds reproduce at different times of year (Temporal).
        - Sperm cannot fertilize egg (Gametic).
        - Hybrid offspring is frail or sterile (Mule).
3. **Modes of Speciation**
    - Compare **Allopatric Speciation** (Other Country) and **Sympatric Speciation** (Same Country).
    - Which one requires a physical geographic barrier?

Part 2: Applying Biological Principles

1. **Adaptive Radiation**
    - **Scenario**: A few finches are blown to a volcanic archipelago (Galapagos) with many empty habitats.
    - **Apply**: Explain how this single species can rapidly diverge into many new species.

2. **Convergent Evolution**

    - Sharks (Fish) and Dolphins (Mammals) look very similar (Torpedo shape, fins).
    - **Apply**: Did they inherit this shape from a common torpedo-ancestor, or did they evolve it independently? What environmental pressure caused this?

Part 3: Analyzing & Evaluating

1. **Macroevolutionary Pacing**

    - Contrast **Gradualism** (Slow, steady change) with **Punctuated Equilibrium** (Long statis, sudden change).
    - Which model is better supported by the fossil record? (Hint: It's often a mix, but Punctuated explains gaps well).

2. **The Goal of Evolution**

    - **Critique**: "Evolution drives organisms to become perfect."
    - Is evolution goal-oriented? Or does it just respond to the immediate environment? (Think about "Good enough" vs "Perfect").