Module 17: Speciation and Macroevolution

Comprehension & Critical Thinking Questions

Part 1: Core Concepts

1. **Species Concepts**
    - Define the Biological Species Concept. What is the key criterion?
    - Why is this concept difficult to apply to fossils or asexual organisms? What is the Morphological Species Concept?
2. **Reproductive Barriers**
    - Classify the following as pre-zygotic or post-zygotic:
        - Temporal isolation (different mating seasons)
        - Gametic isolation (sperm cannot fertilize egg)
        - Hybrid sterility (mule)
3. **Modes of Speciation**
    - Compare allopatric and sympatric speciation. Which requires a geographic barrier?

Part 2: Application

1. **Adaptive Radiation**
    - **Scenario**: Finches colonize a volcanic archipelago with many unoccupied niches.
    - Explain how one ancestral species can rapidly diversify into many species.
2. **Convergent Evolution**
    - Sharks (fish) and dolphins (mammals) have similar body shapes.
    - Did they inherit this shape from a common ancestor, or evolve it independently? What selective pressure drove this?

Part 3: Analysis & Evaluation

1. **Macroevolutionary Pacing**
    - Contrast gradualism (slow, steady change) with punctuated equilibrium (stasis interrupted by rapid change).
    - Which model better explains gaps in the fossil record?
2. **Evolution Has No Goal**
    - Critique the statement: "Evolution drives organisms toward perfection."
    - Is evolution goal-directed, or does it respond to immediate environmental pressures?