

Name: _____ Date: _____

Sophisticated Systems: Sustainability Solutions for 10th Grade

Deconstruct the decoupled economic growth model and assess the lifecycle impacts of rare earth mineral extraction in this advanced systems-thinking challenge.

1. The 'Cradle-to-Cradle' design framework, pioneered by William McDonough, suggests that industrial systems should model themselves on nature's nutrient cycles. Which concept is central to this framework?

- A. Linear throughput efficiency
- B. Elimination of the concept of waste
- C. Downcycling materials into lower-grade products
- D. Increasing consumer demand for short-lived goods

2. The 'Jevons Paradox' posits that increases in resource efficiency through technological progress often lead to an increase in total resource consumption rather than a decrease.

- A. True
- B. False

3. A key challenge in the transition to electric vehicles is the ecological and social impact of mining _____, a critical component in high-capacity lithium-ion batteries.

- A. Cobalt
- B. Bitumen
- C. Anthracite
- D. Potash

4. When examining the 'Triple Bottom Line,' which scenario represents a failure specifically in the social equity pillar while maintaining economic and environmental standards?

- A. A wind farm built on sacred indigenous land without local consent
- B. A factory dumping chemical runoff into a local river system
- C. A solar panel company going bankrupt due to high production costs
- D. A logging operation that fails to replant harvested timber areas

5. In the context of urban planning, _____ refers to the strategy of increasing housing density near transit hubs to reduce per-capita carbon footprints and land consumption.

- A. Greenwashing
- B. Urban Sprawl
- C. Transit-Oriented Development
- D. Gentrification

6. Internalizing 'externalities' means that a company must include the environmental and social costs of production in the final market price of their product.

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- A. True
- B. False

7. The concept of 'Planetary Boundaries' identifies nine Earth system processes that have critical thresholds. Which of the following has been identified by researchers as already being exceeded?

- A. Stratospheric ozone depletion
- B. Biogeochemical flows (Nitrogen/Phosphorus)
- C. Ocean acidification
- D. Global freshwater use

8. Blue carbon refers to the carbon sequestered and stored by _____ ecosystems, which are significantly more efficient at storage than terrestrial forests.

- A. Arctic tundra
- B. Coastal marine
- C. High altitude meadow
- D. Subterranean cave

9. The 'Precautionary Principle' suggests that if an action or policy has a suspected risk of causing harm to the public or environment, the burden of proof that it is NOT harmful falls on those taking the action.

- A. True
- B. False

10. Which agricultural method focuses on restoring soil organic matter and biodiversity to actively reverse climate change by sequestering carbon?

- A. Hydroponic monoculture
- B. Regenerative agriculture
- C. Precision pesticide application
- D. Vertical farming with LED lighting