Name: _____ **Date:** _____

Answer Key: Sustaining Systems: Senior Science Solutions for a Stable State

Twelfth graders identify core pillars of resilience across 10 problems focused on cradle-to-cradle design and the circular economy.

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1. Which concept describes an industrial system that is restorative or regenerative by intention and design, replacing the 'end-of-life' concept with restoration?

Answer: C) Circular Economy

A circular economy aims to eliminate waste through the superior design of materials, products, and systems, ensuring resources are reused rather than discarded.

2. The Triple Bottom Line framework evaluates a company's performance based on three specific dimensions: Profit, People, and Planet.

Answer: A) True

The Triple Bottom Line (TBL) is a sustainability framework that balances financial success with social responsibility and environmental stewardship.

3. When a product like a smartphone is designed to become outdated or non-functional after a short period, it is known as _____.

Answer: B) Planned Obsolescence

Planned obsolescence is a strategy of designing a product with a limited useful life, which forces consumers to replace it, increasing waste and resource use.

4. Which of these is a 'Biomicry' example where engineers solve human challenges by emulating nature's time-tested patterns and strategies?

Answer: B) Designing a high-speed train nose after a Kingfisher's beak

Biomimicry involves using biological models to inform sustainable design, such as the Shinkansen Bullet Train mimicking a bird to reduce noise and energy use.

5. Intergenerational equity suggests that the current generation has a moral obligation to leave a healthy planet for those born in the future.

Name: _____ **Date:** _____

Answer: A) True

Intergenerational equity is a core ethical pillar of sustainability, emphasizing fairness in resource availability across different time periods.

6. The measurement of the environmental impact of a person or community, expressed as the amount of land required to sustain their use of natural resources, is the ecological _____.

Answer: D) Footprint

An ecological footprint measures how fast we consume resources and generate waste compared to how fast nature can absorb our waste and generate new resources.

7. Which of the following is considered 'Downcycling' rather than true recycling?

Answer: B) Turning high-grade office paper into lower-quality cardboard

Downcycling occurs when the recycled material is of lower quality and functionality than the original material, eventually leading to waste.

8. A 'Carbon Sink' is any process, activity, or mechanism that removes a greenhouse gas from the atmosphere.

Answer: A) True

Forests, oceans, and soil act as natural carbon sinks by absorbing and storing CO_2, which is vital for climate stabilization.

9. In sustainability, the 'Precautionary Principle' suggests that if an action has a suspected risk of causing harm to the public or environment, in the absence of scientific consensus, the burden of proof falls on _____.

Answer: C) Those proposing the action

This principle ensures that the entity initiating a potentially harmful change is responsible for proving it is safe before proceeding.

10. Which term refers to the maximum population size of a species that an environment can sustain indefinitely without degrading the resource base?

Answer: B) Carrying Capacity

Carrying capacity is a fundamental ecological concept that defines the limits of growth within a sustainable system.

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