Name: _____ **Date:** _____

Answer Key: Cool Planet, Hot Topics: A 4th Grade Climate Challenge

Synthesize complex data across 10 advanced questions to design original solutions for urban heat islands and marine ecosystem shifts.

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1. In a city with many dark asphalt roads, the 'Urban Heat Island' effect makes it hotter than the countryside. Which innovative engineering solution would best help cool the city down?

Answer: B) Installing 'cool roofs' with white, reflective coatings

Reflective white surfaces have a high albedo, meaning they bounce sunlight back into space instead of absorbing it as heat, effectively cooling the building and its surroundings.

2. When oceans absorb too much carbon dioxide, they undergo a process called _____, which makes it difficult for oysters and clams to build their shells.

Answer: B) Ocean Acidification

Ocean acidification occurs when CO2 reacts with seawater to form carbonic acid, lowering the pH and depleting the minerals that shell-building organisms need.

3. True or False: Permafrost is frozen ground that, when melted, releases ancient methane gas which further accelerates the greenhouse effect.

Answer: A) True

Permafrost acts as a massive carbon sink; as it thaws due to rising temperatures, it releases methane, a potent greenhouse gas, creating a feedback loop.

4. If a species of mountain pika (a small mammal) finds its habitat becoming too warm, what is the most likely 'migration' pattern it will follow to survive?

Answer: C) Moving higher up the mountain to find cooler air

As temperatures rise, many species migrate toward the poles or to higher altitudes (upslope) where the climate is still within their survival range.

5. To reduce the 'carbon footprint' of schools, many designers use _____, which involves placing windows to capture natural light and heat during winter without using electricity.

Answer: C) Passive Solar Design

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Passive solar design uses a building's structure—like the placement of windows and materials—to manage temperature naturally without mechanical systems.

6. True or False: Planting 'Blue Carbon' ecosystems like mangroves is less effective at storing carbon than planting traditional inland pine forests.

Answer: B) False

Coastal ecosystems like mangroves and seagrasses, known as 'Blue Carbon' sinks, can store up to ten times more carbon per acre than terrestrial forests.

7. In the 'Circular Economy' model of waste management, how would a toy company change its business to help the climate?

Answer: C) Designing toys that can be easily taken apart and recycled into new toys

A circular economy focuses on eliminating waste by designing products to be reused, refurbished, or recycled, reducing the need for new raw materials and energy.

8. The _____ describes how some surfaces, like sea ice, reflect sunlight, while darker surfaces, like the open ocean, absorb it and get warmer.

Answer: B) Albedo Effect

Albedo is the measurement of reflectivity. High albedo (ice) keeps the planet cool, while low albedo (dark water) absorbs heat.

9. Why does the melting of 'land ice' (like glaciers in Greenland) cause sea levels to rise more than the melting of 'sea ice' (like in the North Pole)?

Answer: B) Sea ice is already floating in the water, so it has already displaced its volume

Just like an ice cube in a glass of water, sea ice is already part of the ocean's volume. Land ice adds new water to the ocean that wasn't there before.

10. True or False: Using 'biomimicry'—copying designs from nature—to build fans that look like whale fins can make wind turbines more efficient at generating clean energy.

Answer: A) True

Biomimicry helps engineers solve climate problems by using millions of years of natural 'R&D'. Humpback whale fins have bumps (tubercles) that improve aerodynamics for wind turbines.