Name: _____ **Date:** _____

Answer Key: Nail Climate Policy and Feedback Loops for 9th Grade

Albedo effects, permafrost feedback, and global policy frameworks — this 10-question assessment tackles the complexities of planetary system dynamics.

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1. The 'Ice-Albedo Feedback' loop is a critical driver of polar warming. Which scenario best evaluates the mechanism of this positive feedback loop?

Answer: A) Melting ice decreases surface reflectivity, leading to more solar absorption and further warming.

Albedo refers to the reflectivity of a surface. Ice has a high albedo; when it melts, it reveals darker land or water (low albedo), which absorbs more heat, causing more ice to melt.

2. The _____, adopted in 1987, is often cited as a successful model for international climate policy, though it specifically targeted ozone-depleting substances rather than CO2.

Answer: C) Montreal Protocol

The Montreal Protocol successfully phased out CFCs. It is frequently studied in environmental science as a template for how global cooperation can solve atmospheric crises.

3. True or False: The thawing of Arctic permafrost acts as a carbon sink because it allows for the rapid growth of new tundra vegetation that absorbs atmospheric methane.

Answer: B) False

Thawing permafrost is actually a carbon source. It releases trapped methane and CO2 from decomposing organic matter, which accelerates global warming rather than mitigating it.

4. When analyzing 'Ocean Acidification,' which chemical transition is caused by the increased absorption of anthropogenic CO2?

Answer: B) A decrease in pH levels and a reduction in the availability of carbonate ions.

As CO2 dissolves in seawater, it forms carbonic acid, lowering the pH. This process consumes carbonate ions, which many marine organisms need to build shells and skeletons.

5. In the context of climate mitigation, 'Blue Carbon' refers to the carbon captured and stored by _____ ecosystems, such as salt marshes and mangroves.

Answer: B) Coastal

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Coastal ecosystems like mangroves and seagrasses are highly efficient at sequestering carbon, storing it in submerged soils for centuries.

6. True or False: Stratospheric aerosol injection is a proposed form of geoengineering that aims to reflect sunlight back into space to mimic the cooling effect of volcanic eruptions.

Answer: A) True

This is a form of solar radiation management. By spraying reflective particles into the upper atmosphere, scientists hypothesize we could reduce the Earth's temperature.

7. Which of these best describes 'Thermal Expansion' as it relates to sea-level rise?

Answer: A) Water molecules expand in volume as they absorb heat, causing ocean levels to rise.

Sea-level rise isn't just from melting ice; as the ocean warms, the water itself physically expands and occupies more space.

8. The _____ Circulation acts as a 'global conveyor belt' moveing heat around the planet; climate change threatens to slow this process by adding fresh water from melting glaciers.

Answer: C) Thermohaline

Thermohaline circulation is driven by differences in temperature (thermo) and salinity (haline). Melting ice dilutes salinity, potentially disrupting these heat-moving currents.

9. How does the 'Urban Heat Island' (UHI) effect complicate the mitigation of climate change in densifying cities?

Answer: B) Concentrated asphalt and concrete absorb and re-emit heat, increasing local energy demand for cooling.

UHI makes cities significantly warmer than surrounding rural areas. This increases the use of air conditioning, which often burns more fossil fuels, creating a negative cycle.

10. True or False: 'Climate Justice' refers to the ethical framework that argues those who have contributed the least to greenhouse gas emissions are often the most vulnerable to its effects.

Answer: A) True

Climate justice highlights the disparity between developed nations (high emitters) and developing nations or marginalized groups who suffer the most from climate-related disasters.