Name: _____ **Date:** _____

Solve the 9th Grade Climate Crisis Challenge

Challenge students to analyze albedo feedback loops, ocean acidification chemistry, and geopolitical mitigation strategies in this rigorous inquiry-based assessment.

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1. The melting of permafrost in the Siberian tundra releases vast amounts of organic matter. As this matter decomposes in anaerobic conditions, which potent greenhouse gas is released, creating a positive feedback loop?

A. Nitrous Oxide
B. Methane
C. Sulfur Dioxide
D. Ozone

2. Current ocean chemistry is shifting due to increased CO2 absorption, a process known as _____, which reduces the availability of carbonate ions for calcifying organisms.

A. Thermal Expansion
B. Eutrophication
C. Ocean Acidification
D. Salinity Stratification

3. The 'Albedo Effect' refers to a negative feedback loop where increased ice melt leads to more solar radiation being reflected back into space.

A. True
B. False

4. Which of the following describes a 'Climate Wedge' strategy as proposed by Pacala and Socolow to stabilize carbon emissions?

A. Eliminating all fossil fuel use within a single five-year fiscal period
B. Relying on a single technological breakthrough to solve the energy crisis
C. Implementing a series of existing technologies to reduce emissions by 1 gigaton each
D. Using geoengineering to spray sulfate aerosols into the stratosphere

5. The slowing of the _____ (also known as the Ocean Conveyor Belt) due to freshwater influx from Greenland could drastically alter European climates.

A. Thermohaline Circulation
B. Hadley Cell
C. Coriolis Force
D. El Niño Southern Oscillation

6. Stratospheric aerosol injection is considered a type of Solar Radiation Management (SRM) designed to cool the Earth by mimicking volcanic cooling effects.

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A. True
B. False

7. In the context of the Keeling Curve, what explains the annual 'sawtooth' oscillation of atmospheric CO2 concentrations?

A. Variations in industrial production between summer and winter holidays
B. Seasonal cycles of photosynthesis and respiration in Northern Hemisphere forests
C. Periodic volcanic eruptions occurring primarily in the spring months
D. Changes in Earth's orbital distance from the Sun throughout the year

8. The use of _____ (BECCS) involves growing crops to absorb CO2, burning them for energy, and sequestering the resulting emissions underground.

A. Biological Effluence and Carbon Capture Storage
B. Bioenergy with Carbon Capture and Storage
C. Biomass Energy and Climate Cooling Systems
D. Benthic Energy for Carbonic Conversion

9. Climate 'Adaptation' primarily refers to preventing global warming by switching entirely to wind and nuclear power generation.

A. True
B. False

10. How do Milankovitch Cycles differ from current anthropogenic climate change as drivers of global temperature?

A. They operate on timescales of tens of thousands of years rather than decades
B. They are caused by changes in ocean pH rather than orbital changes
C. They only affect the Southern Hemisphere climate patterns
D. They have had no impact on Earth's paleoclimate history