Name: _____ **Date:** _____

Catastrophic Climate Changes: Crack Carbon Challenges for 8th Grade

How do positive feedback loops accelerate permafrost thaw? Assess the complex relationship between albedo reduction, ocean acidification, and anthropogenic forcing.

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1. Scientists are concerned about 'positive feedback loops' in the Arctic. Which scenario best exemplifies a feedback loop that accelerates global warming?

A. Increased plant growth in the Arctic absorbs extra carbon dioxide from the atmosphere.
B. Melting sea ice exposes dark ocean water, which absorbs more solar radiation and melts more ice.
C. Ocean water becomes more acidic, preventing the formation of calcium carbonate shells.
D. Volcanic eruptions release ash that reflects sunlight and temporarily cools the Earth.

2. True or False: The current rate of atmospheric carbon dioxide increase is significantly faster than any natural fluctuations recorded in ice core data over the last 800,000 years.

A. True
B. False

3. As the oceans absorb more CO2, the pH level of the water drops, a process known as _____, which threatens the stability of marine food webs.

A. Eutrophication
B. Ocean Acidification
C. Thermal Expansion
D. Desalination

4. Which of these is a significant 'carbon sink' that naturally sequesters atmospheric carbon for long-term storage?

A. Permafrost that is currently thawing
B. Dormant volcanoes in the Pacific Ring of Fire
C. Peatlands and deep-ocean sediments
D. Urban heat islands in metropolitan areas

5. True or False: Anthropogenic global warming is primarily caused by an increase in the intensity of solar radiation hitting the Earth's upper atmosphere.

A. True
B. False

6. The melting of land-based glaciers contributes to sea-level rise through both the addition of new water and through _____, where warmer water occupies more space.

A. Sublimation
B. Capillary Action
C. Thermal Expansion

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D. Condensation

7. In the context of climate mitigation, what is the primary goal of 'Carbon Capture and Storage' (CCS) technology?

A. To increase the efficiency of gasoline-powered vehicles
B. To remove CO2 from industrial emissions and pump it underground
C. To convert methane into oxygen using artificial photosynthesis
D. To reflect sunlight back into space using stratospheric aerosols

8. True or False: Methane (CH4) is a more potent greenhouse gas than Carbon Dioxide (CO2) molecule-for-molecule over a 20-year period.

A. True
B. False

9. The thawing of _____, which contains vast amounts of ancient organic matter, threatens to release massive amounts of methane in a dangerous feedback loop.

A. Stratospheric ozone
B. Permafrost
C. Atmospheric nitrogen
D. Igneous rock

10. Which of the following is considered an 'adaptation' strategy rather than a 'mitigation' strategy?

A. Transitioning a city's power grid to 100% wind energy
B. Implementing a national tax on carbon emissions
C. Developing heat-resistant urban infrastructure and 'cool roofs'
D. Phasing out the use of hydrofluorocarbons (HFCs) in refrigeration