

Name: _____ Period: ____ Date: _____

Environmental Science
#9-3: "Polar Extremes" Video

Please answer the following questions about **global climate change** by either watching the entire "Polar Extremes" documentary (to.pbs.org/3ibd9ER), or by watching the segments identified below:

1. According to the video segment, "How Earth's Climate Changed Over the Past 500 Million Years" (to.pbs.org/3u5TpZ8), the Earth has fluctuated over two climate states: icehouses and greenhouses.
 - a. Which climate state are we in now? Which climate state has been the most common in Earth's history? What do you think this might mean for our future?
 - b. What is the main cause of major temperature changes on Earth over time? How do we know?
2. In the video segment, "Plant Fossils Hint at Arctic's Swampy Past" (to.pbs.org/3q6NSQR), paleontologist Kirk Johnson shows a group of high schoolers that plant species in Virginia used to be right at home near the North Pole.
 - a. What kinds of plants used to live in the Arctic? How do we know?
 - b. What changed so that those plants can no longer live in the Arctic?
3. The video segment, "How Carbon Dioxide Warms Planet Earth" (to.pbs.org/3CHBFai), looks at how the greenhouse effect keeps Earth warm.
 - a. Over the last 800,000 years, until recently, about how much CO₂ has there been in our atmosphere? How do we know?
 - b. How quickly is CO₂ concentration increasing now? When was the last time the CO₂ concentration was this high?
 - c. What effect does the amount of CO₂ in our atmosphere have on where plants can live on our planet? What impact could this have on human civilization?
4. The video clip, "What if Carbon Left Your Tailpipe as Solid Chunks?" (to.pbs.org/3i7FmMK), visualizes what would happen if carbon emerged from our car tailpipes as a solid.
 - a. How much carbon is in one gallon of gasoline? How much carbon is put into the atmosphere each year as a result of human activities?

- b. What would a year's worth of carbon emissions look like if we piled it up as "car turds", as they're described in the video? How do you think people would react if we could see our carbon emissions as a giant pile of "car turds"?
5. According to the video, "What's Causing Greenland's Biggest Glacier to Melt?" ([to.pbs.org/3ibfPCE](https://www.pbs.org/3ibfPCE)), Jakobshavn has receded dramatically over the past 20 years.
 - a. When did Jakobshavn, Greenland's biggest glacier, begin to melt? What do scientists think is causing it to melt?
 - b. What impact does this have on global sea levels? Why is this a problem?
6. According to the video segment, "How Humans Could Make Icehouse Earth into a Hothouse" ([to.pbs.org/3CHNPQx](https://www.pbs.org/3CHNPQx)), Earth's climate has slowly fluctuated between cold and hot periods for millions of years. Today, humans are greatly accelerating that process.
 - a. According to the video, what has our planet's climate been like for the last few hundred million years? What evidence do scientists have to make this claim?
 - b. In order to understand the changes in our planet's climate, what time scales do we have to use, and why?
 - c. What do you think the host means when she says, "human time and climate time are totally incompatible"?
 - d. In the video, the host says, "Imagine our climate is a car that has airbags and seatbelts rated to withstand an impact at 60 miles per hour—but instead, we're driving at 6000 miles per hour." What do you think of this analogy? What do you think it means for our future on this planet?
7. Scientists have predicted many impacts in the future due to rapid climate change.
 - a. What's one specific impact on the environment that could happen within our lifetimes because of rapid climate change? How significant do you think this impact will be? Explain.
 - b. What's one specific impact on human civilization that could happen within our lifetimes because of rapid climate change? How significant do you think this impact will be? Explain.