Science Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Geology Per \_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Quaternary Climate- Past and Future**

By Vicky Jordan

Work with your team. Divide the list between members. Circle the numbers you will hunt for. Use the graph in the hallway to find where each event most likely occurred, and then fill in the information. Give an “eyeball average” of the CO2 level for that part of the graph. Don’t interfere with another team. There are MANY instances of each event throughout the graph. Share with your teammates when all have found their answers.

1. Warm climate: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:

2. Cold climate: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:

3. Acidic oceans *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:

4. Less precipitation: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:

5. More precipitation: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason:*

6. Challenging living conditions *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:

7. More heat radiating from atmosphere to Earth: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason:*

8. CO2 released from the ocean: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason:*

9. Permafrost melting: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:

10. Global dust storms: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:

11. Change in solar input: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:

12. Sea levels rise: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:

13. Sea levels fall: *CO2 level:\_\_\_\_\_\_\_Temp:* warm / cold *Reason*:



**Part B – Reflections**

14. Look at the cycles of highs and lows on the graph from 11,000 years ago to 800,000 years ago (not including the current time.) What is the approximate average “high” concentration of CO2 over time? \_\_\_\_\_\_\_\_\_\_ What is the approximate average “low” concentration of CO2 over time? \_\_\_\_\_\_\_\_\_\_\_

About how many years did it take (on average) for a low to become a high? \_\_\_\_\_\_\_\_\_\_\_\_

About how many years did it take (on average) for a high to become a low? \_\_\_\_\_\_\_\_\_\_\_\_

15. Look at the last 10,000 years (at the most current end of the graph.) What is the current concentration of CO2 in our atmosphere today? \_\_\_\_\_\_\_\_\_\_ Does this follow the “normal” high in the cycle? \_\_\_\_\_\_\_\_

How long did it take for the most current low to become a high? \_\_\_\_\_\_\_\_\_\_\_\_\_ Does this follow the “normal” amount of time in the geologic cycle? \_\_\_\_\_\_\_\_\_\_

16. Explain what a positive feedback is. Give an example.

**Pre-AP/Advanced**

To earn a “4” on this assignment, you must select one topic or idea that you see on the graph in the hallway, and research more information on that topic as homework. For example, based on the infographics, you may want to know more about moraines, or find out if acidification of the oceans is a problem today. Or, you can research something about the graph itself, like what is the Vostok ice core or the Mauna Loa site. Write or type a summary paragraph about what you learned, including a proper bibliography reference. Feel free to print a picture with a caption that can be placed onto the graph in the hallway if you desire (not required.) This is NOT intended to be a full-blown research paper! A paragraph with a bib is enough.

Write possible research topics here before you go home:

**Answer Key**

**Part B – Reflections**

14. Look at the cycles of highs and lows on the graph from 11,000 years ago to 800,000 years ago (not including the current time.) What is the approximate average “high” concentration of CO2 over time? \_\_300 ppmv\_\_ What is the approximate average “low” concentration of CO2 over time? \_\_160 ppmv\_\_

About how many years did it take (on average) for a low to become a high? \_\_40,000 -50,000 years\_\_

About how many years did it take (on average) for a high to become a low? \_60,000-100,000 years\_\_

15. Look at the last 10,000 years (at the most current end of the graph.) What is the current concentration of CO2 in our atmosphere today? \_\_400 ppmv\_\_ Does this follow the “normal” high in the cycle? \_No\_\_\_

How long did it take for the most current low to become a high? \_\_10,000 years (although it appears that when CO2 reached 300 ppmv, it should have started a downturn, and instead it spiked to 400 ppmv instantly -geologically speaking.)\_\_\_ Does this follow the “normal” amount of time in the geologic cycle? \_\_No\_\_

16. Explain what a positive feedback is. Give an example. A positive feedback is when something happens that causes an amplification in the result. For example, if the temperature is warming, glaciers and ice will melt. Since white ice and snow reflect heat and light, when the ground is covered by ice, the area stays cold. If the ice melts, the dark-colored ground can absorb heat and light, and the area warms up even faster. This is positive feedback. Other examples: melting permafrost releases methane, which causes more warming, which causes deeper melting of the permafrost; warmer oceans release stored CO2 which causes more warming;

*In examining data recorded in the Vostok ice core, scientists have known that cyclic variations in the amount of sunlight reaching the earth trigger glacial-interglacial cycles. However, the magnitude of warming and cooling temperatures cannot be explained by variations in sunlight alone. Instead, large rises in temperatures are more the result of strong upsurges in atmospheric carbon dioxide and methane concentrations set-off by the initial warming.*

Lawrence Berkeley National Laboratory. "Feedback Loops In Global Climate Change Point To A Very Hot 21st Century." ScienceDaily. ScienceDaily, 22 May 2006. <www.sciencedaily.com/releases/2006/05/060522151248.htm>.