Chapter 17 Lab Activity A

Trends in Atmospheric Carbon Dioxide

Although carbon dioxide makes up only about 0.03 percent of the total volume of gases in Earth's atmosphere, its impact on our climate appears to be significant. Scientists have little doubt that Earth was warmer in the past when carbon dioxide levels were higher. Thus, any increase in carbon dioxide levels today would be expected to result in a gradual increase in temperatures throughout the world.

Not all carbon dioxide is the result of human activities. Carbon dioxide can be produced naturally. The respiration of animals and the decay of dead plants and animals are two sources. However, neither of these sources is significant when compared with the amount of carbon dioxide released by the burning of such carbon fuels as coal, oil, and natural gas.

Atmospheric carbon dioxide concentrations have been measured for many years. The longest continuous record comes from air samples taken on Mauna Loa, an inactive volcano and the highest peak in Hawaii.

Procedure

1 Choose a colored pencil and plot the data in the Atmospheric Carbon Dioxide From 1996–2000 data table on the grid provided. Connect the points by drawing straight lines between adjacent points with your straightedge.

2 Use a calculator to complete the upper data table by calculating the annual average for each of the years from 1996 to 2000. The annual average is computed by summing the concentrations for all 12 months and dividing by 12.

3 Use a second colored pencil and a straightedge to plot the annual average on the grid for each of the five years. Place the straightedge horizontally across the grid at the appropriate concentration, and then draw a line at that value across the grid boxes that represent the appropriate year.

Analysis and Conclusions

1 During which month or months does the minimum value for atmospheric CO_2 concentration occur for the years 1996–2000?

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2 During which month or months does the maximum value for atmospheric CO_2 concentration occur for the years 1996–2000?
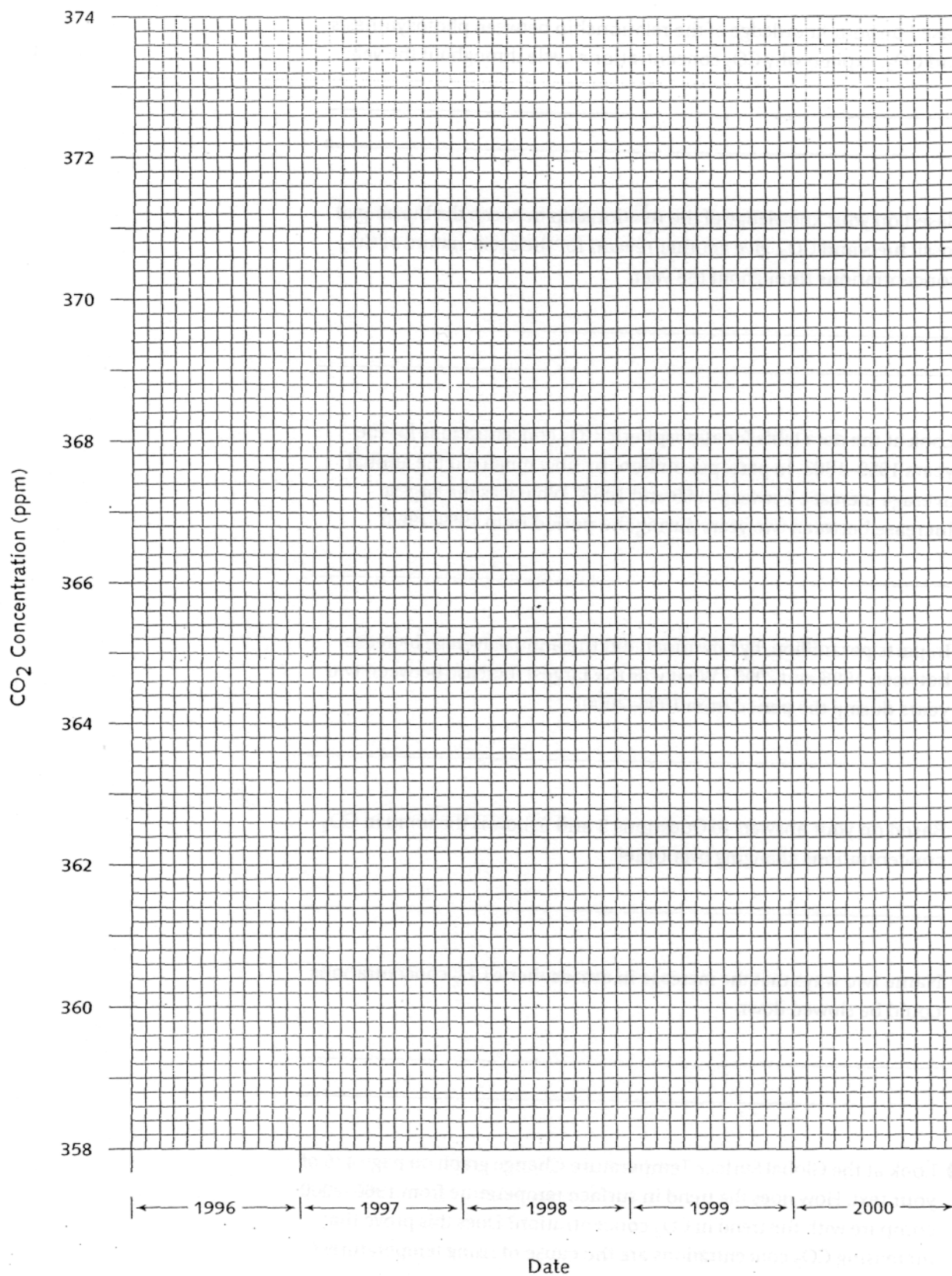
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LAB SKILLS AND OBJECTIVES

- *Plot* several years of carbon dioxide data.
- *Compare* and *contrast* recent data with older data.

MATERIALS

- colored pencils
- straightedge
- calculator
- Global Surface Temperature Change graph, Chapter 21, page 476 of your text

Atmospheric Carbon Dioxide From 1996–2000

Month	Atmospheric Carbon Dioxide Concentration (ppm)				
	1996	1997	1998	1999	2000
JAN	362.05	363.18	365.32	368.15	369.08
FEB	363.25	364.00	366.15	368.86	369.40
MAR	364.02	364.56	367.31	369.58	370.45
APR	364.72	366.36	368.61	371.12	371.59
MAY	365.41	366.80	369.30	370.97	371.75
JUN	364.97	365.62	368.87	370.32	371.62
JUL	363.65	364.47	367.64	369.25	370.04
AUG	361.49	362.51	365.77	366.91	368.04
SEP	359.46	360.19	363.90	364.60	366.53
OCT	359.60	360.77	364.23	365.09	366.63
NOV	360.76	362.43	365.46	366.63	368.20
DEC	362.33	364.28	366.97	367.96	369.43
Annual Average					

Atmospheric Carbon Dioxide From 1959–1963

Month	Atmospheric Carbon Dioxide Concentration (ppm)				
	1959	1960	1961	1962	1963
JAN	315.58	316.43	316.89	317.94	318.74
FEB	316.47	316.97	317.70	318.56	319.69
MAR	316.65	317.58	318.54	319.69	319.86
APR	317.72	319.03	319.48	320.58	321.39
MAY	318.29	320.03	320.58	321.01	322.24
JUN	318.16	319.59	319.77	320.61	321.47
JUL	316.55	318.18	318.58	319.61	319.74
AUG	314.80	315.91	316.79	317.40	317.77
SEP	313.84	314.16	314.99	316.26	316.21
OCT	313.34	313.84	315.31	315.42	315.99
NOV	314.82	315.00	316.10	316.69	317.06
DEC	315.59	316.19	317.01	317.69	318.36
Annual Average	315.98	316.91	317.65	318.45	318.99

ATMOSPHERIC CO_2 AT MAUNA LOA FROM 1996 TO 2000

CO₂ Concentration (ppm) — vertical axis labeled from 358 to 374

|← 1996 →|← 1997 →|← 1998 →|← 1999 →|← 2000 →|

Date

3 Based on your knowledge of the relationship between photosynthesis and CO_2, explain why CO_2 concentrations cycle throughout the year.

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4 Based on your knowledge of the relationship between the burning of fossil fuels and CO_2, give another reason for the cyclic nature of CO_2 concentrations throughout the year.

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5 Look at the data table for atmospheric CO_2 concentrations for the years 1959–1963. In parts per million, by how much did the annual average increase between 1959 and 1963? What was the largest increase between two years during the period from 1959–1963?

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6 In parts per million, by how much did the annual average increase between 1996 and 2000 ? What was the largest increase between two years during the period from 1996–2000?

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7 Based on your answers to Questions 5 and 6, how is the trend in CO_2 concentrations changing over time?

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8 Name two ways that the increase in atmospheric CO_2 concentrations could be slowed down.

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9 Look at the Global Surface Temperature Change graph on page 476 of your text. How does the trend in surface temperature from 1960–2000 compare with the trend in CO_2 concentration? Does this prove that increasing CO_2 concentrations are the cause of rising temperatures?

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