Name: **Date:** **Period:**

LAB: CARBON DIOXIDE IN EARTH'S ATMOSPHERE AND GLOBAL WARMING

BACKGROUND: Throughout Earth's history, climates have gradually changed. Over millions of years, warm periods have alternated with cold periods known as **ice ages**, or glacial episodes. During each ice age, glaciers covered large parts of Earth's surface.

Most changes in world climates are caused by natural factors. But recently scientists have observed climate changes *that are the result of human activities*. For example, over the last 120 years, the average temperature of the troposphere has risen by 0.5˚C. This gradual increase in the temperature of Earth's atmosphere is called **global warming**.

Gases in Earth's atmosphere hold in heat from the sun, keeping the atmosphere at a comfortable temperature for living things. The process by which gases in Earth's atmosphere trap energy is called the **greenhouse effect**. Gases in the atmosphere that trap energy are called **greenhouse gases**. *Carbon dioxide*, water vapor, and methane are some of the greenhouse gases. **Human activities that add greenhouse gases to the atmosphere are warming Earth's atmosphere.**

Most scientists think that an increase in *carbon dioxide* is a major factor in global warming. Since the late 1800s, the level of *carbon dioxide* in the atmosphere has increased steadily. This increase is due to human activities such as the burning of wood, coal, oil, and natural gas.

The effects of global warming are not entirely known. The possible effects might include increased farming in some areas, destruction of fertile land in other areas, increased hurricane strength, and flooding of low-lying coastal areas. The two major causes of global sea-level rise are **thermal expansion** caused by the warming of the oceans (since water expands as it warms) and the **melting of *land-based* ice** (such as glaciers and polar ice caps).

PROCEDURE: In this investigation, you will study the changing concentration of carbon dioxide in Earth's atmosphere over a period of several years, measured at the Mauna Loa Observatory in Hawaii by the National Oceanic and Atmospheric Administration (NOAA)."

- Create two line graphs using the data from Table 1 and Table 2.

  "Table 1" shows* the average concentration of carbon dioxide (CO_2) in the atmosphere in " parts per million" (ppm) by months.

  "Table 2" shows* the yearly average of CO_2 concentration in the atmosphere for each year from 1985 through 2014.

  * SOURCE: ftp://aftp.cmdl.noaa.gov/products/trends/co2/co2_weekly_mlo.txt

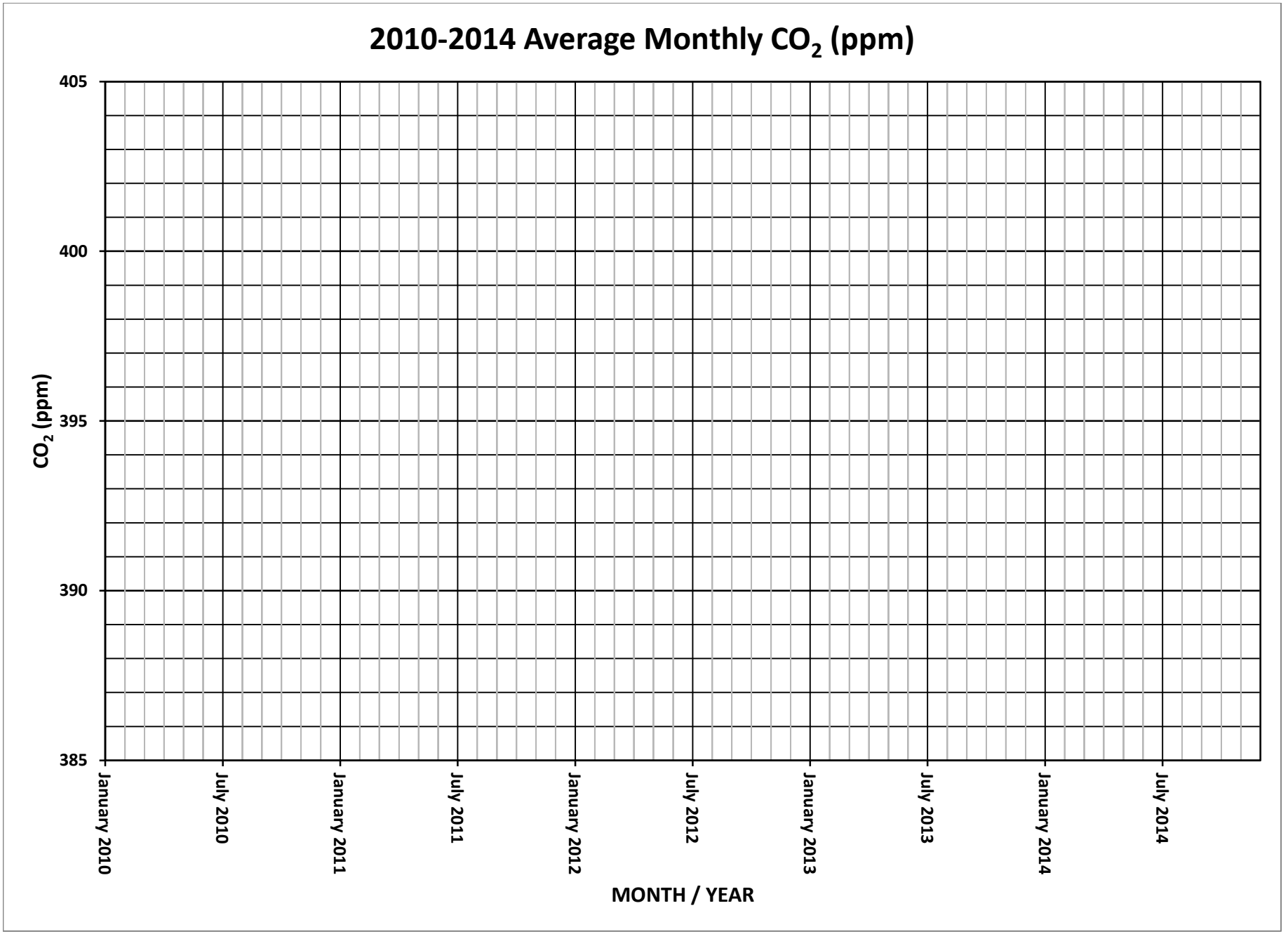
- Answer the **Summary Questions**.

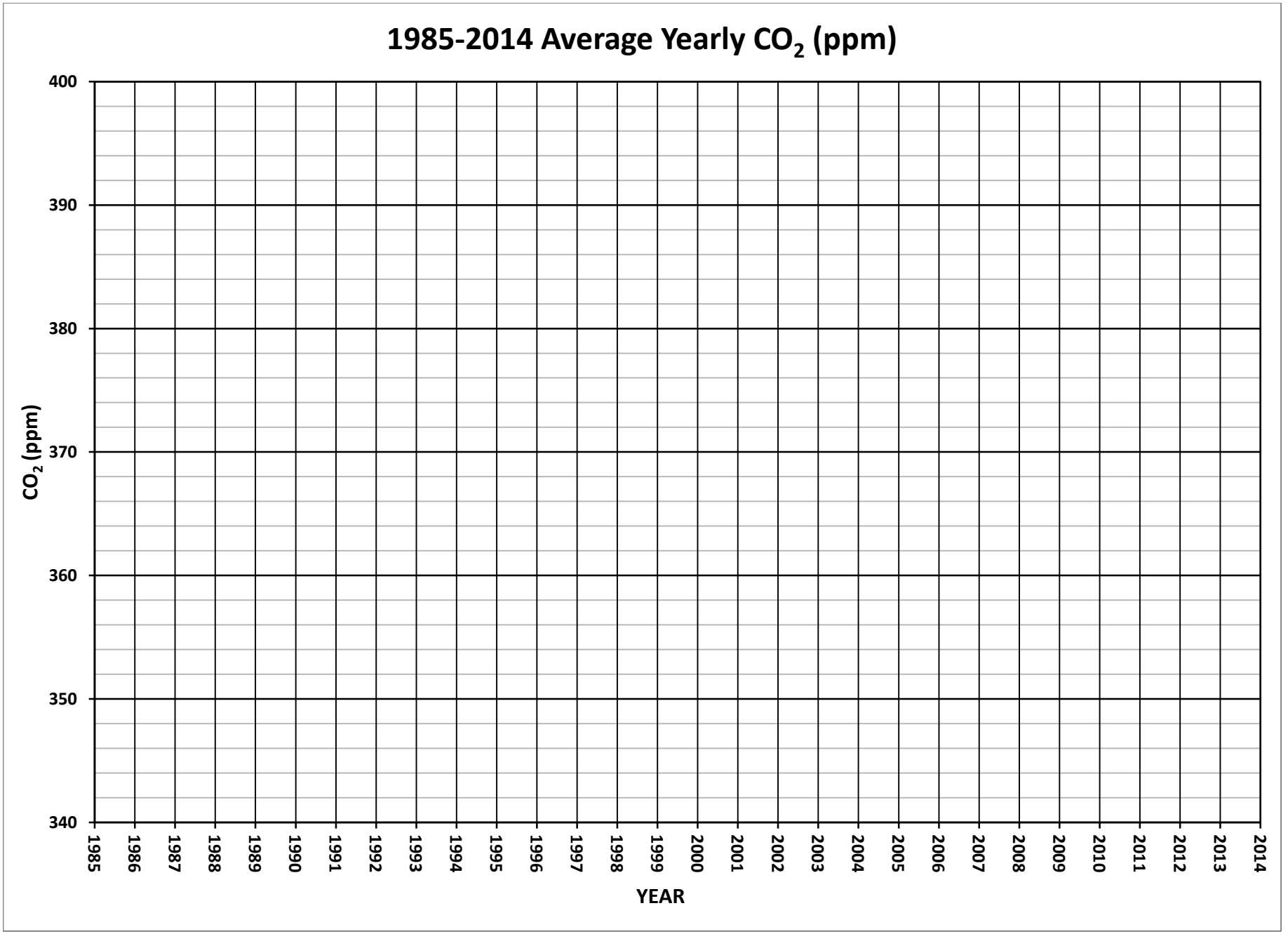
TABLE 1

MONTH / YEAR	Average CO_2 (ppm)	MONTH / YEAR	Average CO_2 (ppm)
January 2010	388.7	July 2012	394.2
February 2010	390.2	August 2012	392.2
March 2010	391.1	September 2012	391.0
April 2010	392.7	October 2012	391.1
May 2010	393.1	November 2012	393.0
June 2010	391.8	December 2012	394.4
July 2010	390.1	January 2013	395.7
August 2010	388.2	February 2013	396.8
September 2010	386.7	March 2013	397.5
October 2010	387.4	April 2013	398.5
November 2010	388.9	May 2013	399.8
December 2010	389.8	June 2013	398.5
January 2011	391.3	July 2013	397.0
February 2011	391.8	August 2013	395.0
March 2011	392.6	September 2013	393.5
April 2011	393.3	October 2013	393.8
May 2011	394.2	November 2013	395.2
June 2011	393.6	December 2013	396.9
July 2011	392.1	January 2014	397.9
August 2011	390.0	February 2014	397.9
September 2011	389.0	March 2014	399.8
October 2011	389.1	April 2014	401.5
November 2011	390.4	May 2014	401.8
December 2011	391.9	June 2014	401.0
January 2012	393.1	July 2014	398.7
February 2012	393.7	August 2014	396.8
March 2012	394.5	September 2014	395.1
April 2012	396.3	October 2014	396.0
May 2012	396.7	November 2014	397.3
June 2012	395.8	December 2014	399.1

TABLE 2

YEAR	Average CO_2 (ppm)	YEAR	Average CO_2 (ppm)
1985	346.1	2000	369.5
1986	347.4	2001	371.2
1987	349.2	2002	373.2
1988	351.6	2003	375.8
1989	353.1	2004	377.5
1990	354.4	2005	379.9
1991	355.6	2006	381.9
1992	356.4	2007	383.8
1993	357.1	2008	385.5
1994	358.8	2009	387.4
1995	360.8	2010	389.8
1996	362.6	2011	391.6
1997	363.7	2012	393.8
1998	366.7	2013	396.5
1999	368.3	2014	398.6


2010-2014 Average Monthly CO_2 (ppm)
405
400
395
390
385
CO_2 (ppm)
January 2010
July 2010
January 2011
July 2011
January 2012
July 2012
January 2013
July 2013
January 2014
July 2014
MONTH / YEAR


1985-2014 Average Yearly CO_2 (ppm)
400
390
380
370
360
350
340
CO_2 (ppm)
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
YEAR

SUMMARY QUESTIONS

1. What type of change is illustrated by your "Table 1" graph?

(1) non-cyclic with an increasing trend
(2) non-cyclic with a decreasing trend
(3) cyclic with an increasing trend
(4) cyclic with a decreasing trend

2. What type of change is illustrated by your "Table 2" graph?

(1) non-cyclic with an increasing trend
(2) non-cyclic with a decreasing trend
(3) cyclic with an increasing trend
(4) cyclic with a decreasing trend

3. During which month(s) of the year is CO_2 concentration in the atmosphere highest?

4. During which month(s) of the year is CO_2 concentration in the atmosphere lowest?

5. What gas in the atmosphere do green plants use to carry on the food-making process of photosynthesis?

6. As the burning of fossil fuels continues or increases, the concentration of CO_2 in the atmosphere will most likely _____.

ANSWER QUESTION 7a **OR 7b.*

***7a**. State **two** (2) reasons why the concentration of CO_2 in the atmosphere increases during the winter months:	***7b**. State **two** (2) reasons why the concentration of CO_2 in the atmosphere decreases during the summer months:

8. List **two** ways in which you (or we as a society) can reduce the rate of CO_2 concentration in the atmosphere, and thus hopefully slow down or prevent "global warming."