**Climate Change Exercises: Questions 8-12**

**Assessment continues**

The climate change exercises continue on this page. Use the libraries and datasets below.

**Libraries and Data Import**

library(tidyverse)

library(dslabs)

data(temp\_carbon)

data(greenhouse\_gases)

data(historic\_co2)

You have used 0 of 10 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 9**

0.0/5.0 points (graded)

Interpret the plot of greenhouse gases over time from the previous question. You will use each answer exactly once ch4, co2, n2o, all, none).

Which gas was stable at approximately 275 ppm/ppb until around 1850?

unanswered

Which gas more than doubled in concentration since 1850?

unanswered

Which gas decreased in concentration since 1850?

unanswered

Which gas had the smallest magnitude change since 1850?

unanswered

Which gas increased exponentially in concentration after 1850?

unanswered

You have used 0 of 3 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 10**

0.0/3.0 points (graded)

While many aspects of climate are independent of human influence, and co2 levels can change without human intervention, climate models cannot reconstruct current conditions without incorporating the effect of manmade carbon emissions. These emissions consist of greenhouse gases and are mainly the result of burning fossil fuels such as oil, coal and natural gas.

Make a time series line plot of carbon emissions (carbon\_emissions) from the temp\_carbon dataset. The y-axis is metric tons of carbon emitted per year.

Which of the following are true about the trend of carbon emissions?

Check all correct answers.

Carbon emissions were essentially zero before 1850 and have increased exponentially since then.

Carbon emissions are reaching a stable level.

Carbon emissions have increased every year on record.

Carbon emissions in 2014 were about 4 times as large as 1960 emissions.

Carbon emissions have doubled since the late 1970s.

Carbon emissions change with the same trend as atmospheric greenhouse gas levels (co2, ch4, n2o)

unanswered

You have used 0 of 2 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 11**

0.0/2.0 points (graded)

We saw how greenhouse gases have changed over the course of human history, but how has CO2 (co2 in the data) varied over a longer time scale? The historic\_co2 data frame in **dslabs** contains direct measurements of atmospheric co2 from Mauna Loa since 1959 as well as indirect measurements of atmospheric co2 from ice cores dating back 800,000 years.

Make a line plot of co2 concentration over time (year), coloring by the measurement source (source). Save this plot as co2\_time for later use.

Which of the following are true about co2\_time, the time series of co2 over the last 800,000 years?

Check all correct answers.

Modern co2 levels are higher than at any point in the last 800,000 years.

There are natural cycles of co2 increase and decrease lasting 50,000-100,000 years per cycle.

In most cases, it appears to take longer for co2 levels to decrease than to increase.

co2 concentration has been at least 200 ppm for the last 800,000 years.

unanswered

You have used 0 of 2 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 12**

0.0/4.0 points (graded)

One way to differentiate natural co2 oscillations from today's manmade co2 spike is by examining the rate of change of co2. The planet is affected not only by the absolute concentration of co2 but also by its rate of change. When the rate of change is slow, living and nonliving systems have time to adapt to new temperature and gas levels, but when the rate of change is fast, abrupt differences can overwhelm natural systems. How does the pace of natural co2 change differ from the current rate of change?

Use the co2\_time plot saved above. Change the limits as directed to investigate the rate of change in co2 over various periods with spikes in co2 concentration.

Change the x-axis limits to -800,000 and -775,000. About how many years did it take for co2 to rise from 200 ppmv to its peak near 275 ppmv?

100

3,000

6,000

10,000

unanswered

Change the x-axis limits to -375,000 and -330,000. About how many years did it take for co2 to rise from the minimum of 180 ppm to its peak of 300 ppmv?

3,000

6,000

12,000

25,000

unanswered

Change the x-axis limits to -140,000 and -120,000. About how many years did it take for co2 to rise from 200 ppmv to its peak near 280 ppmv?

200

1,500

5,000

9,000

unanswered

Change the x-axis limits to -3000 and 2018 to investigate modern changes in co2. About how many years did it take for co2 to rise from its stable level around 275 ppmv to the current level of over 400 ppmv?

250

1,000

2,000

5,000

unanswered

You have used 0 of 3 attempts