ATMS 211. Homework #1: Global Change, Ozone.

Review Questions (based on reading assignments and lecture material)

1.)
   a. What is meant by “anthropogenic greenhouse gases”?
   b. Name three greenhouse gases that have increased in concentration in Earth’s atmosphere. [5 pts]

2.) What are the four fundamental components of the Earth system? (Describe each briefly, i.e., in one sentence each). [4 pts]

3.) Explain the difference between global warming and the greenhouse effect. [4 pts]

4.)
   a. By how much did Earth’s atmospheric CO₂ concentration increase from the year 1800 to the year 2001?
   b. How do we know this?
   c. What are thought to be the primary causes of this increase? [5 pts]

5.) Cite two ways in which chlorofluorocarbons (CFCs) can affect the environment. [2 pts]

6.)
   a. How far back in time do direct measurements of Earth’s surface temperature extend?
   b. Give 3 reasons why is it difficult to determine accurately the global long-term temperature trend? [4 pts]

7.) How might the burning of coal have had opposing effects on climate during the 20th century? [4 pts]
8.) Why is stratospheric ozone important to humans? [2 pts]

9.) To what two global environmental problems does tropical deforestation contribute? [2 pts]

10.) We discussed three global scale problems in class: ozone depletion, global warming, and biodiversity loss. Ozone depletion has a recovery timescale of 50-150 years, which is the lifetime of CFCs in the atmosphere. Thus, if we stop putting new CFCs in the atmosphere, we can expect the ozone layer to recover on a 50-150 year timescale. What are the recovery timescales associated with (a) global warming from CO₂ input (i.e. how long to get back to preindustrial levels of CO₂ if we stop putting CO₂ into the atmosphere) and (b) biodiversity loss (i.e., how long to restore biodiversity if we stop wiping out species)? [2 pts]

11.) (See Chapter 1 and Chapter 17 of the textbook for the information required to answer this question).
   (a) By how much, as a percentage, did the total ozone column depth in the month of October decrease over Antarctica from 1960 to 2000?
   (b) Are there any months of the year when the total ozone column depth above the equator reaches a level like that seen in October 2000 above Antarctica?
   (c) The ozone column above the Australian city of Melbourne decreased in summer during Dec 1987 - Jan 1988 because of an intrusion of ozone-poor air into the stratosphere above Melbourne. What was the lowest value of ozone column depth in Dobson Units recorded during this time?
   (d) Are there any months of the year when the total ozone column depth above the equator reaches a level like that given in your answer to (c) above Melbourne? [6 pts]

**Critical Thinking/Discussion Problem**

12) Which of the three modern global change problems discussed in class -- global warming, ozone depletion, or loss of biodiversity -- do you consider to be the most serious? Give reasons for your answer. If you wish, include information drawn from other sources. Do not exceed 2/3 of a page in your discussion. [10 pts]