

(Due Thursday, May 4, 5 pm)

Name: _____ Section _____

ID #: _____

AOS 1 Homework #2 (30 points, Understanding of Ozone formation and ozone hole)

A. Assume that there are 500 oxygen molecules (O_2) in a room where sunlight is available and assume that 10% of them interact with photons, how many oxygen atoms (O) can become available? (3 points)

B. Another 10% of O_2 can undergo three body collisions, how many ozone molecules (O_3) can then be formed? What is the meaning of “third body”? In this case, what is the third body associated with ozone formation? (3 points)

C. 20 % of ozone can be destroyed by sunlight and 10% of ozone is destroyed by collision with atomic oxygen. How many ozone molecules are left in the room? Also, how many oxygen molecules exist at this point? (3 points)

D. Can the processes in item **C** create an ozone hole such as that occurred in Antarctica? If not, explain the three steps leading to the formation of ozone hole (Lecture Notes and Course Reader, pp 35-39 and pp104-111). (5 points)

E. What is the meaning of DU (Dobson Units) for the quantification of ozone concentration? What is a typical value for ozone in Los Angeles and at Antarctica? (Lecture Notes, 3 points)

F. Why is ozone a greenhouse gas? Also, name the greenhouse gases that are related to ozone in the troposphere. (Lecture Notes, 3 points)

G. Carbon monoxide (CO) is not a greenhouse gas since it doesn't have absorption band to trap the infrared radiation emitted from the Earth. But why is it important in the discussion of greenhouse warming? What is the prime source of CO? (Lecture notes, 3 points)

H. In the discussion of greenhouse warming, the concept of climate radiative forcing (W/m^2 , flux density) is customarily used. What does it mean? What are the radiative forcings estimated for ozone and carbon dioxide at this point? (Lecture Notes, 4 points)

I. In reference to item **H**, the light bulb on your study desk is 75 Watts (W). Let the desk be 5 meters long and 3 meters wide, what is the flux density available to the desk in this case? (3 points)