

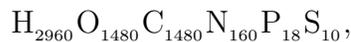
Math 29
Homework 5

Write a 1-3 sentence summary of what we did in class the previous period.

1. Charles's law for gases states that if the pressure remains constant, then the relationship between the volume V (in cm^3) that a gas occupies and its temperature T in degrees Celsius is given by

$$V = V_o \left(1 + \frac{T}{273} \right).$$

- a) Explain what V_o represents.
 - b) What increase in temperature corresponds to an increase in volume from V_o to $2V_o$?
2. A formula representing the approximate chemical composition of a typical dry freshly photosynthesized biomass (plant material that can be used as a source of energy) is



where each subscript denotes the relative number of atoms of that element. Given that the atomic masses of hydrogen, oxygen, carbon, nitrogen, phosphorus and sulfur are, respectively, 1, 16, 12, 14, 31 and 32, estimate the carbon content of dry biomass; i.e., the fraction of the mass of dry biomass which is made up of carbon. (The atomic mass of an element is the mass of an atom of that element relative to the mass of an atom of hydrogen; for example, the mass of one mole of oxygen gas is 16 times the mass of one mole of hydrogen gas under the same conditions.)

3. The net primary productivity (npp) in units of carbon per year is the net amount of carbon converted from CO_2 to carbon-containing organic molecules each year through photosynthesis. The npp has been estimated to be 7.5×10^{16} grams of carbon per year on the entire Earth. Given that the energy content of dry biomass is about 1.6×10^4 joules per gram of biomass, use your answer to Problem 2 to estimate the npp in joules per year.

4. You go to the LA county Fair and you want to go on rides. Suppose that the rides you like cost 4 tickets each. You can buy individual tickets for 75 cents each, you can buy a pack of 15 tickets for 10 dollars, or you can buy a bracelet for 12 dollars which would allow you to go on an unlimited number of rides. What is the minimum number of rides that you would have to go on for it to be worth it to buy the bracelet instead of some combination of tickets?

In Section 1.5 do problems 29, 31, 32; and in Section 1.7, do problems 4 and 8. Be sure to show all of the steps of your work.