CHEM 234 - Fall 2014

Assignment #1 (5 points)

Due date: September 18th, 2014

Question 1: (1 point)

The mass of air in our classroom was evaluated to be around 450 kg, when estimating that air is composed of 79% nitrogen (N2) and 21% oxygen (O2). What difference in mass could you calculate, if any, if air had been estimated to be composed of 100% nitrogen, instead of 79% N2 and 21% O2?

Question 2: (1 point)

In an industrial process, nitrogen has to be heated to 500 K at a constant volume of 1.000m3. The gas enters the container at 300 K and 100 atm. The mass of the gas is 92.4 kg. Use the van der Waals equation to determine the approximate pressure of the gas at its working temperature of 500 K. For nitrogen, a = 1.352 dm6 atm mol-2, and b= 0.0387 dm3 mol-1.

Question 3 : (1 point)

Calculate the work needed for a bird of mass 135 g to fly to a height of 60 m from the surface of the Earth.

Question 4: (2 points)

A sample consisting of 1.0 mol of solid calcium carbonate (CaCO3) was heated to 800°C, when it decomposed. The heating was carried out in a container fitted with a piston that was initially resting on the solid. Calculate the work done during the complete decomposition of the sample at 1.0 atm. What work would be done if instead of having a piston, the container was open to the atmosphere?