

CHEMISTRY 302

ASSIGNMENT 1

DUE 4:30 PM, THURSDAY 11 JANUARY 2006

1. The composition of the atmosphere below 100 km is:

Constituent	Molecular Mass (g mol ⁻¹)	Content (fraction of total molecules)
Nitrogen (N ₂)	28.016	0.7808
Oxygen (O ₂)	32.00	0.2095
Argon (Ar)	39.94	0.0093
Water Vapour (H ₂ O)	18.02	0 - 0.04
Carbon dioxide (CO ₂)	44.01	325 ppm
Neon (Ne)	20.18	18 ppm
Helium (He)	4.00	5 ppm
Krypton (Kr)	83.7	1 ppm
Hydrogen (H ₂)	2.02	0.5 ppm
Ozone (O ₃)	48.00	0-12 ppm

(a) To the nearest milligram, what is the average molar mass of dry (i.e. no water vapour present) air with no ozone present?

(b) Would an "ozone episode" (i.e. concentration of ozone at maximum) make a difference to the answer calculated in (a)?

(c) At 50% relative humidity, the water content of air is 0.020 as a fraction of the total molecules. What is the molar mass of this air?

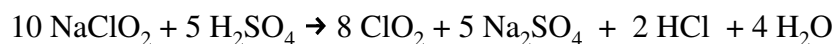
(d) If the ozone concentration is 8.4 ppm at a pressure of 100 kPa at 19°C, what is the concentration of ozone in molecules cm⁻³?

(e) The total mass of the atmosphere below 100 km is 5.0×10^{15} tonnes. Assuming uniform composition, what is the total mass of each of the first three constituents listed in the table?

2. Do question 3, page 27 Bunce.

3. Do question 3, page 128 Bunce.

4. Chlorine dioxide is prepared for water treatment by the reaction below.



What mass of NaClO₂ is needed to generate enough ClO₂ to treat 3.8×10^5 m³ of water with 4.9 ppm of ClO₂ if the percent yield of the reaction is 86%?