5.1) Cloudy air consists of dry air, water vapor, and cloud droplets. In a particular cloud volume, there are 200 droplets per cubic centimeter, all of the same size, with a radius of 10 micrometers. The temperature is 10°C and the pressure is 80kPa. Determine the following properties of the cloud:
   a. The mass of cloud water per unit volume.
   b. The mass of water vapor per unit volume.
   c. The mass of dry air per unit volume.
   d. The mean distance between the droplets.

5.2) An airplane flies through an isolate cumulus cloud to make microphysical measurements with a raindrop spectrometer probe having a cross-sectional area of 20cm². The cruising speed is 80m/s and a horizontal transverse through the cloud core takes about 2 minutes. Assume that the cloud shape can be roughly approximated by a cylinder having a depth of 4km. Under these assumptions, compute the fraction of the cloud volume that is actually sampled during a traverse.