1. Find the average molecular weight and gas constant for air saturated with water vapor at 0°C and $p = 1$ atm. The vapor pressure of water at 0°C is 6.11 mb.

2. A dry air parcel ascends in the atmosphere from the 1000 mb level where its temperature is 10°C to that of 700 mb. Assuming an adiabatic process, calculate:

   - a) Its initial specific volume.
   - b) Its final temperature and specific volume.
   - c) Its change in specific internal energy (in $J kg^{-1}$) and in specific enthalpy (in $cal g^{-1}$).
   - d) What is the work of expansion done by 1 km$^3$ of that air (volume taken at initial pressure)?

3. Prove that when an ideal gas undergoes an adiabatic transformation,

\[ pV^\gamma = \text{constant} \]

where $\gamma = \frac{C_p}{C_v}$.

4. Calculate the work done in compressing isothermally 2 kg of dry air to one-tenth of its volume at 15°C.

5. Find the gas constants, R, for the atmospheres of Mars, Jupiter, and Saturn.