Wet-Bulb Temperature and Relative Humidity from Air Temperature and Dewpoint Temperature

From the user, an air temperature (T), a dewpoint temperature (T_d), and a station pressure (p_{sta}) are given. The temperatures must be converted to units of degrees Celsius ($°C$), and the station pressure must be converted to units of millibars (mb) and hectopascals (hPa). To see how to convert temperatures and pressures, see the links below:

http://www.wrh.noaa.gov/slc/projects/wxcalc/formulas/tempConvert.pdf

http://www.wrh.noaa.gov/slc/projects/wxcalc/formulas/pressureConversion.pdf

Then, the saturation vapor pressure (e_s) and the actual vapor pressure (e) can be calculated. To see how to calculate the vapor pressure, see the link below:

http://www.wrh.noaa.gov/slc/projects/wxcalc/formulas/vaporPressure.pdf

Next, the relative humidity can be calculated by using the vapor pressures.

$$rh = \frac{e}{e_s} \times 100$$

Next, a wet-bulb temperature (T_w)must be calculated. The best way to do this is by using a Skew-T diagram which is used by the National Weather Service and other meteorologists for determining the current state of the atmosphere. A blank Skew-T diagram can be found here at this link:

http://www.eos.ubc.ca/courses/atsc201/BrooksCole/MetSciEngr/BlankSoundings/Skew-T.pdf

For information on how to read and understand a Skew-T diagram, see the link below:

http://www.theweatherprediction.com/thermo/

For finding the wet-bulb temperature, first find the elevation of your location. Next, at the elevation of your location, plot the air temperature (in degrees Celsius) and the dewpoint temperature on the chart. Take the air temperature up the dry adiabat line and the dewpoint temperature up the theta line until they meet. At the point where they meet, come back down the moist (or wet) adiabat to the elevation of your station. This will be the wet-bulb temperature.