Problems.

1. Refer to the sounding in Fig. 7.22.

    a. Estimate the mixing ratio at the surface.

    b. Estimate the saturation mixing ratio at the surface. What is the relative humidity at the surface?

    c. What is the dew point?

    d. What is the pressure level at the LCL?

    e. What is the wet bulb temperature at the surface?

    d. Is CIN > 0?

    e. Is there a large CAPE?

    f. What is the mixing ratio at 800 hPa?

    g. What is the saturation mixing ratio at 800 hPa?

2. Refer to sounding in Fig. 7.23.

    a. Where is the tropopause?

    b. Describe the air mass over Bismarck on this day.

    c. Describe the humidity as function of altitude.

    d. Are there any temperature inversions as a function of altitude?

    e. Is there any CAPE or CIN? Stable?

3. Refer to sounding in Fig. 7.24.

    a. Where is the tropopause?

    b. Describe the air mass over Bismarck on this day.

    c. Describe the humidity as function of altitude.

    d. Are there any temperature inversions as a function of altitude?

    e. Is there any CAPE or CIN? Stable?

4. The air at 1000 hPa and 11° C has dew point -0.5 ° C.

    a. Find the mixing ratio, relative humidity, and the potential temperature both the Skew T chart and formulas.

    b. Find the lifting condensation level using the chart.

    c. Find the equivalent potential temperature using the chart.

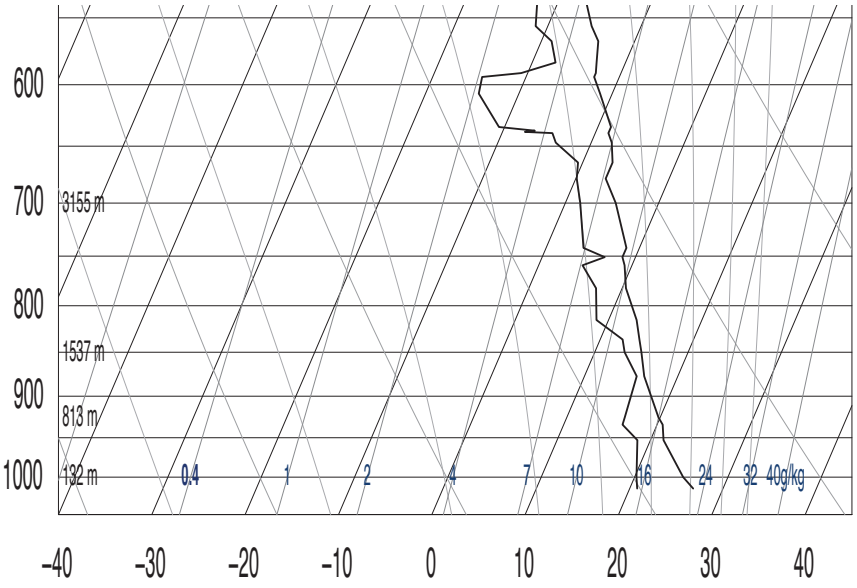

Figure 7.22: A sounding from Lake Charles, LA., at 00Z, June 1, 2007. Taken from the University of Wyoming website.

d. What are the mixing ratio and the potential temperature if the parcel rises to 900 hPa.

e. What is the equivalent potential temperature if the parcel rises to 600 hPa.

5. Consider a parcel of moist air that rises from the surface where p=1000 hPa to 400 hPa. Assume all of the condensed water is precipitated out during the ascent. The parcel then descends (unsaturated) back to the surface. If the initial temperature is 20° C and its initial dew point is 0° C, find:

   a. How much water is condensed during the ascent.

   b. The temperature of the parcel and its dew point temperature when it returns to the surface (1000 hPa).

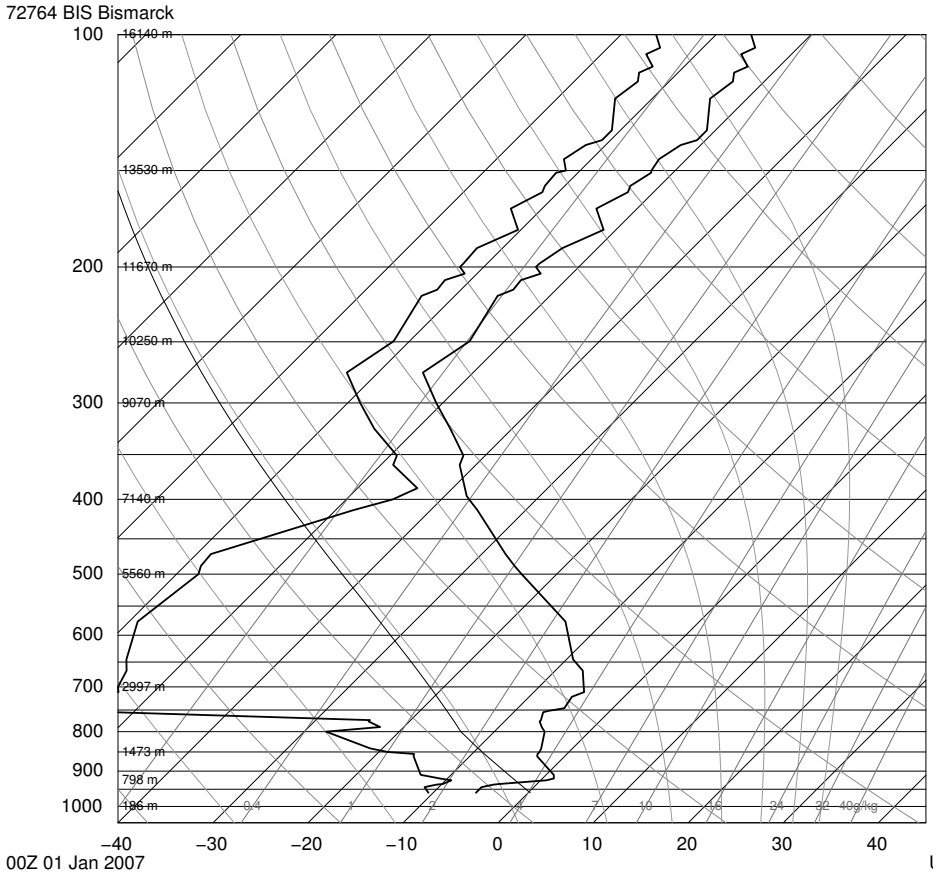

Figure 7.23: A sounding from Bismarck, N. D., at 00Z, August 1, 2007. Taken from the University of Wyoming website.

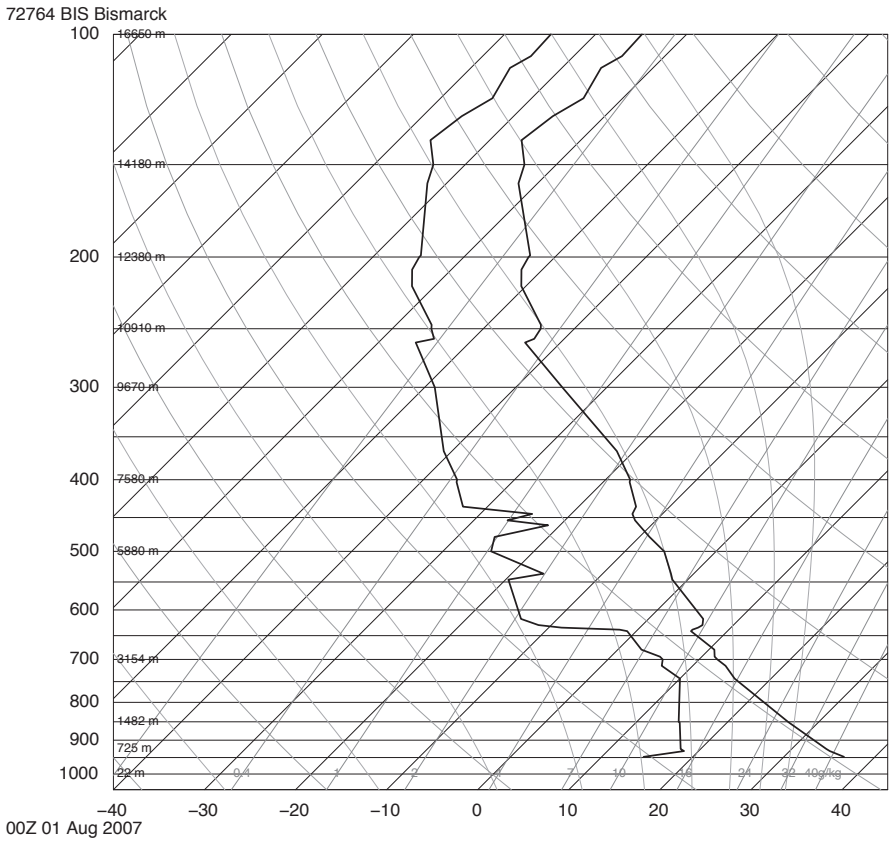

Figure 7.24: A sounding from Bismarck, N. D., at 00Z, January 1, 2007. Taken from the University of Wyoming website.

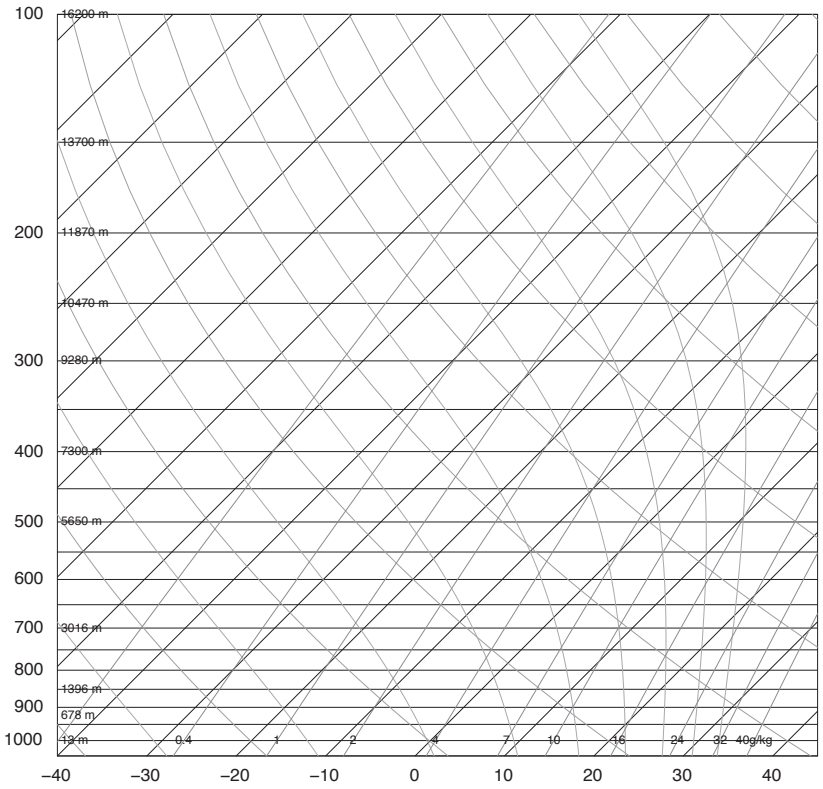

Figure 7.25: A blank Skew T chart for problem 4. Taken from the University of Wyoming website.

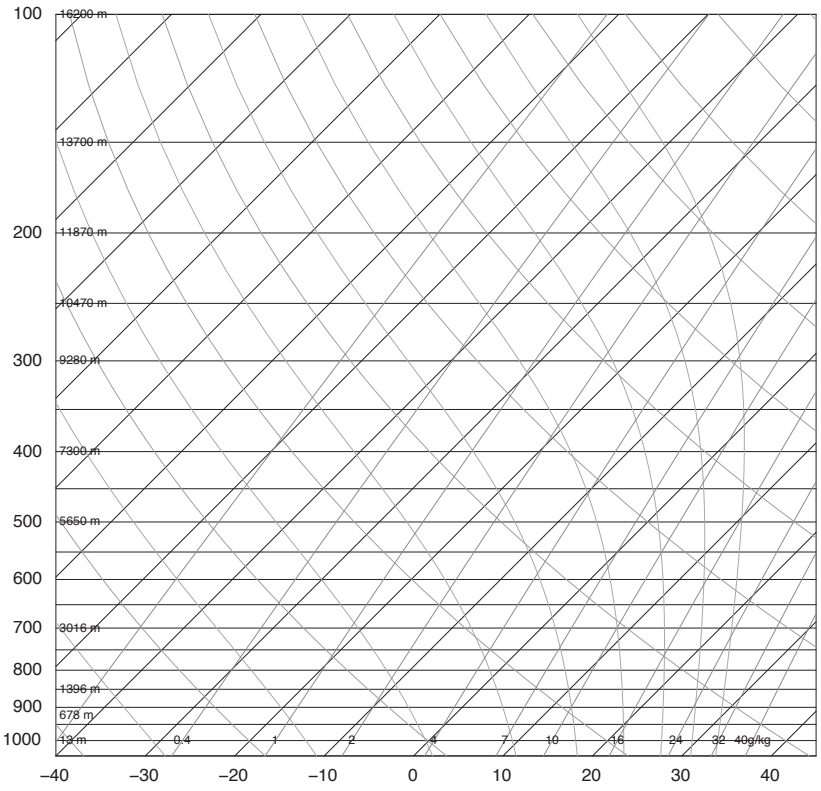

Figure 7.26: A blank Skew T chart for problem 5. Taken from the University of Wyoming website.