Meteorology 3510
Midterm Exam
April 12, 2007
100 points

You may use your skew-T log p diagram for any problem for which it is applicable. You may be specifically asked to use it for some problems. A list of physical constants and mathematical relations for cosine and sine functions follows the problems.

1. (30 points) A parcel ascends adiabatically over a mountain range starting from 1000 mb, where $T = 30°$ C K and mixing ratio = 20 g kg^{-1}, to 550 mb. Then it descends adiabatically back down to 1000 mb.

   (a) Complete the following table of parcel properties. The parcel ascends from time 1 to time 4, then descends. from time 4 to time 6.

time (arbitrary units)	1	2	3	4	5	6
pressure (mb)	1000	*930*	685	550	*685*	1000
temperature (T, ° C)	30	*23.5*	*13*	*5*	*13*	*46*
saturation mixing ratio (w_s, g/kg)	*27.5*	20	*14*	*10*	14	*70*
water vapor mixing ratio (w, g/kg)	20	20	*14*	*10*	14	14
liquid water mixing ratio (w_l, g/kg)	0	*0*	*3*	*4*	*0*	*0*
total water mixing ratio ($w + w_l$, g/kg)	20	*20*	17	14	14	*14*
Relative humidity (percent)	*73*	100	100	100	100	*20*

   (b) Plot the parcel's temperature and dewpoint temperature versus pressure during ascent and descent on the accompanying skew-T log p diagram. *Label each point with its corresponding time.*

   (1) $T_d = 25°$ C
   (2) LCL = 930 mb
   (2)–(5) are on the saturation adiabat labeled 26 (wet-bulb potential temperature)
   (5) SEL = 685 mb
   (6) $T_d = 19°$ C