

## Exercise Lecture 2

Q1/ Which statements are true and which of them are false?

1. If an air parcel is lifted adiabatically, its temperature will increase.
2. According to the lapse rate equation, a negative lapse rate means temperature decreases with height.
3. According to the density, if an air parcel is lighter than the environment, the acceleration will be upward, and thus the air parcel will sink.
4. Stable atmosphere is when the environmental lapse rate is larger than the dry adiabatic lapse rate
5. If the potential temperature is increasing with height, then the atmosphere is stable.

Q2/ A dry air parcel has a temperature of 20°C. The environmental lapse rate is 5°C/km, and the dry adiabatic lapse rate is 10 ° C/km, the air parcel is forced to rise over a mountain that is 3 km high.

1. What is the temperature of the air parcel at the top of the mountain? ( ans. - 10 C)
2. What is the temperature of the environment at the top of the mountain? (ans. 5 C)
3. What is the buoyant acceleration of the air parcel at the top of the mountain? (-30 m/s<sup>2</sup>)
4. Is the atmosphere stable or unstable? and why?

Q3/ For the following data,

Altitude (m)	Pressure (hPa)	Temp (°C)	Θ ( °K)
1480	850	7	?
5700	500	-15	?

1. Find the potential temperature (in kelvin) at the two altitudes,  $c_p = 1005 \text{ J/ kg K}$ , and  $R_d = 287.1 \text{ J/kg K}$ .
2. Is the atmosphere stable or unstable?