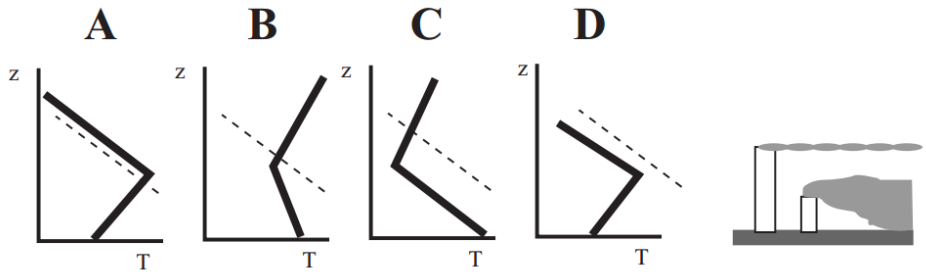
1. Suppose the following atmospheric altitude versus temperature data have been collected

Altitude(m)	0	100	200	300	400	500	600	700	800	900	1000
Temperature(^{o}c)	20	18	16	14	13	12	14	16	18	16	14

   a. How high would air parcels rise from the ground (elev. 0 km) if their initial temperatures were 21 and 24°C? What does this behavior imply about air pollution concentrations for pollutants released at the ground, starting at various temperatures?
   b. How high would you expect a plume to rise if it is emitted at 25°C from a 100-m tall stack if it rises at the dry adiabatic lapse rate? Would you expect the plume to be looping, coning, fanning, or fumigating, and why?

2. A tall stack and a nearby short stack have plumes as shown below. Which atmospheric temperature profile would be most likely to cause that pair of plumes? Explain or justify your answer. The dashed lines represent random dry adiabatic as slope references.



3. A coal-fired power plant with effective stack height of 100 m emits 1.2 g/s of SO_2 per megawatt of power delivered. If winds are assumed to be 4 m/s at that height and just over 3 m/s at 10 m, how big could the plant be (MW) without having the ground level SO_2 exceed 365 μg/m^3? (First decide which stability classification leads to the worst conditions.)

4. A 90 m high stack emits 80 g/s of NO. The wind speed is 4 m/s at 10 m, and it is a clear summer day with the sun nearly overhead (Take stability condition of B with ∂y=290 m and ∂z=234 m at 2 km). Stack parameters: Diameter = 1.30 m, Exit velocity = 10.0 m/s, Temperature = 320^{o}C Atmospheric conditions: Pressure = 95.0 kPa, Temperature = 25.0 ^{o}C

   Estimate the ground level NO concentration:

   a. Directly downwind at a distance of 2 km
   b. At the point downwind where NO is maximum
   c. At a point located 2 km downwind and 0.1 km off the downwind axis