6.8 Answer or explain the following in light of the principles discussed in Chapter 6.

(a) Small droplets of pure water evaporate in air, even when the relative humidity is 100%.

(b) A cupboard may be kept dry by placing a tray of salt in it.

(c) The air must be supersaturated for a cloud to form.

(d) Cloud condensation nucleus concentrations do not always vary in the same way as Aitken nucleus concentrations.

(e) CCN tend to be much more numerous in continental air than in marine air.

(f) Growth by condensation in warm clouds is too slow to account for the production of raindrops.

(g) Measurements of cloud microstructures are more difficult from fast-flying than from slow-flying aircraft.

(h) If the liquid water content of a cloud is to be determined from measurements of the droplet spectrum, particular attention should be paid to accurate measurements of the larger drops.

(i) The tops of towering cumulus clouds often change from a cauliflower appearance to a more diffuse appearance as the clouds grow.

(j) Why are actual LWC in clouds usually less than the adiabatic values? Can you suggest circumstances that might produce cloud LWC that are greater than adiabatic values?

(k) Patches of unsaturated air are observed in the interior of convective clouds.

(l) Cloud droplets growing by condensation near the base of a cloud affect each other primarily by their combined influence on the ambient air rather than by direct interactions. [Hint: consider the average separation between small cloud droplets.]

(m) After landing on a puddle, raindrops sometime skid across the surface for a short distance before disappearing.

(n) The presence of an electric field tends to raise the coalescence efficiency between colliding drops.

(o) Raindrops are more likely to form in marine clouds than in continental clouds of comparable size.

(p) Collision efficiencies may be greater than unity, but coalescence efficiencies may not.

(q) In some parts of convective clouds the liquid water content may be much higher than the water vapor mixing ratio at cloud base.

(r) In the absence of coalescence, cloud droplet spectra in warm clouds would tend to become monodispersed.

(s) Raindrops reaching the ground do not exceed a certain critical size.

(t) Ice crystals can be produced in a deep-freeze container by shooting the cork out of a toy pop-gun.

(u) Large supersaturations with respect to water are rare in the atmosphere but large supercoolings of droplets are common.

(v) Large volumes of water rarely supercool by more than a few degrees.

(x) Aircraft icing may sometimes be reduced if the aircraft climbs to a higher altitude.

(y) Present techniques for measuring ice nucleus concentrations may not simulate atmospheric conditions very well.

(z) Ice particles are sometimes much more numerous than measurements of the concentrations of ice nuclei would suggest they should be.

(aa) The length of a needle crystal increases relatively rapidly when it is growing by the deposition of water vapor.

(bb) Natural snow crystals are often composed of more than one basic ice crystal habit.

(cc) No two snowflakes are entirely identical.

(dd) Rimming tends to be greatest at the edges of ice crystals (see, for example, Figs. 6.40c and 6.40d).

(ee) Rimming significantly increases the fall speeds of ice crystals.

(ff) Graupel pellets tend to be opaque rather than transparent.

(gg) Strong updrafts are required to produce large hailstones.

(hh) Aggregated ice crystals have relatively low fall speeds for their masses.

(ii) When snow is just about to change to rain, the snowflakes often become very large.

(jj) The melting level is a prominent feature in radar imagery.

(kk) Cold fogs are easier to disperse by artificial means than warm fogs.