



Figure 9.24 Comparison of a rough diagram (a) drawn from an insufficient number of data points and a finalized diagram (b) that has a well-defined phase boundary.

samples can be prepared to better characterize that region of the diagram. Figure 24a shows a rough diagram drawn from a limited number of available points, and Figure 24b shows the refined diagram.

Thus far, we have discussed single-phase regions and homogeneous phases. It may be necessary to clarify what is meant by a phase. A general definition quoted from Ref. 8 is: *A sample of matter is said to be in a certain phase when it has a certain well defined set of macroscopically observable properties. The phase of a sample is really an indication of the degree of order or disorder inherent in the molecules of which the sample is composed.* Because the researcher can establish the set of macroscopically observable properties, a phase can be defined in various ways. For our cream example from the first paragraphs of this section, the phase could be defined as any mixture that remains homogeneous after being heated to 40°C for 10 min and then immediately centrifuged at 4000 rpm for 1 hr. Note, that this was not referred to as a single phase. Usually the term *single phase* is reserved for a mixture of molecules forming a phase that is thermodynamically stable. Such systems include simple solutions at equilibrium, lyotropic liquid crystals, and other surfactant association structures. Emulsions are kinetically stabilized by the presence of the surfactant and, thus, cannot be considered "single-phase" systems. Distinct phase boundaries will enclose the stable emulsion regions on the di-