Tracking Composition as a Mixture Evaporates

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

A display models a liquid mixture containing 40 particles of ethanol and 40 particles of water. A sample of 20 vapor particles leaves the liquid and is collected. No chemical reaction occurs. The display can count each type in the collected sample.

Collected vapor	Ethanol particles	Water particles
First sample	15	5

1 Which statement compares the first vapor sample with the initial liquid?

(1) The vapor has a greater fraction of ethanol.

(2) The vapor has the same ethanol fraction.

(3) The vapor contains no water.

(4) The vapor has a smaller fraction of ethanol.

2 Calculate the fraction of the remaining liquid particles that are ethanol. [1]

Answer and work

3 A student says the first vapor sample proves that only ethanol evaporates. Evaluate the claim using both particle counts. [1]

Answer and work

The display collects a second vapor sample after the remaining liquid changes composition. The second sample contains 10 ethanol particles and 10 water particles.

4 Compare the second sample’s ethanol fraction with the fraction in the liquid just before it was collected. Explain whether the second vapor still contains a greater fraction of ethanol than its source liquid. [1]

Answer and work