**Reading a Vapor Signal After Expansion**

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

A class simulates a liquid and its vapor in a sealed vessel. The temperature stays fixed. Some liquid remains throughout. The vessel’s lid moves so the space above the liquid can expand. The table shows the vapor pressure before and after this change.

| **Reading** | **Vapor space volume (L)** | **Vapor pressure (kPa)** |
|---|---|---|
| Before expansion | 1.0 | 12 |
| Immediately after expansion | 2.0 | 6 |
| After the reading settles | 2.0 | 12 |

**1** Which observation shows that the vapor pressure returned to its original value?

(1) The space stayed at 1.0 L.

(2) The final pressure is 12 kPa, the same as before expansion.

(3) The final pressure is 6 kPa, half its starting value.

(4) The final vapor space is 2.0 L, so the pressure must be unchanged at all times.

**2** At fixed temperature the vapor amount is proportional to pressure times volume. Compare the final vapor amount with the starting vapor amount. [1]

Answer and work

The class observes a smaller amount of liquid at the end of the test. The container did not exchange material with the room.

**3** Explain where the extra vapor came from and why the pressure could settle while liquid still remained. [1]

Answer and work

**4** A student says the matching pressure proves the liquid amount stayed fixed. Use the volume evidence to evaluate that claim. [1]

Answer and work