Checking a Temperature Probe at Two Phase Points

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

A class checks a temperature probe using pure water at 1 atm. In the model, ice and liquid water coexist at 0.0 °C and water boils at 100.0 °C. The probe gives the readings shown when the two phases are present.

Reference condition	**Expected temperature (°C)**	**Probe reading (°C)**
Ice and liquid water	0.0	1.5
Liquid water and steam at 1 atm	100.0	101.5

1 Which possible probe error fits both readings?

(1) The probe reads 1.5 °C too low.

(2) The probe reads 1.5 °C too high.

(3) The probe reads correctly at both points.

(4) The probe always reports twice the true temperature.

2 Why does using two reference points give stronger evidence for a fixed offset than using the ice-water point alone? [1]

Answer and work

In a second test, another class uses a verified probe and a lower air pressure. The boiling reading is below 100.0 °C, while the ice-water reading is still close to 0.0 °C.

3 Explain why the second class should consider pressure before treating its boiling reading as a probe error. [1]

Answer and work

4 Describe how to check whether the second probe has an offset using the boiling reference from the first test. [1]

Answer and work