Checking Neutralization With Two Sensors

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

A class simulates adding sodium hydroxide to hydrochloric acid at 25 °C. In the model, H^+ and OH^- react to form water, while Na^+ and Cl^- remain dissolved. A pH sensor and a conductivity sensor read the same sample after each addition.

$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

Stage	pH	Conductivity (model units)
Before adding base	2.0	14
At neutral pH	7.0	5
With excess base	11.0	10

1 Which conclusion matches the readings at neutral pH?

(1) The solution is neutral and gives a nonzero conductivity reading.

(2) The solution is acidic and gives no conductivity reading.

(3) The solution is basic and gives the lowest pH.

(4) The solution has no dissolved particles.

2 Identify the two ions from the model that can still carry charge at neutral pH. Explain why the neutralization equation does not remove them. [1]

Answer and work

A student dilutes a separate portion of the neutral solution with pure water at the same temperature. The conductivity reading drops. The pH stays close to 7.0.

3 Explain why the two sensor readings can respond differently to dilution. [1]

Answer and work

4 Name a control reading that would help the class check whether the low conductivity is from the sample or from the sensor itself. Explain how to use it. [1]

Answer and work