Checking a Wet Gas Collection Model

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

A lab simulation collects nitrogen in two vessels at the same temperature. The first vessel is dry. The second holds nitrogen over liquid water, so some of its pressure comes from water vapor. In the simulation the partial pressures add to give the total pressure. Nitrogen has the same temperature in both vessels.

Vessel	**Gas volume (L)**	**Total pressure (kPa)**	**Water vapor partial pressure (kPa)**
Dry	1.00	100.0	0.0
Over water	1.00	103.2	3.2

1 Calculate the nitrogen partial pressure in the wet vessel. Show how you use both pressures. [1]

Answer and work

2 Which comparison follows from the measurements and the ideal gas model?

(1) The wet vessel contains more nitrogen because its total pressure is greater.

(2) The dry vessel contains more nitrogen because it has no water vapor.

(3) The two vessels have equal amounts of nitrogen because its partial pressure, volume, and temperature match.

(4) The nitrogen amounts cannot be compared unless the mass of liquid water is known.

The simulation repeats the wet collection at the same temperature. The water vapor still contributes 3.2 kPa. The new volume is 0.50 L and the total pressure is again 103.2 kPa.

3 Compare the amount of nitrogen in the new collection with that in the original wet collection. Explain using the corrected pressure and volumes. [1]

Answer and work

4 If a student uses total pressure instead of nitrogen partial pressure for the new collection, would the estimated nitrogen amount be too high or too low? Explain. [1]

Answer and work