Checking Two Emission Lines With a Finer Scan

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

A display tests gases with known emission-line models. Each line corresponds to a photon emitted during an electron transition. The coarse scanner merges two equal-strength lines if their wavelengths are less than 3 nm apart. It displays their average wavelength in that case. The fine scanner separates lines that are at least 1 nm apart.

Gas model	**Actual emission wavelengths (nm)**
P	590
Q	589 and 591
R	585 and 595

1 Which gas models could each give a single coarse reading of 590 nm?

(1) P and Q

(2) P and R

(3) Q and R

(4) R only

2 Explain why averaging the two wavelengths for R would give the wrong prediction for the coarse scan. [1]

Answer and work

The unknown gas gives a single coarse reading of 590 nm. Its fine scan shows two lines separated by 2 nm.

3 Identify which model fits both scans. Explain why the single coarse reading was insufficient. [1]

Answer and work

4 A student says the Q gas must emit a photon at 590 nm because that number appears on the coarse display. Evaluate the claim using the actual line model. [1]

Answer and work