Following Light Across a Liquid Boundary

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

A display sends the same steady beam from air into a clear liquid. The model does not absorb or emit light. A wave’s frequency equals its speed divided by its wavelength. A nanometer is one billionth of a meter.

Part of path	**Wave speed (m/s)**	**Wavelength (nm)**
In air before the liquid	3.0×10^8	600
In the liquid	2.0×10^8	400

1 Which quantities both decrease when the beam enters the liquid?

(1) Wave speed and wavelength

(2) Wavelength and frequency

(3) Wave speed and frequency

(4) Frequency and photon energy

2 Calculate the frequency before and after the boundary. Compare the results. [1]

Answer and work

In the display, color corresponds to frequency. Photon energy is proportional to frequency. The beam then exits the liquid and returns to air.

3 A student says the photons have more energy inside the liquid because the wavelength is shorter there. Evaluate the claim with the two speed records. [1]

Answer and work

4 Predict the wavelength just after the beam returns to air. Explain what changes at the boundary. [1]

Answer and work