Checking Where Light Is Absorbed in a Stack

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

A lamp sends 80 energy units through a filter and a sample. The filter passes half the energy reaching it. At the start of each trial the cool sample passes one quarter of the energy reaching it. Each layer absorbs the part it does not pass, and the detector measures what leaves the last layer.

Path	**First layer**	**Second layer**
P	Filter	Sample
Q	Sample	Filter

1 In which path does more light energy reach the sample?

(1) P only

(2) Q only

(3) Both reach the same amount.

(4) The sample absorbs no light in either path.

2 Calculate the energy at the final detector for each path. [1]

Answer and work

3 A student says the equal final readings prove the sample absorbs the same energy in both paths. Calculate the energy the sample absorbs in P and Q to evaluate the claim. [1]

Answer and work

The lamp gives two pulses in each path. If the sample absorbs at least 50 energy units in the first pulse, it passes one half of the energy that reaches it in the second pulse. Otherwise its transmission stays at one quarter. The second pulse also supplies 80 units.

4 Calculate the detector reading on the second pulse in each path. Explain why the first pulse gives the information needed to make the prediction. [1]

Answer and work