Reading an Ink Trail on Test Paper

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

A museum class compares two blue inks using paper chromatography. Water moves up the paper from the starting line. Dye particles may move with the water or spend time attached to the paper. In this model, a dye that spends a larger fraction of the test attached to the paper travels a shorter distance when the same water front has passed.

Ink spot	Blue mark A from starting line (cm)	Blue mark B from starting line (cm)	Water front from starting line (cm)
Known ink	1.5	4.5	6.0
Unknown ink	2.0	6.0	8.0

1 For the known ink, which mark supports the claim that its dye spent more time attached to the paper?

(1) A, because it traveled a shorter distance

(2) A, because it reached the water front

(3) B, because it traveled a shorter distance

(4) B, because it reached the water front

The runs ended at different times. For comparison the class divides each mark’s distance by the water front distance from that same run.

2 Calculate the two distance ratios for the unknown ink. Show your setup. [1]

Answer and work

3 Do the ratios rule out the known ink as a possible source of the unknown mark? Use both marks in your answer. [1]

Answer and work

4 A student says matching both ratios proves the inks are identical. Propose a follow-up comparison that could reveal a difference hidden in this test. [1]

Answer and work