Comparing Two Model Dye Baths at Neutral pH

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

A fabric class models two dye baths with different dissolved ingredients. Both begin at pH 7.0 at 25 °C. The class wants to know which bath changes pH less if a small amount of base enters. It adds equal amounts of the same dilute base to equal volumes of the baths.

Bath	pH before adding base	pH after adding base
P	7.0	9.0
Q	7.0	7.2

1 Which conclusion is supported by the results?

(1) Bath P was more acidic before the test.

(2) Bath Q was more basic before the test.

(3) Bath Q changed pH less after the addition.

(4) Baths P and Q changed pH by the same amount.

2 In this model, the hydrogen ion concentration in mol/L equals 10 raised to the power −pH. By what factor did this concentration decrease in bath P? [1]

Answer and work

The class proposes that bath Q contains dissolved particles that react with some of the added OH^-. Bath P contains almost none of those particles.

3 Explain how the proposed reaction could account for the smaller pH rise in Q. [1]

Answer and work

The class adds a second equal dose of base to bath Q. After this dose, the pH is 8.8.

4 Does bath Q resist the second addition as well as it resisted the first? Compare the two pH changes to support your answer. [1]

Answer and work