Checking a Rinse When Flow Is Uneven

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

A workshop collects a rinse in two intervals of equal duration. Its model gives the marker mass in an interval as concentration times collected volume. The total marker mass over both intervals must be at most 30 mg.

Run	First interval (L, mg/L)	Second interval (L, mg/L)
P	2 L, 4 mg/L	6 L, 8 mg/L
Q	6 L, 4 mg/L	2 L, 8 mg/L

1 In which run does the higher concentration coincide with the larger volume?

(1) P only

(2) Q only

(3) Both runs

(4) Neither run

2 Calculate the total mass of marker in each run and decide whether either run meets the 30 mg limit. [1]

Answer and work

3 A student says P and Q release the same marker mass because the average of their two concentration readings is the same. Explain what that comparison omits. [1]

Answer and work

A new run has the same 8 L total volume. All of it is collected in one tank and mixed evenly before a concentration reading is taken.

4 Find the greatest mixed concentration that would meet the 30 mg mass limit. [1]

Answer and work

Another 8 L run contains a low interval at 4 mg/L and a high interval at 8 mg/L. Its thoroughly mixed concentration is 5.5 mg/L.

5 Find the volume from the high interval. Show how the mixed reading constrains the two volumes. [1]

Answer and work