Approaching the Same Mixture From Two Sides

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

A reaction model lets a particle change between forms R and S. Each run contains 100 particles and stays at the same temperature. The class records the number of S particles as the mixture changes.

Run	S at 0 s	S at 20 s	S at 40 s	S at 80 s	S at 120 s
P	0	35	55	60	60
Q	100	78	66	60	60

1 Which comparison supports the same equilibrium composition from both starting points?

(1) P and Q have the same initial count.

(2) P and Q have the same count at 20 s.

(3) P and Q have the same stable count at the final two observations.

(4) The count of S increases in both runs.

2 Use the first 20 seconds to show that the net change can go in either direction in this model. [1]

Answer and work

A third run starts with 100 S, as Q did, and uses a catalyst. It shows 60 S at both 20 s and 40 s. The temperature and total number of particles are unchanged.

3 Compare the new run with Q. What does the evidence show about how quickly the mixture approaches its stable composition? [1]

Answer and work

4 Describe how the count of S could stay at 60 while particles continue changing form. Include both directions of change. [1]

Answer and work