Comparing Two Products After a Catalyst Change

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

A model reaction turns each of its starting particles into one of two products. The desired product is P and the other product is Q. All runs start with the same number of particles. The display records both products with and without a catalyst. The two product paths do not reverse in the model.

Run	P at 10 s	Q at 10 s	P at finish	Q at finish
Without catalyst	20	10	40	30
With catalyst X	32	8	56	14

1 Which comparison shows more total product by 10 s with catalyst X?

(1) 20 + 10 without X and 32 + 8 with X

(2) 40 + 30 without X and 56 + 14 with X

(3) 20 and 40 without X

(4) 8 and 14 with X

2 Compare the fraction of all final product particles that are P in the two runs. [1]

Answer and work

3 Use the final records to evaluate the claim that X makes more P only by causing more total starting particles to react. [1]

Answer and work

A third run with catalyst Y forms 42 total products by 10 s. Its final P and Q counts are 40 and 30, the same as in the run without a catalyst.

4 Which catalyst should the class choose if the goal is to make the most P by the finish? Explain why the early total alone would give the wrong choice. [1]

Answer and work