Choosing a Time to Stop a Model Reaction

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

A class models a color-making process with a useful colored product P and a different product Q. It begins with 100 identical starting particles. Each starting particle can become one P or one Q particle. The display gives snapshots of total product counts at four stopping times.

Time (s)	P particles	Q particles
10	34	2
20	58	9
30	65	18
40	67	26

1 During which recorded 10 s interval does P increase by the largest amount?

(1) 10–20 s

(2) 20–30 s

(3) 30–40 s

(4) The increase is the same in all three intervals.

2 Calculate the number of starting-form particles that remain at 30 s, assuming the display has no other forms. [1]

Answer and work

A useful batch must have at least 55 particles of P and at most 12 particles of Q. The class can stop at one of the recorded times.

3 Choose a stopping time and show how both requirements are met. Explain why waiting until P is largest would fail. [1]

Answer and work

4 The class can make one more measurement between 20 s and 30 s. State both readings it should record to check whether a later stopping time gives more P while still meeting the constraints. [1]

Answer and work