Gas Particles and Diffusion

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

In a still gas, individual particles move randomly and collide. Diffusion spreads a tracer from a region of higher concentration into regions of lower concentration.

1 A small amount of tracer gas starts at one end of a sealed container. What happens as diffusion proceeds?

(1) It spreads through the container.

(2) It permanently remains at the starting end.

(3) All tracer particles stop moving.

(4) The tracer particles combine into one large particle.

2 A student says each tracer particle must move directly toward a region of lower concentration. Explain what actually produces net spreading. [1]

Answer and work

3 What is true after the tracer concentration becomes uniform?

(1) Particles still move randomly.

(2) All particles stop moving.

(3) The tracer vanishes.

(4) Tracer molecules all move in the same direction.

4 How does warming a sample of the same gas affect its average kinetic energy and particle speed? [1]

Answer and work

A Tracer in a Model Tube

Use the information below to answer the questions.

A simulation releases equal amounts of tracer into the same tube of still gas at the same starting pressure. It records the time to reach the same tracer concentration at a sensor. The runs vary temperature or sensor distance as shown.

Run	Temperature (K)	Sensor distance (cm)	Time (s)
P	280	20	60
Q	320	20	48
R	320	30	100

5 Which comparison isolates the effect of temperature on the measured arrival time?

(1) P with Q

(2) P with R

(3) Q with R

(4) All comparisons isolate temperature.

6 How many seconds shorter is the arrival time in Q than in P? Use the measurements. [1]

Answer and work

7 Which result supports the claim that increasing sensor distance can increase the measured time at fixed temperature?

(1) P takes longer than Q.

(2) R takes longer than Q.

(3) Q takes longer than R.

(4) P and R have equal times.

8 A student compares only P and R to estimate the effect of temperature. Explain why the comparison is insufficient. [1]

Answer and work