**Testing Filters for a Chalk Dust Demo**

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

An art class models a filter for a box that contains suspended chalk particles. The chalk particles are small grains of solid calcium carbonate. The model treats each filter opening as a screen that blocks particles too large to fit through. The class wants a filter that retains at least 90% of the chalk particles and lets at least 12 L/min of air pass at the tested fan setting. Every trial starts with 200 chalk particles arriving at the filter.

| Filter | Chalk particles leaving filter | Airflow (L/min) |
|---|---|---|
| J | 40 | 18 |
| K | 14 | 15 |
| L | 4 | 9 |

**1** Calculate the percentage of chalk particles retained by filter K. Show how the particle counts enter the calculation. [1]

Answer and work

**2** Which filter meets both criteria in the test?

(1) J only

(2) K only

(3) L only

(4) K and L

**3** Explain why a filter can let air pass through while trapping some chalk particles. Refer to the relative sizes of the particles and the openings. [1]

Answer and work

A student tests K at a higher fan setting and counts 22 particles leaving. The class did not measure how many particles arrived at the filter in that trial.

**4** Explain why the new count alone cannot show that the higher fan setting reduced the percentage retained. State an additional measurement that would let the class compare the two settings. [1]

Answer and work