Measuring Open Space in a Model Grain Bed

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

A class compares two beds made from equal masses of the same solid grains. One bed is loosely packed and the other is pressed together. Water can fill the gaps between the grains but cannot enter the grains. The displacement reading counts the space that the water cannot occupy.

Bed	Outside volume (mL)	Water displaced by grains (mL)
Loose	50	24
Pressed	40	24

1 Calculate the volume of the open gaps in each bed. Use both measurements. [1]

Answer and work

2 Which comparison fits the data after pressing?

(1) The pressed bed has less grain material.

(2) The pressed bed has less open space between grains.

(3) The pressed bed gains 10 mL of solid.

(4) Pressing increases both measured volumes.

A second material has grains with tiny sealed air spaces inside them. Water still fills the gaps between grains, but it cannot enter the sealed spaces.

3 Explain why water displacement for the second material would include the sealed spaces as well as the solid grain material. [1]

Answer and work

4 Describe how the class could check whether pressing a new bed changes only its open gaps. State the two readings to compare before and after pressing. [1]

Answer and work