Checking a Float With a Compressed Pocket

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

A water exhibit tests a sealed float made from a rigid body and a flexible gas pocket. The body displaces 8 mL. The float has a fixed total mass of 15 g. The gas pocket remains sealed and the temperature is fixed. In this model doubling the outside pressure halves the pocket volume. Each milliliter of displaced water has a mass of one gram.

Test depth	**Pocket volume (mL)**	**Total fully submerged volume (mL)**
Shallow	12	20
Deeper, twice the pressure	6	14

1 Which reading shows that the deeper float can displace less water while fully submerged?

(1) The 12 mL shallow pocket

(2) The 20 mL shallow total

(3) The 14 mL deeper total

(4) The fixed 15 g mass

2 Use the displaced water and the fixed mass to decide whether the fully submerged float can support its weight at the deeper point. [1]

Answer and work

3 A student says the deeper result shows water must have entered the pocket. Evaluate the claim using the volume and mass records. [1]

Answer and work

A replacement keeps the rigid body and total mass the same. It has a larger shallow gas pocket, and the pocket still halves in volume at the deeper point.

4 Calculate the smallest shallow pocket volume that allows the fully submerged replacement to displace at least 15 g of water at the deeper point. [1]

Answer and work