Checking Swelling at Equal Water Uptake

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

A museum tests two model coatings on detachable supports. Each dry coating has a mass of 5.0 g and a thickness of 1.00 mm. After equal time in humid air, students remove each support’s contribution from the mass reading. Only absorbed water increases coating mass in the model.

Coating	Mass after exposure (g)	Thickness after exposure (mm)
P	5.8	1.25
Q	5.8	1.05

1 Which statement is supported by both sets of measurements?

(1) P absorbs more water and swells less than Q.

(2) Q absorbs more water and swells more than P.

(3) They absorb the same mass of water but have different thickness changes.

(4) They have the same thickness change because their final masses match.

2 A conservator allows a thickness increase of no more than 0.10 mm. Use the readings to determine which coating qualifies under the tested conditions. [1]

Answer and work

The team learns that Q’s support might restrict its expansion. It can compare equally sized pieces of Q that start at the same dry thickness, one attached and the other freely supported.

3 State which measurements would test the support explanation while keeping absorbed water mass comparable. [1]

Answer and work

4 If free and attached Q still thicken by the same amount at equal water uptake, explain how that result affects the support explanation. [1]

Answer and work