Testing Polymer Gels for a Model Shipping Insert

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

A class compares polymer gels for a reusable insert around a model instrument. The gels use the same polymer. In the particle model, links join neighboring polymer chains. Gels U, V, and W have increasing numbers of links per unit volume. The class presses each gel with the same load for the same time.

Gel	Compression under load (mm)	Height recovered after release (%)
U	12	75
V	8	94
W	3	99

1 Use the chain-link model to explain why gel W compresses less than gel U under the same load. [1]

Answer and work

To protect the model instrument, the insert must compress by at least 6 mm under the test load and recover at least 90% of its original height after the load is removed.

2 Which gel meets both requirements?

(1) Gel U only

(2) Gel V only

(3) Gel W only

(4) Gels V and W

The students use gel V for 20 repeated tests. On test 20 it compresses by 8 mm and recovers 86% of its original height.

3 Use the new measurements to evaluate the claim that gel V still meets the requirements after 20 tests. [1]

Answer and work

4 The class wants to estimate the first test on which the recovery fell below 90%. Explain what to measure more often and what part of the loading procedure to hold constant. [1]

Answer and work