Comparing Two Paths to One Gas State

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

A sealed model gas starts at 100 kPa, 4.0 L, and 300 K. The amount of gas stays fixed. The model keeps pressure times volume divided by absolute temperature constant. Two paths reach a final volume of 2.0 L and a final temperature of 360 K.

Path	First operation	Second operation
P	Compress to 2.0 L at 300 K	Warm to 360 K at 2.0 L
Q	Warm to 360 K at 100 kPa	Compress to 2.0 L at 360 K

1 Which first operation keeps pressure constant?

(1) P only

(2) Q only

(3) Both

(4) Neither

2 Calculate the pressure after P’s first operation and the volume after Q’s first operation. [1]

Answer and work

3 A student uses the different intermediate states to argue that the final pressures must differ. Select whether the model supports or refutes the claim. Calculate the final pressures as evidence. [1]

Select one

☐ Supports the claim

☐ Refutes the claim

Final pressures and work

A repeated Q trial reaches 2.0 L and 360 K, but it reports only 216 kPa. The instruments are correct, and the model still relates pressure to gas amount at the final volume and temperature.

4 Calculate what fraction of the starting gas remains in the repeated trial. [1]

Answer and work