Tracking Melting and Freezing at Once

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

An insulated model has two trays of ice and water. The mixtures stay at 0 °C. A warm plate supplies energy to tray P and melts some ice. A cold plate removes energy from tray Q and freezes some water. Assume the plates transfer energy only through these phase changes. Melting one gram of ice takes 334 J, and freezing one gram of water releases 334 J.

Tray	Ice at start (g)	Ice at end (g)
P	9.0	7.0
Q	3.0	5.0

1 Use the two changes in ice mass to calculate how much energy the warm plate supplies and how much the cold plate removes. [1]

Answer and work

2 Which change in the two trays combined is consistent with the data?

(1) The total ice mass falls by 4.0 g.

(2) The total ice mass rises by 4.0 g.

(3) The total ice mass stays the same.

(4) The total ice mass rises by 2.0 g.

3 A student says the unchanged total ice mass proves neither plate transferred energy. Evaluate the claim using both trays. [1]

Answer and work

In a repeat, the warm plate melts 2.0 g of ice in P but the cold plate freezes only 1.0 g of water in Q. Both mixtures stay at 0 °C.

4 Find the net energy transferred into the two trays during the repeat. Explain how energy can enter with no temperature rise. [1]

Answer and work