Tracking Frost Loss Without Melting

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

A class models equal frost samples on two cool plates. Both plates stay at −8 °C. One is in dry air and the other in humid air at the same temperature. The class detects no liquid water on either plate. The container model lets water molecules move between the frost and the air.

Air in container	Frost mass at start (g)	Frost mass at 20 min (g)
Dry	2.0	1.2
Humid	2.0	1.8

1 Calculate the net frost mass loss in each container. [1]

Answer and work

2 Which change accounts for water leaving the frost without forming liquid in the model?

(1) Solid water changes directly to water vapor.

(2) Water vapor changes directly to solid water.

(3) Water vapor changes to liquid water.

(4) Solid water chemically changes into a different substance.

The model allows some surface water molecules to overcome attractions in the frost and enter the air. Some water molecules in the air can also return to the frost.

3 Explain why more water vapor in the humid container could account for its smaller net frost loss. [1]

Answer and work

4 A student says the smaller net loss means no water molecules left the humid frost. Explain what its mass reading establishes about the two directions of change. [1]

Answer and work