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Problem 26.9 (RHK)

To make some ice, a freezer extracts 185 kJ of heat at -12.0°C . The freezer has a coefficient of performance of 5.70. The room temperature is 26.0°C . (a) We have to find the amount of heat that was delivered to the room; and (b) the work required for running the freezer.

Solution:

The amount of heat extracted from the freezer,
 $Q_L = 185 \text{ kJ}$.

Coefficient of performance of a refrigerator,

$$K = \frac{Q_L}{W}.$$

As the coefficient of performance of the freezer is 5.70, we find that the mechanical work done on the freezer will be

$$W = \frac{Q_L}{5.70} = \frac{185}{5.7} \text{ kJ} = 32.5 \text{ kJ}.$$

Therefore, the amount of heat delivered to the room will be $Q_H = Q_L + W = (185 + 32.5) \text{ kJ} = 217.5 \text{ kJ}$.

