Fermi

4.1. What is the entropy variation of 1000 grams of water when raised from freezing to boiling.

For water, $C_V = \dfrac{1 \text{ cal}}{\text{gram} \cdot \text{degree}}$

$$\Delta S = \int_{Q_1}^{Q_2} \frac{dQ}{T} = \int_{T_1}^{T_2} \frac{1}{T} \frac{dQ}{dT} dT$$

$$= \int_{T_1}^{T_2} \frac{1}{T} C \, dT = C \ln \frac{T_2}{T_1}$$

$$= \frac{1000 \text{ cal}}{kg \cdot \text{gram} \cdot \text{degree}} \ln\left(\frac{373}{273}\right).$$