Answer to Question #62366, Chemistry / Physical Chemistry

Calculate the change in the entropy of 100 g of water when it freezes at 0 ^{o}C in a refrigerator ice tray. Standard entropy of (ice) = 43.2 J K^{-1} $mol^{-1}$and Standard entropy of (water) = 65.2 J K^{-1} mol^{-1}.

Answer:

$$\Delta S_{fr} = \Delta S(ice) - \Delta S(water) = 43.2 - 65.2 = -22.0\, JK^{-1}mol^{-1}$$

$$\Delta S^0 = 273\, K \times (-22.0\, JK^{-1}mol^{-1}) = -6006.0\, Jmol^{-1}$$

$$n = \frac{100\, g}{18 \frac{g}{mol}} = 5.56\, mol$$

$$\Delta S = -6006.0\, Jmol^{-1} \times 5.56\, mol = \mathbf{-3.34\ kJ}$$