52. The change in entropy for the ideal gas is found from Eq. 21-2, Eq. 20-14, and the first law of thermodynamics (using the fact that $\Delta E_{\text{int}} = 0$ for an ideal gas isothermal process).

$$\Delta S = \frac{Q}{T} = \frac{W}{T} = \frac{nRT}{T} \ln\left(\frac{V_f}{V_i}\right) = nR \ln 2 \ ,$$

which is independent of the temperature $T$ of the reservoir. Thus the change in entropy of the reservoir, $\Delta S' = -\Delta S = -nR \ln 2$, is also independent of $T$. Here we noticed that the net change in entropy for the entire system (the ideal gas plus the reservoir) is $\Delta S_{\text{total}} = \Delta S + \Delta S' = 0$ for a reversible process so $\Delta S' = -\Delta S$.