Chapter 2 Answers

1. $\Delta_r V^\circ = -15.867\,\mathrm{cm^3\,mol^{-1}}$.

2. $\Delta_r V^\circ = -7.934\,\mathrm{cm^3\,mol^{-1}}$. Note that you must pay attention to how the equation is written when you calculate reaction properties.

3. $\Delta_r V^\circ = -475.348\,\mathrm{cm^3\,mol^{-1}}$.

4. Because the reference or standard state of gases in the tables is the ideal gas. In other words, all the properties are those the gas would have if it were ideal. From Appendix A, the molar volume of ideal gas at 273.15 K, 1 bar is $0.02241410\,\mathrm{m^3 mol^{-1}}$. By the ideal gas law, the volume at 298.15 K is $0.02241410 \times 298.15/273.15 = .024465.55\,\mathrm{m^3 mol^{-1}}$, or $24465.6\,\mathrm{cm^3 mol^{-1}}$.

5. $\Delta_r V^\circ = 17.3 + 0 - 17.3 = 0\,\mathrm{cm^3}$. The properties of individual ions such as Cl^- cannot be measured. In order to have properties for them, the properties of the hydrogen ion H^+ are defined as zero, and so the properties of Cl^- become the same as the properties of $HCl(aq)$. Although this is the usual explanation, it is a little oversimplified, as discussed in Chapter 15.

6. $\Delta_r V^\circ = -10.915\,\mathrm{cm^3}$. The properties of aqueous (dissolved) species in the tables are actually *partial molar* properties. This important concept is discussed in Chapter 10.