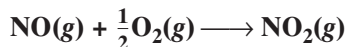


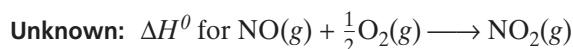
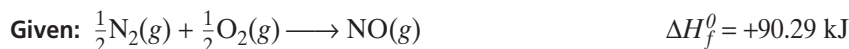
SAMPLE PROBLEM B

For more help, go to the *Math Tutor* at the end of this chapter.

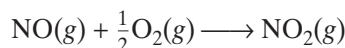
Calculate the enthalpy of reaction for the combustion of nitrogen monoxide gas, NO, to form nitrogen dioxide gas, NO₂, as given in the following thermochemical equation.



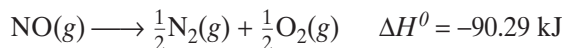
Use the enthalpy-of-formation data in Appendix Table A-14. Solve by combining the known thermochemical equations. Verify the result by using the general equation for finding enthalpies of reaction from enthalpies of formation.

SOLUTION**1 ANALYZE****2 PLAN**

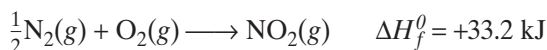
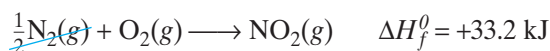
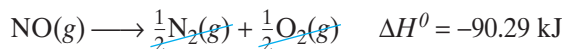
ΔH can be found by adding the ΔH s of the component reactions as specified in Hess's law. The desired equation has NO(g) and $\frac{1}{2}\text{O}_2(g)$ as reactants and NO₂(g) as the product.



We need an equation with NO as a reactant. Reversing the first reaction for the formation of NO from its elements and the sign of ΔH yields the following thermochemical equation.



The other equation should have NO₂ as a product, so we can retain the second equation for the formation of NO₂ from its elements as it stands.

**3 COMPUTE**

Note the cancellation of the $\frac{1}{2}\text{N}_2(g)$ and the partial cancellation of the O₂(g).

4 EVALUATE

The unnecessary reactants and products cancel to give the desired equation. The general relationship between the enthalpy of a reaction and the enthalpies of formation of the reactants and products is described in the following word equation.

$$\Delta H^\circ = \text{sum of } [(\Delta H_f^\circ \text{ of products}) \times (\text{mol of products})] - \text{sum of } [(\Delta H_f^\circ \text{ of reactants}) \times (\text{mol of reactants})]$$