Questions

1. Explain how Hess's law is connected with the law of conservation of energy.

2. When you multiply the coefficients of balanced reactions when changing signs, what happens in the sign and magnitude of ΔH?

3. When Hess's law is used, what is the difference between a forward reaction and an inverse reaction?

4. State Hess's law in your own words.

Summary

Review 4.5
Questions

1. Write the balanced equation for the combustion of carbon in air, which yields carbon dioxide and water.

2. Explain how Hess's law is connected with the law of conservation of energy.

3. What happens when the signs and magnitude of \( \Delta H \) for each reaction are reversed?

4. What is the rate limiting step in the synthesis of nitric acid, and how is it determined using the following thermodynamic equations?

5. Write the following thermodynamic equations:

6. What is the purpose of determining the enthalpy change of a reaction using Hess’s law?

7. Liquid hydrocarbon undergoing combustion is a rocket fuel. It consists of \( \text{C}_x\text{H}_y \). The combustion reaction between liquid hydrocarbon \( \text{C}_x\text{H}_y \) and oxygen \( \text{O}_2 \) is expressed in a balanced form.

8. The enthalpy of formation between liquid hydrocarbon \( \text{C}_x\text{H}_y \) and oxygen \( \text{O}_2 \) is given by:

   \[
   \Delta H_{\text{f, liquid}} = \Delta H_{\text{f, gas}} + \Delta H_{\text{f, liquid}} + \Delta H_{\text{f, oxygen}}
   \]

   Where:
   - \( \Delta H_{\text{f, liquid}} \) is the enthalpy of formation of liquid hydrocarbon
   - \( \Delta H_{\text{f, gas}} \) is the enthalpy of formation of gas
   - \( \Delta H_{\text{f, liquid}} \) is the enthalpy of formation of liquid
   - \( \Delta H_{\text{f, oxygen}} \) is the enthalpy of formation of oxygen

   Determine the enthalpy change for each reaction.

9. Write the following thermodynamic equations:

   \[
   \Delta H_{\text{f, liquid}} = \Delta H_{\text{f, gas}} + \Delta H_{\text{f, liquid}} + \Delta H_{\text{f, oxygen}}
   \]

   Where:
   - \( \Delta H_{\text{f, liquid}} \) is the enthalpy of formation of liquid hydrocarbon
   - \( \Delta H_{\text{f, gas}} \) is the enthalpy of formation of gas
   - \( \Delta H_{\text{f, liquid}} \) is the enthalpy of formation of liquid
   - \( \Delta H_{\text{f, oxygen}} \) is the enthalpy of formation of oxygen

10. Explain how Hess’s law is connected with the law of conservation of energy.