

# THERMOCHEMISTRY CALCULATIONS WORKSHEET 1

## Using reaction equation ratios

- How much heat will be released when 6.44 g of Sulfur reacts with excess  $O_2$  according to the following equation?  
 $2S + 3O_2 \rightarrow 2SO_2 \quad \Delta H^\circ = -791.4 \text{ kJ}$
- How much heat will be released when 4.72 g of Carbon reacts with excess  $O_2$  according to the following equation?  
 $C + O_2 \rightarrow CO_2 \quad \Delta H^\circ = -393.5 \text{ kJ}$
- How much heat will be absorbed when 38.2 g of Bromine reacts with excess  $H_2$  according to the following equation?  
 $H_2 + Br_2 \rightarrow 2HBr \quad \Delta H^\circ = 72.80 \text{ kJ}$
- How much heat will be released when 1.48 g of Chlorine reacts with excess phosphorus according to the following equation?  
 $2P + 3Cl_2 \rightarrow 2PCl_3 \quad \Delta H^\circ = -886 \text{ kJ}$
- How much heat will be released when 4.77 g of ethanol ( $C_2H_5OH$ ) reacts with excess  $O_2$  according to the following equation?  
 $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O \quad \Delta H^\circ = -1366.7 \text{ kJ}$
- How much heat will be absorbed when 13.7 g of Nitrogen reacts with excess  $O_2$  according to the following equation?  
 $N_2 + O_2 \rightarrow 2NO \quad \Delta H^\circ = -180 \text{ kJ}$
- How much heat will be released when 11.8 g of Iron reacts with excess  $O_2$  according to the following equation?  
 $3Fe + 2O_2 \rightarrow Fe_2O_3 \quad \Delta H^\circ = -1120.5 \text{ kJ}$
- How much heat will be released when 18.6 g of Hydrogen reacts with excess  $O_2$  according to the following equation?  
 $2H_2 + O_2 \rightarrow H_2O \quad \Delta H^\circ = -571.6 \text{ kJ}$
- How much heat will be transferred when 14.9 g of ammonia reacts with excess  $O_2$  according to the following equation?  
 $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O \quad \Delta H^\circ = -1170 \text{ kJ}$
- How much heat will be transferred when 5.81 g of graphite reacts with excess  $H_2$  according to the following equation?  
 $6C(\text{graphite}) + 3H_2 \rightarrow C_6H_6 \quad \Delta H^\circ = 49.03 \text{ kJ}$

## Using $\Delta H = mC\Delta T$

- How many kilojoules of heat energy are required to heat all the aluminum ( $C_p$  of Al =  $.902 \text{ J/g}\cdot^\circ\text{C}$ ) in a roll of aluminum foil (500.0 g) from room temperature ( $25.0^\circ\text{C}$ ) to the temperature of a hot oven ( $250.0^\circ\text{C}$ )?
- One way to cool down your cup of coffee is to plunge an ice-cold piece of aluminum into it. Suppose you store a 20.0 g piece of aluminum ( $C_p$  of Al =  $.902 \text{ J/g}\cdot^\circ\text{C}$ ) in the refrigerator at  $4.40^\circ\text{C}$  and then drop it into your coffee. The coffee temperature drops from  $90.0^\circ\text{C}$  to  $55.0^\circ\text{C}$ . How many joules of heat energy did the aluminum block absorb? (Ignore the cooling of the cup)
- Suppose you pick up a 16.0-kilogram ball of iron (such as a "shot-put" ball at a track event). The iron ( $C_p$  =  $.451 \text{ J/g}\cdot^\circ\text{C}$ ) ball has the same temperature as the atmosphere on a cool day say  $16.0^\circ\text{C}$ . How many kilojoules of heat energy must the iron ball absorb to reach the temperature of your body ( $37.0^\circ\text{C}$ )?
- The specific heat of silver is  $0.24 \text{ J/g}\cdot^\circ\text{C}$ . How much heat in joules must be added to a silver block of mass 86.0 g to raise its temperature by  $9.00^\circ\text{C}$ ?
- An 18.7 g sample of platinum metal increases in temperature by  $2.30^\circ\text{C}$  when 5.70 J of heat are added. What is the specific heat of platinum?

Answers: 1) -79.4kJ 2) -155kJ 3) 17.4kJ 4) -3.75kJ 5) -142kJ 6) -88.1kJ 7) -78.7kJ 8) -2660kJ 9) -256kJ 10) 3.96kJ  
 11) 101kJ 12) 912J 13) 152kJ 14) 186J 15)  $.132 \text{ J/g}\cdot^\circ\text{C}$

# Thermochemistry Calculations Answer Key

**Herbert DaCosta, Maohong Fan**



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## **Table of Contents Thermochemistry Calculations Answer Key**

1. Understanding the eBook Thermochemistry Calculations Answer Key
  - The Rise of Digital Reading Thermochemistry Calculations Answer Key
  - Advantages of eBooks Over Traditional Books
2. Identifying Thermochemistry Calculations Answer Key
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Thermochemistry Calculations Answer Key
  - User-Friendly Interface
4. Exploring eBook Recommendations from Thermochemistry Calculations Answer Key
  - Personalized Recommendations
  - Thermochemistry Calculations Answer Key User Reviews and Ratings
  - Thermochemistry Calculations Answer Key and Bestseller Lists
5. Accessing Thermochemistry Calculations Answer Key Free and Paid eBooks
  - Thermochemistry Calculations Answer Key Public Domain eBooks
  - Thermochemistry Calculations Answer Key eBook Subscription Services
  - Thermochemistry Calculations Answer Key Budget-Friendly Options
6. Navigating Thermochemistry Calculations Answer Key eBook Formats



- ePub, PDF, MOBI, and More
  - Thermochemistry Calculations Answer Key Compatibility with Devices
  - Thermochemistry Calculations Answer Key Enhanced eBook Features
7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Thermochemistry Calculations Answer Key
    - Highlighting and Note-Taking Thermochemistry Calculations Answer Key
    - Interactive Elements Thermochemistry Calculations Answer Key
  8. Staying Engaged with Thermochemistry Calculations Answer Key
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Thermochemistry Calculations Answer Key
  9. Balancing eBooks and Physical Books Thermochemistry Calculations Answer Key
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Thermochemistry Calculations Answer Key
  10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
  11. Cultivating a Reading Routine Thermochemistry Calculations Answer Key
    - Setting Reading Goals Thermochemistry Calculations Answer Key
    - Carving Out Dedicated Reading Time
  12. Sourcing Reliable Information of Thermochemistry Calculations Answer Key
    - Fact-Checking eBook Content of Thermochemistry Calculations Answer Key
    - Distinguishing Credible Sources
  13. Promoting Lifelong Learning
    - Utilizing eBooks for Skill Development
    - Exploring Educational eBooks
  14. Embracing eBook Trends
    - Integration of Multimedia Elements
    - Interactive and Gamified eBooks

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