

# ARISE Curriculum Guide

## Chemistry: Topic 11—Thermochemistry

### ChemMatters

[Order a CD with 25 years of ChemMatters](#), \$30

#### Articles for Student Use

Burning Diamonds and Squeezing Peanuts: April 1990, pp. 14-15.  
Colors Bursting in Air: Oct. 1998, pp. 7-9.  
The Explosive History of Nitrogen: Feb. 2003, pp. 8-10.  
Fire in the Hold: April 1997, pp. 11-13.  
Fireside Dreams: Dec. 1988, pp. 13-15.  
Hot and Cold Packs: Feb. 1987, pp. 7-11.  
Matches. Striking Chemistry at Your Fingertips: *ChemMatters*, Dec. 2002, pp. 14-16.  
Mighty Thermite: Feb. 2002, pp. 14-15.  
Non-Safety Glass: Oct. 1987, pp. 10-11.  
Rockets: Chemistry Model for Liftoff: April 2001.

#### Articles for Teacher Use

<b>Number and Topic:</b>	<b>1. Matter and Change</b> <b>6. Chemical Names and Formulas/Compounds and Elements</b> <b>8. Chemical Reactions</b> <b>10. Phases, Solids, Liquids and Gases (States of Matter)</b> <b>11. Thermochemistry,</b>
Source:	<i>ChemMatters</i> , Dec. 2002, pp. 14-16, "Matches. Striking Chemistry at Your Fingertips"
Type of Material:	Student Journal Article
Building on:	Chemical names and formulas/compounds and elements, chemical reactions and thermochemistry
Leading to:	Reaction rates, redox reactions
Links to Physics:	Matter, energy, thermodynamics, heat
Links to Biology:	
Good Stories:	Entire article is a "good story"
Activity Description:	Article describes the history of the development of the common match, covering early matches and their inherent weaknesses and dangers. Good review of chemical equations and/or a review or introduction to redox reactions.

**Number and Topic:** 4. Atomic Structure  
8. Chemical Reactions  
11. Thermochemistry  
22. Redox/Electrochemistry

Source: *ChemMatters*, Oct. 1998, pp. 7-9, "Colors Bursting in Air"

Type of Material: Student Journal Article

Building on: Atomic structure, electron transitions in atoms

Leading to: Redox

Links to Physics: Electromagnetic spectrum, light, electrons

Links to Biology:

Good Stories:

Activity Description: Article discusses the chemistry and electron transitions that produce the colors seen in fireworks.

**Number and Topic:** 6. Chemical Names and Formulas/Compounds and Elements  
8. Chemical Reactions  
11. Thermochemistry  
16. Covalent Bonds, Molecular Shapes and Intermolecular Forces  
18. Reaction Rates and Kinetics

Source: *ChemMatters*, Feb. 2003, pp. 8-10, "The Explosive History of Nitrogen"

Type of Material: Student Journal Article

Building on: Basic chemical knowledge

Leading to: Discussion of bonding in nitrogen compounds and elemental nitrogen, thermochemistry and reaction rates.

Links to Physics: Matter, energy, entropy

Links to Biology:

Good Stories: What caused a terrible explosion aboard a cargo ship loaded with ammonium nitrate on April 16, 1947, killing 576 people?

Activity Description: Article deals with explosive nitrogen-containing compounds and the chemical reasons that underlie their explosive nature.

**Number and Topic:** 6. Chemical Names and Formulas/Compounds and Elements  
11. Thermochemistry

Source: *ChemMatters*, April 1990, pp. 14-15, "Burning Diamonds and Squeezing Peanuts"

Type of Material: Student Journal Article

Building on: Elements, allotropes

Leading to: Thermodynamics of converting graphite into diamonds, phase diagrams

Links to Physics:

Links to Biology:

Good Stories:

Activity Description: This article is an extension of the article, "Burning Diamonds and Squeezing Peanuts" that precedes it. It goes into more thermodynamic detail regarding the conversion of graphite into diamonds, including the phase diagram for the diamond-graphite-liquid system.

**Number and Topic:** 8. Chemical Reactions  
11. Thermochemistry  
15. Ionic and Metallic Bonds  
22. Redox/Electrochemistry

Source: *ChemMatters*, Feb. 2002, pp. 14-15, "Mighty Thermite"

Type of Material: Student Journal Article

Building on: Chemical reactions

Leading to: Thermochemistry and redox

Links to Physics: Matter, energy, thermodynamics, heat, entropy

Links to Biology:

Good Stories:

Activity Description: Article describes the thermite reaction, its history, the thermodynamics behind it, and some of its practical applications.

**Number and Topic:** 8. Chemical Reactions  
9. Stoichiometry  
11. Thermochemistry  
12. Gases/Gas Laws/Kinetic Theory  
22. Redox/Electrochemistry/Electrochemistry

Source: *ChemMatters*, April 2001, "Rockets: Chemistry Model for Liftoff"

Type of Material: Student Journal Article

Building on: Properties of compounds and elements, chemical reactions, gas laws

Leading to: Redox reactions

Links to Physics: Strong links to motions and forces and kinematics as well as measurement

**Number and Topic:** 8. Chemical Reactions  
11. Thermochemistry  
21. Organic Chemistry

Source: *ChemMatters*, Dec. 1988, pp. 13-15, "Fireside Dreams"

Type of Material: Student Journal Article

Building on: Chemical reactions

Leading to: Combustion reactions

Links to Physics:

Links to Biology: Molecular structure of wood

Good Stories:

Activity Description: Article discusses the composition of wood, how and why it burns, and the chemical processes and reactions that are involved.

**Number and Topic:** 8. Chemical Reactions  
10. Phases, Solids, Liquids and Gases (States of Matter)  
11. Thermochemistry  
17. Water, Aqueous Solutions

Source: *ChemMatters*, Feb. 1987, pp. 7-11, “Hot and Cold Packs”

Type of Material: Student Journal Article and Activity

Building on: Chemical reactions

Leading to: Thermodynamics of the dissolving process

Links to Physics: Thermodynamics, heat, energy, entropy

Links to Biology:

Good Stories:

Activity Description: Article discusses both “hot packs” and “cold packs” and how they utilize both chemical reactions and simple crystallization to either release heat or absorb heat from their surroundings.

**Number and Topic:** 11. Reaction rates.  
21. Organic Chemistry

Source: *ChemMatters*, Oct. 1987, pp. 10-11, “Non-Safety Glass”

Type of Material: Student Journal Article

Building on: Basic chemical knowledge

Leading to: A discussion of ignition temperatures and reaction kinetics, including activation energy.

**Number and Topic:** 8. Chemical Reactions  
11. Thermochemistry  
22. Redox/Electrochemistry

Source: *ChemMatters*, April 1997, pp. 11-13, “Fire in the Hold”

Type of Material: Student Journal Article

Building on: Chemical reactions

Leading to: Oxidation-reduction, Reaction Rates

Links to Physics:

Links to Biology:

Good Stories: Tells of the explosion of a Turkish ship in 1996 that was caused by unintended oxidation of porous iron pellets stored.

Activity Description: Article explains the scientific principles that resulted in the spontaneous oxidation of the iron pellets—for example, the large surface area that was exposed because of the porous nature of the particles.

## **Flinn ChemTopic Labs**

[Order Flinn ChemTopic Labs](#)

Demo: Acid in the Eye – Safety

Demo: A Burning Candle - Observations

Demo: Classifying Matter

Demo: Flaming Vapor Ramp—Safety Demo

Lab: Observation and Experiment - Introduction to the Scientific Method

Lab: Separation of a Mixture - Percent Composition

Lab: What is a Chemical Reaction - Evidence of Change

Lab: Common Gases—Physical and Chemical Properties

Lab: Preparing and Testing Hydrogen Gas—A Microscale Approach

Lab: Carbon Dioxide - What a Gas—Microscale Gas Chemistry

## **ICE LABS**

[Online Descriptions and Experiments](#)

No activities for this topic.

## **Technology-Adapted Labs**

No activities for this topic.