

ARISE Curriculum Guide

Chemistry: Topic 13—Electrons in Atoms

ChemMatters

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Articles for Student Use

Automatic Sunglasses: Dec. 1989, pp. 4-6.
Chemiluminescence, the Cold Light: Oct. 1995, pp. 12-15.
The Color of Gems: Dec. 1988, pp. 7-9.
Iron for Breakfast: Oct. 1994, pp. 13-15.
Lasers: April 2003, pp. 2-3.
Light Your Candy: Oct. 1990, pp. 10-12.
Spectroscopy: Sensing the Unseen: Sep. 2001, pp. 4-6.
Superconductivity: Oct. 1987, pp. 18-21.

Articles for Teacher Use

Number and Topic:	4. Atomic Structure 13. Electrons in Atoms
Source:	<i>ChemMatters</i> , April 2003, pp. 2-3, “Lasers”
Type of Material:	Student Journal Article
Building on:	Atomic structure
Leading to:	Electron transitions in atoms—emission of photons
Links to Physics:	Light, Atoms, Electromagnetic spectrum
Links to Biology:	
Good Stories:	
Activity Description:	Article discusses lasers, both the scientific principles behind their operation and their technological design.

Number and Topic: 4. Atomic Structure
13. Electrons in Atoms
16. Covalent Bonds, Molecular Shapes and Intermolecular Forces

Source: *ChemMatters*, Sep. 2001, pp. 4-6, "Spectroscopy: Sensing the Unseen"

Type of Material: Student Journal Article

Building on: Atomic Structure

Leading to: Discussion of how electromagnetic radiation allows us to detect the presence of different molecules in the atmosphere

Links to Physics: Electromagnetic spectrum, atoms, light, motion and forces

Links to Biology: Except that the atmosphere is a very important part of our ecosystem, and any change in the atmosphere can have significant effects upon life on earth.

Good Stories:

Activity Description: The article discusses the electromagnetic spectrum and how the interaction of light with matter can be used to detect and measure gases present in earth's atmosphere. This is then connected to the NASA EOS-Aura project, a project that will launch a satellite that will carry four state-of-the-art instruments designed to make sophisticated measurements of earth's atmosphere.

Number and Topic: 4. Atomic structure
8. Chemical Reactions
13. Electrons in Atoms

Source: *ChemMatters*, Oct. 1995, pp. 12-15, "Chemiluminescence, the Cold Light"

Type of Material: Student Journal Article

Building on: Electromagnetic spectrum, chemical reactions, electrons in atoms

Leading to: Organic chemistry

Links to Physics: Atoms, electromagnetic spectrum, light

Links to Biology: Bacteria, bioluminescence

Good Stories: Several interesting stories of how specific organisms utilize bioluminescence in their daily quests for survival.

Activity Description: Article deals with the entire subject of chemiluminescence. It details the kinds of chemical reactions typically involved, presenting specific examples and several practical applications of the phenomenon both in nature and in medicine.

Number and Topic: 4. Atomic Structure
13. Electrons in Atoms

Source: *ChemMatters*, Oct. 1990, pp. 10-12, "Light Your Candy"

Type of Material: Student Journal Article

Building on: Atomic structure

Leading to: Energy levels and changes in atoms and molecules

Links to Physics: Electromagnetic spectrum, quantum theory, energy, light, electrons

Links to Biology:

Good Stories:

Activity Description: Article describes the phenomenon of triboluminescence and how and why the common Wint-O-Green Lifesaver exhibits this phenomenon.

Number and Topic: 4. Atomic Structure
13. Electrons in Atoms
Source: *ChemMatters*, Dec. 1988, pp. 7-9, "The Color of Gems"
Type of Material: Student Journal Article
Building on: Atomic structure
Leading to: Electron configurations, electron transitions within atoms, crystal structures
Links to Physics: Quantum theory, atoms, electrons, light, electromagnetic spectrum
Links to Biology:
Good Stories:
Activity Description: Article discusses why certain gems exhibit the colors that they do and gets into the electron configurations of atoms and electron transitions between orbitals.

Number and Topic: 4. Atomic Structure
13. Electrons in Atoms
Source: *ChemMatters*, Oct. 1987, pp. 18-21, "Superconductivity"
Type of Material: Student Journal Article
Building on: Atomic structure and normal electrical conductivity
Leading to: Mechanism of superconductivity
Links to Physics: Electrons, electricity, electrical conductivity
Links to Biology:
Good Stories:
Activity Description: Article describes the history of superconductivity and then attempts to present an explanation of this most unusual and counterintuitive phenomenon.

Number and Topic: 6. Chemical Names and Formulas/Compounds and Elements
8. Chemical Reactions
13. Electrons in Atoms
17. Water, Aqueous Solutions
18. Reaction Rates and Kinetics
22. Redox/Electrochemistry
Source: *ChemMatters*, Oct. 1994, pp. 13-15, "Iron for Breakfast"
Type of Material: Student Journal Article and Activity
Building on: Chemical names and formulas, electrons in atoms
Leading to: Catalysis, redox reactions
Links to Physics: Magnetism
Links to Biology: Hemoglobin, the function of iron in human biology
Good Stories:
Activity Description: Article relates the nature of iron in human metabolism and the biological effects of having too much or too little.

Number and Topic:	8. Chemical Reactions 13. Electrons in Atoms 19. Equilibrium 22. Redox/Electrochemistry
Source:	<i>ChemMatters</i> , Dec. 1989, pp. 4-6, "Automatic Sunglasses"
Type of Material:	Student Journal Article
Building on:	Chemical reactions, electrons in atoms
Leading to:	Equilibrium, redox
Links to Physics:	Light, electromagnetic spectrum
Links to Biology:	
Good Stories:	
Activity Description:	Article describes the reactions and mechanisms involved in photochromic sunglasses that darken when exposed to sunlight but turn clear when you come back indoors.

Flinn ChemTopic Labs
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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

Number and Topic:	13. Electrons in Atoms
Source:	Bill Grosser, Glenbard South High School. See attached student handout along with a CD containing a finished student project.
Type of Material:	Project-based learning activity: Alternatives for Producing Electrical Energy: Student Generated Infomercials
Building on:	Conservation of energy Subtopics - Exothermic reactions, energy calculations
Leading to:	Environmental chemistry
Links to Physics:	Conservation of energy
Links to Biology:	Ecological impacts of energy production
Good stories:	Field trip to local power plant works great to increase student interest.
Activity Description:	Students research different methods of generating electricity and present their research as 3-5 minute video infomercials. This is an informationbased blended (project/problem-based) research activity that is used in chemistry after students study energy transfer and combustion reactions. This project lays the groundwork to start investigations into atmospheric chemistry/gas laws, and nuclear chemistry/fusion and fission. This is a great project that allows students to see the practical application of many concepts that are taught as isolated units in the curriculum. For example, this year a group of students were researching Ocean Thermal Energy Conversion. We got into great discussions of energy transfer, heat of vaporization (ammonia), the effect of pressure on boiling points, etc. For the first time these students saw the very practical application of many of the concepts taught in the class. These types of projects produce many such teachable moments.
Technology:	Apple's superb iMovie software is used along with the Internet and several subscription databases for research.