Taught Curriculum

Learning Objectives

Students will be able to:

- Use physical properties of substances, including density, to identify an unknown substance. (4 days)
- Investigate various ways to separate mixtures and identify the properties that allow the separation. (3 days)
- Investigate how physical changes result in changes to the energy of the system. (1 day)
- Understand intermolecular forces and the relationship between temperature (energy changes) and phase changes. (3 days)
- Explain the similarities and differences between physical and chemical changes. (1 day)
- Reflect on knowledge of chemical and physical properties and apply that knowledge in a new context. (1 day)
- Demonstrate understanding of concepts and skills related to chemical and physical properties. (1 day)

Resources

Chemistry: Concepts & Applications, Glencoe, 2009

- Teacher's Edition and student textbook

  Chapter 1 (pp. 4-42)

  Chapter 6 (pp. 188-195)

  Chapter 20 (p. 722)
- Supplemental Practice Problems

  Teacher's Edition (p. 10)

  Chapter Review and Assessment Booklet (p. 8)

  Critical Thinking and Problem Solving Booklet (p. 1)
- Chapter Review and Assessment Booklet (pp. 8-9)
- Phases of Water, mutuslab.cs.uwindsor.ca/schurko/animations/waterphases/status_water.htm

District Documents

- Comparison of Physical and Chemical Changes
- Phase Change Worksheet
- Chemical Properties and Changes

Note: The district resources may contain content that goes beyond the standards addressed in this unit. See the Teaching Strategies and Assessed Curriculum sections below for specific recommendations.

Materials

Computer and projector; access to the *Molecular Workbench*; Simulation—Particulate Nature of Phase Change (Concord Consortium)

See materials list for Comparison of Physical and Chemical Change.

Specific resource suggestions by learning objective:

- Use physical properties of substances, including density, to identify an unknown substance. (4 days) [pp. 32-34; pages 36-37, Chemlab 3: The Composition of Pennies]
- Investigate various ways to separate mixtures and identify the properties that allow the separation. (3 days) [pp. 4-22; p. 10, Supplemental Practice Problems, TE 1, 4, and 6; p. 22, Minilab 1.2: Paper Chromatography of Inks; p. 1, Critical Thinking and Problem Solving]
- Investigate how physical changes result in changes to the energy of the system. (1 day) [pp. 32-33; Minilab 20.2, Dissolving—Exothermic or Endothermic?]
- Understand intermolecular forces and the relationship between temperature (energy changes) and phase changes. (3 days) [pp. 362-363; p. 360-361, Chemlab: Molecules and Energy]
- Explain the similarities and differences between physical and chemical changes. (1 day) [pp. 38-42; District Document, Comparison of Physical and Chemical Changes; p. 8, Chapter Review and Assessment]
- Reflect on knowledge of chemical and physical properties and apply that knowledge in a new context. (1 day) [pp. 44-45, Chapter 1 Assessment, problems 19, 21, 23, and 27]
- Demonstrate understanding of concepts and skills related to chemical and physical properties. (1 day) [Chapter Review and Assessment Booklet, p. 8, problems 1-8, and p. 9, problems 1-5]

Assessed Curriculum

Embedded/Formative Assessments

- Textbook (pp. 44-45), Chapter 1 Assessment, problems 19, 21, 23, and 27

Summative/Unit Assessment

- ExamView Assessment Suite CD: Chapter 1 Chemistry of Science and Matter test bank. Multiple choice questions: 1, 3, 4, 5, 9, 16, 17, 19, 20 26, 27, 33, 35, 36. Problems: 6, 9, and 10, plus two district-developed questions.

Embedded/Formative Assessments

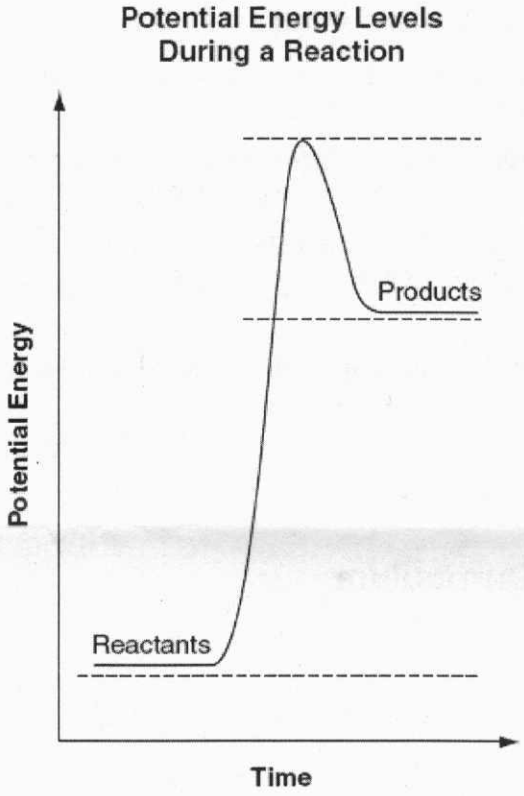
- Textbook (pp. 44-45), Chapter 1 Assessment, problems 19, 21, 23, and 27

Summative/Unit Assessment

- ExamView Assessment Suite CD: Chapter 1 Chemistry of Science and Matter test bank. Multiple choice questions: 1, 3, 4, 5, 9, 16, 17, 19, 20 26, 27, 33, 35, 36. Problems: 6, 9, and 10, plus two district-developed questions.

- NECAP, 2009, released item 2 (MC): SAE; PS 2-6; depth of knowledge 2

❷ The graph below shows the potential energy levels of products and reactants during a reaction.



Which statement **best** describes the reaction shown in the graph?

A. The reaction is exothermic because the products have less energy than the reactants.

B. The reaction is endothermic because the reactants have more energy than the products.

C. The reaction is endothermic because the products have more energy than the reactants.

D. The reaction is exothermic because the reactants have less energy than the products.

Taught Curriculum

Learning Objectives

Students will be able to:

- Summarize the advancements in technology that have allowed scientists to discover and explain the structure of the atom. (5 days)
- Use the periodic table to determine the number of protons, neutrons, and electrons of different elements. (1 day)
- Describe and explain how the mass of an atom can change. (2 days)
- Reflect on and apply knowledge learned in this unit in a new context. (1 day)
- Demonstrate understanding of concepts and skills learned in this unit. (1 day)

Resources

Chemistry: Concepts & Applications, Glencoe, 2009

- Teacher's Edition and student textbook, Chapter 2 (pp. 50-77)
- Critical Thinking and Problem Solving Booklet

  The Nuclear Atom . . . What If? (p. 2)
- Chemistry Media Library

  Rutherford's Gold Foil Experiment (TE, p. 62)

  Flame Tests (TE, p. 72)
- Glencoe Personal Tutor, www.glencoe.com—Tutorial, Gold Foil Experiment
- Test Bank CD, Chapter 2

  MC 12, 15-18, 20, 23, 25-27, 29-30, 32, 36-42, 43, 45

  Completion 50–55, 59, 62, 64-65, 67-69

  Short Answer 74-75
- CPO, Atom-Building Game

District Document, Project—Models of Isotopes & Ions

Website

- Atomic Model Timeline, www.docstoc.com/docs/5109029/atomic-model-timeline
- Rutherford Scattering, phet.colorado.edu/simulations/sims.php?sim=Rutherford_Scattering

Note: The district resources may contain content that goes beyond the standards addressed in this unit. See the Teaching Strategies and Assessed Curriculum sections below for specific recommendations.

Materials

Computer with projector, web access, calculators

Embedded/Formative Assessments

- Project—Models of Isotopes & Ions
- Critical Thinking and Problem Solving (p. 2), The Nuclear Atom . . . What If?

Summative/Unit Assessment

- ExamView Assessment Suite CD: Chapter 2 test bank–Multiple choice: 1, 4, 5, 6, 9, 13, 14, 15, 16, 19, 20, 29, 32, 33, 34. Short answer: 1, 5, 8. Problems 1, 3.
- NECAP, 2009, released item 5 (MC): POC; ESS 1-4; depth of knowledge 2

5 A rock sample contains 80 g of a potassium-40 (K_{19}^{40}) isotope with a half-life of 1.25 billion years.

How much of the potassium-40 isotope will remain after 2.5 billion years have passed?

A. 0 g
B. 10 g
C. 20 g
D. 80 g

Taught Curriculum

Learning Objectives

Students will be able to:

- Observe nuclear changes (alpha, beta, and gamma particle decay) and explain how they change an element. (3 days)
- Express alpha and beta decay in nuclear equations. (2 days)
- Model the half-life of an isotope and how half-life is used to date materials. (2 days)
- Distinguish between fission and fusion processes. (1 day)
- Reflect on and apply knowledge learned in this unit in a new context. (1day)
- Demonstrate understanding of concepts and skills learned in this unit. (1 day)

Resources

Chemistry: Concepts & Applications, Glencoe, 2009

- Teacher's Edition and student textbook, Chapter 21 (pp. 740-761)
- Chemistry Media Library, Detecting Radiation

Laboratory Investigations

- Laboratory Manual TE

  Experiment 21.1: Radioactive Dating—A Model (p. 201)
- Critical Thinking and Problem Solving

  Nuclear Decay Series (p. 24)
- Applying Scientific Methods in Chemistry Booklet: Radioactive Decay (p. 50)
- Chapter Review and Assessment Booklet (pp. 128, 129)

Note: The district resources may contain content that goes beyond the standards addressed in this unit. See the Teaching Strategies and Assessed Curriculum sections below for specific recommendations.

Materials

Computer and projector

See materials lists for

- Mini Lab 21.1: Model a Chain Reaction (p. 758)
- Experiment 21.1: Radioactive Dating—A Model, TE Lab Manual (p. 201)
- Try at Home Lab: Modeling Fusion (p. 878)

Embedded/Formative Assessments

- pp. 775-777, problems 23, 25, 26, 29, 32, 39, 40, and 47-49
- Applying Scientific Methods in Chemistry Booklet (p. 50), Radioactive Decay

Summative/Unit Assessment

- Glencoe Chapter Review and Assessment Booklet: Multiple Choice: 3, 7, 12, 13, 14, 15, 17, 21, 22, 24, 25, 36, 37, 38, and 40. Chapter 21 Short Answer: 2 and 25. Problems 1 and 5.

Taught Curriculum

Learning Objectives

Students will be able to:

- Summarize the historical development of the periodic table. (1 day)
- Predict similarities in the properties of elements by using the periodic table. (3 days)
- Determine the atomic structure and properties of elements by using the periodic table. (3 days)
- Relate an element's valence electron number to its position on the periodic table. (1 day)
- Reflect on and apply knowledge learned in this unit in a new context. (1 day)
- Demonstrate understanding of concepts and skills learned in this unit. (1 day)

Resources

Chemistry: Concepts & Applications, Glencoe, 2009

- Teacher's Edition and student textbook, Chapter 3 (pp. 82-115)

ChemMedia Library, Activity of Alkaline Metals

Applying Scientific Methods in Chemistry booklet: Mendeleev's Periodic Table (p. 21)

Chapter Review and Assessment Booklet

- Introduction to the Periodic Table of Elements (pp. 17-19)
- Interpret Data and Lab Skills and Introduction to Critical Thinking (pp. 20-21)
- ChemLab (pp. 23-27) or Small Scale Lab: Periodicity and the Properties of Elements (pp. 13-15)
- ChemLab and MiniLab Worksheets Booklet
- The Periodic Table of Useless Things (district document)

Note: The district resources may contain content that goes beyond the standards addressed in this unit. See the Teaching Strategies and Assessed Curriculum sections below for specific recommendations.

Materials

Section Focus Transparency 5, Basic Concept Transparencies 7 and 22, Problem-Solving Transparency 3

Computer with projector, web access, periodic tables on cardstock for student use, 30 element samples to be determined by teacher

See materials lists for

- ChemLab
- Small Scale Lab: Periodicity and the Properties of Elements

Embedded/Formative Assessments

- Teacher's Edition, p. 92, extension question
- Teacher's Edition, p. 114, problem 38
- Teacher's Edition, p. 99, performance assessment

Summative/Unit Assessment

- Chapter Review and Assessment Booklet, p. 19, problems 1-6
- ExamView Test Generator, Chapter 3 Test Bank, multiple choice items 1, 2, 4, 5, 7-9, 10, 12-19, 21-26, 29-31, 34; problems 1-3, 13, 15
- NECAP, 2009, released item 1 (MC): POC; PS 1-3; depth of knowledge 2

Please use the periodic table on the reference sheet to answer the question.

1 Which chemical property places neon (Ne) and argon (Ar) in the same group?

A. Both elements form ionic compounds.
B. Both elements have a full outer energy level.
C. Both elements have low ionization energy.
D. Both elements are liquids at 38°C.

Learning Objectives

Students will be able to:

- Identify trends across the periodic table, including atomic radii, electronegativity, ionic radius, reactivity, and ionization energy. (2 days)
- Demonstrate the relationship between atomic radius and electronegativity. (2 days)
- Reflect on and apply knowledge learned in this unit in a new context. (1 day)
- Demonstrate understanding of concepts and skills learned in this unit. (1 day)

Resources

Chemistry: Concepts & Applications, Glencoe, 2009

- Teacher's edition and student textbook

  Chapter 8 (pp. 254-297)

  Chapter 9 (pp. 298-304)

  Mini Lab 3.2: Trends in Atomic Radii (p. 260)

  Table D.5 (pp. 850-852)

Laboratory Investigations

- Laboratory Manual
- Applying Scientific Methods in Chemistry, Electronegativity (p. 24)
- Chemistry Media Library, The Periodic Table

District Documents

- Element Flashcards

Note: The district resources may contain content that goes beyond the standards addressed in this unit. See the Teaching Strategies and Assessed Curriculum sections below for specific recommendations.

Materials

Graph template, graphing calculators, graph paper

See materials lists for

- Trends in Atomic Radii
- Element Flashcards

Instructional Considerations

Key Vocabulary

atomic radii

electronegativity

ionization energy

periodic trends

periodicity

Embedded/Formative Assessments

- Section 8.1 Assessment, p. 279, problems 1 and 2

Summative/Unit Assessment

- ExamView Test Generator, Chapter 8 Test Bank, multiple-choice items 2, 9, 13, 19, 31, 34, 38. Short answer items 3, 35. Chapter 9 Test Bank multiple-choice item 9. Short answer items 10, 11.

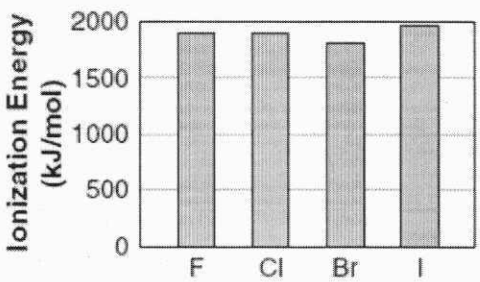
- NECAP, 2008, practice item 1 (MC): PS1.3, depth of knowledge 2

Please use the periodic table on the reference she to answer the question.

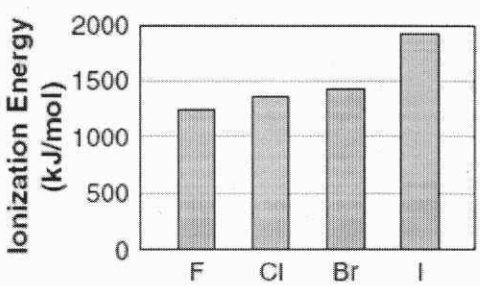
❶ Ionization energy is the energy required to remove electrons from atoms. Fluorine (F), chlorine (Cl), bromine (Br), and iodine (I) are found in the halogen family in the periodic table.

Which graph shows the correct trend for th first ionization energy of these four element

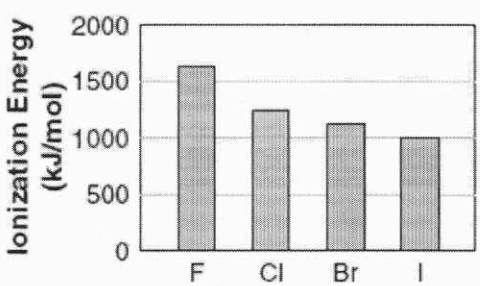
A.



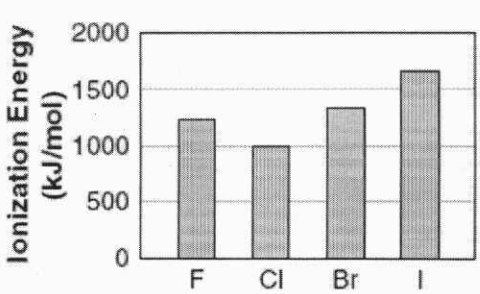
B.



C.



D.



Learning Objectives

Students will be able to:

- Describe the energy sub-levels and orbitals within the atom. (2 days)
- Demonstrate that each element has a unique arrangement of electrons. (2 days)
- Organize electrons according to the element's electron configuration. (1 day)
- Distinguish between the *s*, *p*, *d*, and *f* blocks on the periodic table. (2 days)
- Predict the electron configurations of an element using the periodic table. (1 day)
- Investigate emission spectra to determine how electrons behave when energy is added to an element. (2 days)
- Reflect on and apply knowledge learned in this unit in a new context. (1 day)
- Demonstrate understanding of concepts and skills learned in this unit. (1 day)

Resources

Chemistry: Concepts & Applications, Glencoe, 2009

- Teacher's Edition and student textbook

  Chapter 7 (pp. 226-253)

  Chapter 2 (p. 75), Mini Lab 2.2: Line Emission Spectra

  Mini Lab 7.2: Model Electrons in Atoms (p. 244)

- Study Guide, Teacher's Edition

  7.1: Present Day Atomic Theory (pp. 27-28)

  7.1:The Periodic Table and Atomic Structure (pp. 29-30)

Supplemental Practice Problems Booklet

- Completing the Model of the Atom (pp. 51-54)
- Chapter Review and Assessment (pp. 43 and 44)

Interactive Periodic Table

- webelements.com
- chemicalelements.com

Critical Thinking and Problem Solving Booklet

- Orbital Investigations (p. 8)

Laboratory Investigations

- Laboratory Manual
- Applying Scientific Methods in Chemistry:

  Energy Levels (p. 20)

- Comparing Activity of Selected Metals (pp.73-76)

Note: The district resources may contain content that goes beyond the standards addressed in this unit. See the Teaching Strategies and Assessed Curriculum sections below for specific recommendations.

Materials

Section Focus Transparencies 4, 14, 15; Basic Concepts Transparencies 6, 14; Problem-Solving Transparencies 8, 9

Embedded/Formative Assessments

- Textbook: Chemistry Journal (p. 245)
- Section 7.1 Assessment, problems 1-4 (p. 240)
- Section 7.2 Assessment, , problems 6, 7, 9, and 10 (p. 249)

Summative/Unit Assessment

- Chapter Review and Assessment, problems 1-12 (p. 43) and problems 1-10 (p. 44)
- ExamView Test Bank, Chapter 2 Test Bank, multiple choice items 8, 24, 35-37; short answer items 3, 11; problems 4-8.
- ExamView Test Bank, Chapter 7 Test Bank, multiple choice items 2, 6, 8-11, 15, 16, 19, 21, 24-26, 29-32.

Learning Objectives

Students will be able to:

- Explain how atoms achieve chemical stability by bonding. (3 days)
- Describe how intermolecular forces determine a compound's physical properties. (1 day)
- Predict the type of bonds that form between atoms by calculating electronegativity differences. (1 day)
- Apply scientific conventions to write chemical formulas and name chemical compounds. (2 days)
- Construct electron (Lewis) dot diagrams for molecules. (2 days)
- Compare and contrast characteristics and properties of ionic, covalent, and metallic bonds. (3 days)
- Predict a molecule's polarity from 3-D geometry and bond polarity. (2 days)
- Reflect on and apply knowledge learned in this unit in a new context. (1 day)
- Demonstrate understanding of concepts and skills learned in this unit. (1 day)

Resources

Chemistry: Concepts & Applications, Glencoe, 2009

- Teacher's Edition and student textbook

  Chapter 4 (pp. 128-147)

  Chapter 5 (pp. 152-185)

  ChemLab: Ionic or Covalent Compounds (pp. 170-171)

  Chemistry MiniLab Worksheet (pp. 36-38)

  Chapter 9 (pp. 300-310 and 313-335)

  Mini Lab 9.2: Model Molecules (p. 323)

  Chemistry Media Library, Bonding

  Chapter Review and Assessment (pp. 23-28, 29-34, 53-58)

- Study Guide

  Chapter 4, The Variety of Compounds (pp. 13-16)

  Chapter 5, Ionic Compounds and Covalent Compounds (pp. 17-20)

  Chapter 9. Molecular Shape and Molarity (pp. 37-38)

Laboratory Investigations

- Laboratory Manual
- Distinguishing Ionic and Covalent Compounds (pp. 37-40)

Critical Thinking and Problem Solving Booklet

- The Octet Rule and Bond Formation (p. 5)
- Ionic Clue to Atomic Identity (p. 6)
- Electron-Pair Repulsion and Molecular Structure (p. 10)

Note: The district resources may contain content that goes beyond the standards addressed in this unit. See the Teaching Strategies and Assessed Curriculum sections below for specific recommendations.

Do the Ionic or Covalent Bonds ChemLab on pages 170–171 or the Distinguishing Ionic and Covalent Compounds lab on pages 37-40 of the Laboratory Manual, depending on your equipment.

Specific resource suggestions by learning objective:

- Explain how atoms achieve chemical stability by bonding. (3 days) [pp. 128-147; p. 5, Critical Thinking and Problem Solving, The Octet Rule and Bond Formation; p. 133, Mini Lab 4.2; pp. 136-137, Demonstration, A Chemical Formula; pp. 140-141, Demonstration, Make It Neutral; p. 145, Section 4.2 Assessment, problems 6, 7]
- Describe how the intermolecular forces determine a compound's physical properties (1 day) [pp. 141-145, Section 4.2 Assessment, problem 10]
- Predict the type of bonds that form between atoms by calculating electronegativity differences. (1 day) [pp. 300-310; p. 312, Section 9.1 Assessment, problems 3-5]
- Apply scientific conventions to write chemical formulas for and name chemical compounds. (2 days) [pp. 152-185; p. 167, Section 5.1 Assessment, problems 8, 9; Section 5.2 Assessment, problems 16, 18; p. 6, Critical Thinking and Problem Solving, Ionic Clue to Atomic Identity]
- Construct electron dot diagrams for molecules. (1 day) [pp. 137-139 and 313-335; p. 331, Section 9.2 Assessment, problems 10-12]
- Compare and contrast characteristics and properties of ionic, covalent, and metallic bonds. (3 days) [pp. 141-145 and 313-335; pp. 37-40, Laboratory Manual, Distinguishing Ionic and Covalent Compounds; p. 145, Section 4.2 Assessment, problems 8, 9; p. 167, Section 5.1 Assessment, problem 7]
- Predict a molecule's polarity from 3-D geometry and bond polarity. (2 days) [pp. 328-331; p. 10, Critical Thinking and Problem Solving, Electron-Pair Repulsion and Molecular Structure; p. 323, MiniLab, Model Molecules]
- Reflect on and apply knowledge learned in this unit in a new context. (1 day) [pp. 147-148, Chapter Assessment, problems 14, 16-18; pp. 183-184, Chapter Assessment, problems 20-24; pp. 333-334, Chapter Assessment, problems 14, 16, 21, and 31]
- Demonstrate understanding of concepts and skills learned in this unit. (1 day) [Chapter Review and Assessment, p. 26, problems 1-6; p. 27, problems 1-10; p. 31, problems 1-10; p. 55, problems 1-5]

Assessed Curriculum

Embedded/Formative Assessments

- Section 4.2 Assessment, problems 6-10
- Assessment Performance (p. 157)

Summative/Unit Assessment

- Chapter Review and Assessment, problems 1-6 (p. 26), 1-10 (p. 27), 1-10 (p. 31), 1-5 (p. 55)

Embedded/Formative Assessments

- Section 4.2 Assessment, problems 6-10
- Assessment Performance (p. 157)

Summative/Unit Assessment

- Chapter Review and Assessment, problems 1-6 (p. 26), 1-10 (p. 27), 1-10 (p. 31), 1-5 (p. 55)

- NECAP, 2008, released item 1 (MC): MAS, FAF; PS1.4; depth of knowledge 2

Please use the periodic table on the reference sheet to answer the question.

❶ Element X reacts with potassium (K) to produce the compound K_2X. The table below shows the number of valence electrons in four elements.

Valence Electrons in Four Elements

Element	Number of Valence Electrons
Hydrogen (H)	1
Nitrogen (N)	5
Oxygen (O)	6
Fluorine (F)	7

Which element listed in the table is **most likely** element X?

A. hydrogen
B. nitrogen
C. oxygen
D. fluorine