

SECTION 2

Exploring the Periodic Table

Key Ideas

- Why do elements within a group of the periodic table have similar chemical properties?
- What happens to an atom that gains or loses electrons?
- What are the three main categories of elements?

Key Terms

ion
metal
nonmetal
semiconductor

Why It Matters

The properties of metals make metals useful for conducting electricity. For example, wires that carry electricity are made of metal.

Why is neon an unreactive element? Why is sodium so reactive that it reacts violently with moisture and oxygen in the air? These chemical properties are related to the number of electrons in each element.

The Role of Electrons

The periodic table is organized by atomic number, which is the number of protons in an atom. For a neutral atom, the number of protons equals the number of electrons. **The periodic trends in the periodic table are the result of electron arrangement.** Specifically, the chemical properties of each group are largely determined by the number of valence electrons. These electrons are closest to the outside of the atom and are sometimes considered part of an outer “shell” of electrons.

Valence electrons account for similar properties.

The number of valence electrons determines many of the chemical properties of an element. The diagrams in **Figure 1** show atoms of two elements from Group 1: lithium and sodium. Because they each have one valence electron, lithium and sodium have similar chemical properties. In general, elements in a group have chemical and physical properties in common because they have the same number of valence electrons. Of course, elements in a group are not exactly alike. They differ in numbers of protons in their nuclei and in numbers of electrons in their filled inner energy levels. As a result, the properties of elements in a group are not exactly the same.

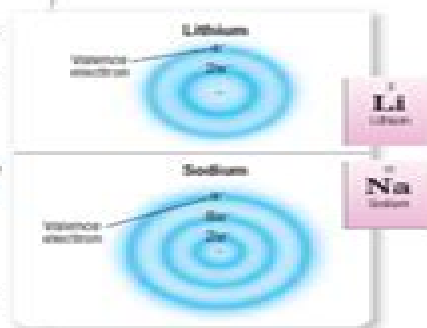


Figure 1 These two elements in Group 1 each have one valence electron. **What is the difference in the location of these electrons?**

Key Resources

- Teaching Transparencies**
C12 Ion Formation
TM15 Elements and Orbitals
- Visual Concept**
Valence Electrons
- Cross-Disciplinary Worksheets**
Integrating Biology—The Elements in Your Body

SECTION 2

Focus

In this section, students learn about the process of ionization and how valence electrons account for the periodic properties of elements. The section concludes with a brief description of how elements are classified as metals, semiconductors, and nonmetals according to their properties and where, in general, these categories can be found in the periodic table.

Bellringer

Use the Bellringer transparency to prepare students for this section.

Demonstrate

Conductivity For this demonstration you will need a conductivity tester and samples of elements, such as a copper coin, an iron nail, and pieces of charcoal and sulfur. A conductivity tester can be made from insulated wire, a battery, and a flashlight bulb.

Use the conductivity tester to see which elements conduct an electric current. Ask students: “Which elements are metals?” “How do you know?” (Generally, elements that conduct a current under standard conditions are metals.) “Which elements are nonmetals?” “How do you know?” (Generally, elements that do not conduct a current under standard conditions are nonmetals.)

Logical

Answer to caption question

Lithium has one valence electron in the second level, while sodium has one valence electron in the third level.

Answers For Section Exploring The Periodic Table

J Spring



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Exploring Physical Science in the Laboratory John T. Salinas ,2019-02-01 This full color manual is designed to satisfy the content needs of either a one or two semester introduction to physical science course populated by nonmajors It provides students with the opportunity to explore and make sense of the world around them to develop their skills and knowledge and to learn to think like scientists The material is written in an accessible way providing clearly written procedures a wide variety of exercises from which instructors can choose and real world examples that keep the content engaging Exploring Physical Science in the Laboratory guides students through the mysteries of the observable world and helps them develop a clear understanding of challenging concepts Discovering Science Through Inquiry: Matter Kit Rachel E. Green,2010-05-12 The Discovering Science through Inquiry series provides teachers and students of grades 3 8 with direction for hands on science exploration around particular science topics and focuses The series follows the 5E model engage explore explain elaborate evaluate The Matter kit provides a complete inquiry model for the exploration of the structure and properties of matter through supported investigation Encourage students through activities such as studying the chemical properties of matter and investigating whether household items are acids and bases Matter kit includes 16 Inquiry Cards in print and digital formats Teacher s Guide Inquiry Handbook Each kit includes a single copy additional copies can be ordered Digital resources include PDFs of activities and additional teacher resources including images and assessment tools leveled background pages for students and video clips to support both students and teachers **Chemical Interactions** ,2005 Writer's Choice Tests with Answer Key and Rubrics Grade 12 McGraw-Hill Staff,2000-07 **Study Guide/Selected Solutions Manual** Julie R. Frentrup,2002-06 Contains a brief overview of every chapter review of skills self tests and the answers and detailed solutions to all odd numbered end of chapter problems in the text book **ENC Focus** ,2001 Enrichment Worksheets, Student Edition, for Use with Glencoe Physical Science Aron Thompson,1999 *Glencoe Physical Science* ,1999 *Reports and Memoranda* ,1973 Beginning with no 650 each hundredth number contains a list of the Reports and memoranda published since the last list *Exploring Earth and Space* Michael DiSpezio,1995 A textbook exploring such aspects of matter and energy as heat electricity and nuclear chemistry with suggested activities and review questions at the end of each chapter **Te HS&T J** Holt Rinehart & Winston,Holt, Rinehart and Winston Staff,2004-02 **Reports and Memoranda - Aeronautical Research Council** Aeronautical Research Council (Great Britain),1972 **Explore** ,2000 Exploring the World of Science Ellsworth Scott Obourn,1963 **Studying Turbulence Using Numerical Simulation Databases** ,2002 **Chemistry 2007** David Wilson,2006-12 Kaplan s guide includes 2 full length practice tests Diagnostic test to target areas for score improvement Detailed answer explanations Hundreds of practice questions from calculations of chemical equations to organic chemistry Explanations of important terms formulas and concepts Powerful strategies to help you score higher **AQA GCSE Chemistry 9-1 Student Book (GCSE Science 9-1)**

Ann Daniels,2021-09-20 Exam Board AQA Level Subject GCSE Chemistry First teaching September 2016 First exams June 2018 AQA approved *Physics* Eugene Hecht,2003 Student text An Introduction to Physics Measurement The Language of Physics Kinematics Speed Velocity Speed Velocity Relative Motion Kinematics Acceleration The Concept of Acceleration Uniformly Accelerated Motion Free Fall Newton s Three Laws The Three Laws Dynamics Statics Centripetal Force Gravity Centripetal Force Gravity The Cosmic Force Energy The Transfer of Energy Mechanical Energy Conservation of Mechanical Energy Momentum Collisions Linear Momentum Rotational Motion The Kinematics of Rotation Rotational Equilibrium The Dynamics of Rotation Solids Liquids Gases Atoms Matter Fluid Statics Fluid Dynamics Elasticity Oscillations Elasticity Harmonic Motion Waves Sound Mechanical Waves Sound Thermal Properties of Matter Temperature Thermal Expansion The Gas Laws Heat Thermal Energy Thermal Energy Change of State The Transfer of Thermal Energy Thermodynamics The First Law of Thermodynamics Cyclic Processes Engines Refrigerators The Second Law of Thermodynamics Electrostatics Forces Electromagnetic Charge The Electric Force The Electric Field Electrostatics Energy Electric Potential Capacitance Direct Current Flowing Electricity Resistance Circuits Circuit Principles Network Analysis Optional Magnetism Magnets the Magnetic Field Electrodynamics Magnetic Force Electromagnetic Induction Electromagnetically Induced emf Generators Self Induction AC Electronics Alternating Current R L C AC Networks Optional Electronics Optional Radiant Energy Light The Nature of Light The Electromagnetic Photon Spectrum The Propagation of Light Scattering Scattering Reflection Refraction The World of Color Geometrical Optics Instruments Lenses Mirrors Physical Optics Polarization Interference Diffraction Special Relativity Before the Special Theory The Special Theory of Relativity Relativistic Dynamics The Origins of Modern Physics Subatomic Particles The Nuclear Atom The Evolution of Quantum Theory The Old Quantum Theory Atomic Theory Quantum Mechanics The Conceptual Basis of Quantum Mechanics Quantum Physics Nuclear Physics Nuclear Structure Nuclear Transformation High Energy Physics Elementary Particles Quantum Field Theory A Brief Mathematical Review Algebra Geometry Trigonometry Vectors Dimensions **Essentials of Geology** Stanley Chernicoff,Haydn A. Fox,2003 A condensed version of Geology 3e this textbook provides succinct focused explanations of key points ideal for those who require a basic introduction to the field As in the past the Third Edition successfully engages students by concentrating on dynamic geologic processes rather than on rote memorisation of key terms Three themes plate tectonics environmental geology and natural resources and planetary geology appear repeatedly throughout the text to highlight the connections between core concepts Highlights of this third edition include New Text design is more visually appealing and more effective in communicating core concepts of geology to students New Geology at a Glance features use flow charts figures and photos to visually summarise difficult concepts in a succinct manner recognising that many students are visual learners New Coverage of Earth Systems is integrated throughout the text New Highlights Boxes which link applications of the geology being studied to situations that are recognisable to students are now categorised as Environmental Earth System Science or

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