

# Unit 5: Electron Interaction: Configuration and Bonding

Content Area: **Science**  
Course(s): **Chemistry/Lab Honors**  
Time Period: **3rd Marking Period**  
Length: **6 Weeks**  
Status: **Published**

## Unit Overview

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Electron behavior within an atom determines its placement on the periodic table and ability to interact with other atoms to form bonds of varying strength

## Transfer

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Students will be able to independently use their learning to predict how bonding of atoms takes place.

## Meaning

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## Understandings

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- 1) Electron Configuration impacts placement on the periodic table.
- 2) Electron Configuration influences bonding of atoms
- 3) Energy of a Bond depends on several factors.

## Essential Questions

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- 1) How can you determine where an atom should be placed on the periodic table using its electrons?

2) How do properties of electrons determine various trends?

3) How can the energy of a bond be determined?

## **Application of Knowledge and Skill**

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### **Students will know...**

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- 1) The electronic structure of atoms and relating them to positions on the table
- 2) The history, organization and trends on the Periodic Table.
- 3) How to determine a bond's strength.

### **Students will be skilled at...**

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- 1) Writing out the electron configuration in various forms.
- 2) Predicting Trends in groups and families
- 3) Building Models of Molecules.

## **Vocabulary**

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### **Academic**

#### **Vocabulary**

activation energy  
activated complex

### **Application**

#### **Vocabulary**

configuration  
trends

catalyst  
chemical bond  
collision theory  
concentration  
endothermic  
energy  
equilibrium  
ionization energy  
exothermic  
electronegativity  
atomic radius  
ionic radius  
temperature

molecular geometry  
polarity  
frequency

## **Learning Goal 1**

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Students will be able to use their learning of the current atomic model to determine electronic structure of atoms and ions and relate to their locations on the Periodic Table.

## **Proficiency Scale**

- Students will be able to use their learning of the current atomic model to determine electronic structure of atoms and ions and relate to their locations on the Periodic Table.

SCI.HS-PS1-1

Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

## **Target 1**

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SWBAT explain the phenomenon of a specific atomic orbital (s,p,d,f) based on quantum numbers in terms of concepts.

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## **Target 2**

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SWBAT create the electron configuration of an given atom in the various forms, including exceptions (Long Hand, Short Hand, Orbital Notation, Electron Dot).

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### **Target 3**

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SWBAT create the electron configuration of an ion in the various forms (Long Hand, Short, Orbital Notation, Electron Dot).

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### **Learning Goal 2**

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Students will be able to explain the placement of elements on the periodic table and predict patterns in chemical and physical properties.

### **Proficiency Scale**

- Students will be able to explain the placement of elements on the periodic table and predict patterns in chemical and physical properties.

SCI.HS-PS1-1

Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

### **Target 1**

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SWBAT prove that the placement of elements on the periodic table is based on their physical properties (Metal, Non-Metal, Metalloid and Group Names).

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### **Target 2**

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SWBAT define and differentiate between atomic size, ionization energy, electronegativity, reactivity.

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### **Target 3**

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SWBAT develop a logical explanation for the patterns in the chemical and physical properties of elements.

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## Target 4

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SWBAT develop a logical explanation for the patterns in the chemical and physical properties of an isoelectronic series.

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## Learning Goal 3

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Determine the general structure of molecules and explain the geometry of molecules.

### Proficiency Scale

- Determine the general structure of molecules and explain the geometry of molecules.

SCI.HS-PS2-6

Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

## Target 1

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SWBAT construct an Electron Transfer Diagram for Ionic Bonds, a Lewis Structure for a covalently bonded molecule using the Electron Dot Structure, and show the electron sea for metallic bonds.

- SWBAT construct an Electron Transfer Diagram for Ionic Bonds, a Lewis Structure for a covalently bonded molecule using the Electron Dot Structure, and show the electron sea for metallic bonds.

## Target 2

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SWBAT design and build the molecular geometry of a molecule, given the Lewis Structure or asked to draw the Lewis Structure.

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## Target 3

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SWBAT design and build the molecular geometry of a polyatomic ion, given the Lewis Structure or asked to draw the Lewis Structure.

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## Target 4

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SWBAT critique the factors that determine molecular polarity and hybridization and predict the polarity and hybridization of covalent bonds.

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## **Learning Goal 4**

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Explain that the amount of energy per bond depends on the strength of the bond, and how the energy released or absorbed affects the internal motion of atoms and molecules in the system.

### **Proficiency Scale**

- Explain that the amount of energy per bond depends on the strength of the bond, and how the energy released or absorbed affects the internal motion of atoms and molecules in the system.

SCI.HS-PS3-1                      Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

SCI.HS-PS1-4                      Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

SCI.HS-PS3-2                      Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

## **Target 1**

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SWBAT apply concepts of chemical reactions to determine how chemical bonds can be broken and new ones can be formed.

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## **Target 2**

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SWBAT hypothesize how a chemical reaction may occur in terms of collision theory.

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## **Target 3**

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SWBAT create and/or interpret a diagram indicating the relative energies of reactants, products, and activated complex, for both exo- and endothermic reactions

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## **Formative Assessment and Performance Opportunities**

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Lab Reports

Worksheets

PowerPoints with Notes

Homework and Classwork Activities

Group Activities

In Class Discussion

- Lab Reports, Worksheets, PowerPoints with Notes, Homework and Classwork Activities, Group Activities, In Class Discussion

## **Summative Assessment**

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Unit Assessment will be created collaboratively and used for every student in the course. In addition, there will be other assessments in the form of lab reports, pen and paper tests, and quizzes. Common Assessment is administered through LinkIt.

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## **Accommodations/Modifications**

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All instruction, labs, activities, and assessments will be modified and enhanced to adhere to individual student's IEPs and 504s. As well differentiated classroom management strategies will be utilized as to adhere to these students individual plans as well. These strategies can be but are not limited to the following: Graphic Organizers and Flow Charts to help visualization of content, Using acronyms and mnemonic devices to assist memorization, Academic Games to practice skills and deepen understanding of topics, Stations and Learning Centers to influence peer tutoring, Utilizing Reviews and Study Guides to reteach complex content before summative and formative assessment, Providing additional resources to students during and outside of school (videos, study guides, teacher notes, web-based resources).

**On Assessments, College Prep Chemistry students will be given the following resources:  
Electronegativity Ranges for Bond Types, Electron Configuration Chart, Bond Energy Formula.**

**On Assessments, Honors AND College Prep Chemistry students will be given the following resources:  
AB/AX Names, Periodic Table.**

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## Unit Resources

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Teacher generated PowerPoints, Notes, Labs and Worksheets

Textbooks

Resource Books

Internet Resources

Computer Based Activities

Lab in this unit: Computer Configuration Lab, Identify Configuration Lab, Intro to Bonding Lab, Single Bond Lab, Double Triple Bond Lab, Hybrid and Polarity Lab

- Teacher generated PowerPoints, Notes, Labs and Worksheets, Textbooks, Resource Books, Internet Resources, Computer Based Activities

## 21st Century Life and Careers

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CRP.K-12.CRP1.1

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP.K-12.CRP2.1

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.K-12.CRP4.1

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting



with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP.K-12.CRP5.1

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

CRP.K-12.CRP6.1

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP.K-12.CRP7.1

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP.K-12.CRP8.1

Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP.K-12.CRP9.1

Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.

CRP.K-12.CRP11.1

Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

CRP.K-12.CRP12.1

Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

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## **Interdisciplinary Connections**

MA.K-12.2

Reason abstractly and quantitatively.

MA.A-SSE.A.1b

Interpret complicated expressions by viewing one or more of their parts as a single entity.

MA.A-SSE.A.2	Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$ , thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$ .
MA.K-12.4	Model with mathematics.
MA.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
LA.WHST.11-12.1	Write arguments focused on discipline-specific content.
MA.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.A-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
LA.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
MA.A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
MA.A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
LA.WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
LA.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.11-12.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks,

purposes, and audiences.

LA.SL.11-12.5

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.