Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

UNIT OVERVIEW

<table>
<tr><th colspan="4">STAGE ONE: Identify Desired Results</th></tr>
<tr><td rowspan="4">Established Goals/Standards</td><td rowspan="4">NYS Chemistry Standards:

3.1 u, 3.1 cc, 3.1 dd, 3.1 a, 3.1g, 3.1 w, 3.1x, 3.1 v, 3.1 a-g, 3.1 m-p, 3.4 e, 4.3 a, 3.1 i-k, 3.3 a, 3.3c, 5.2 c</td><td colspan="2">Long-Term Transfer Goal</td></tr>
<tr><td colspan="2">At the end of this unit, students will use what they have learned to independently…
● Make and use observations to identify and analyze relationships and patterns in order to explain the structure and use of the periodic table.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>Enduring Understandings
Students will understand that…
The model of the atom is the result of experiments, observations and deductive reasoning.
• The nuclear forces holding the nucleus together are many times larger than the electrostatic forces holding the atom together.
• A chemical reaction is a process where one or more substances are changed into new substances by the exchange and sharing of electrons.
• Nuclear reactions are due to changes in the nucleus and may have many times the energy of chemical reactions.
• When elements are listed by their atomic numbers, properties of the elements repeat over and over again.
• There are only approximately 100 elements in the world and all</td><td>Essential Questions
Students will consider such questions as…
• What is the purpose of models? How do they evolve?
• How does the structure of atoms affect their function and properties?
• How can you create an organizational chart to assist in understanding?
• How do you investigate things you cannot see?</td></tr>
</table>

Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

		materials are made of these elements or a combination of them.	
		Acquisition	
		What knowledge will students learn as part of this unit? • An **element** is any pure substance in the periodic table that cannot be chemically broken down into simpler materials. Each element has its unique atomic number, chemical properties, and symbol. • All matter is composed of **atoms** which are the smallest particles that retain the chemical properties of the element. • A **chemical property** is demonstrated when the atoms of a substance rearrange to form new substances. • If a change occurs in a substance but no atoms are rearranged, a **physical property** is exhibited. • Materials that are shiny, malleable, ductile, and conduct electricity are classified as **metals**. Metals react with oxygen to produce metal oxides which are basic in aqueous solution.	*What skills will students learn as part of this unit?* Section 1: Organize information. Identify trends and patterns. Section 2: Identify physical and chemical properties. Perform chemical tests safely and accurately. Section 3: Perform laboratory measurements. Section 4: Utilize simulations/ models of physical/chemical systems. Identify the differences between a theory and a law. Section 5: Explain macroscopic observations with atomic level processes/models. Section 6: Explain macroscopic observations with atomic level processes/models.

Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

		• Materials that are typically gases or soft solids are classified as **nonmetals**. They occupy the upper right corner of the periodic table and their oxides form acidic aqueous solutions. • The dense central core of an atom is called the **nucleus**, which contains the protons and neutrons. The nucleus contains essentially all of the mass of the atom. The **proton** has a mass of 1 amu and a charge of _1; the **neutron** also has a mass of 1 amu but has no electrical charge. • The third subatomic particles found in an atom are the **electrons**. Electrons occupy the space outside the nucleus, have negligible mass, and a charge of _1. In other contexts electrons may be called **beta radiation** or **cathode rays**. • To find the **atomic mass** of an element add the number of protons and neutrons in the nucleus. • The identity of each element is determined by the number of protons in its nucleus, the **atomic number.** Elements with the same atomic number but different numbers of neutrons are **isotopes**. • A **compound** is formed when two or more elements combine to form a	Section 7: Perform data analysis. Recognize patterns and trends. Section 8: Make a claim based on data-based evidence. Section 9: Use models to make predictions. Make predictions based on observations. **NYS Process Skills-** **Analysis, Inquiry, and Design** M1.1 Use algebraic and geometric representations to describe and compare data. • organize, graph, and analyze data gathered from laboratory activities or other sources • measure and record experimental data and use data in calculations • recognize and convert various scales of measurement temperature • use knowledge of geometric arrangements to predict particle properties or behavior S1.1 Elaborate on basic scientific and personal explanations of natural phenomena, and develop extended visual models and mathematical formulations to represent thinking.

Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

		new substance. The elements will always combine in exactly the same proportions by mass **(law of definite proportions)**. • Since atoms are so small, chemists always work with vast numbers of atoms. A convenient measure of chemical quantities is **Avogadro's number**, also called a **mole**. A mole is 6.022 _ 1023. • Modern atomic theory, **quantum theory,** shows that electrons occupy highly specific regions in the space about the nucleus. These regions are called **energy levels** and each energy level (1, 2, 3, 4…) has **sublevels** (*s, p, d, f, g*) of orbitals. • A shorthand method for describing the arrangement of electrons in the orbitals of an element is called its **electron configuration**. • A form of energy that travels through space at the speed of light (*c* _ 3.00 _ 108 m/s) is **electromagnetic radiation**. It is characterized by **wavelength**, λ, and **frequency**, *f*. *c* _ λ*f E* _ *hf* • When two elements combine chemically to form a new substance, a **chemical reaction** has	• use theories and/or models to represent and explain observations • use theories and/or principles to make predictions about natural phenomena • develop models to explain observations S2.1 Devise ways of making observations to test proposed explanations. • design and/or carry out experiments, using scientific methodology to test proposed calculations S3.1 Use various means of representing and organizing observations (e.g., diagrams, tables, charts, graphs, equations, and matrices) and insightfully interpret the organized data. • organize observations in a data table, analyze the data for trends or patterns, and interpret the trends or patterns, using scientific concepts S3.3 Assess correspondence between the predicted result contained in the hypothesis

Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

		occurred. A reaction can be expressed in shorthand with a **balanced equation _ reactants → products**, exhibiting the **conservation of mass**. • When an ionic bond forms, a certain amount of energy is required to remove the electron to be transferred, the **ionization energy**. The atom giving up electron(s) becomes a cation; the atom receiving the electron(s) becomes an anion.	and the actual result, and reach a conclusion as to whether or not the explanation on which the prediction is supported. • evaluate experimental methodology for inherent sources of error and analyze the possible effect on the result S3.4 Using results of the test and through public discussion, revise the explanation and contemplate additional research. S3.5 Develop a written report for public scrutiny that describes the proposed explanation, including a literature review, the research carried out, its results, and suggestions for further research. **Information Systems** Information technology is used to retrieve, process, and communicate information as a tool to enhance learning. Examples include: • use the Internet as a source to retrieve information for classroom use, e.g., Periodic Table, acid rain

Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

			Interconnectedness: Common Themes Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design. 2.1 Revise a model to create a more complete or improved representation of the system. • show how models are revised in response to experimental evidence, e.g., atomic theory, Periodic Table 2.2 Collect information about the behavior of a system and use modeling tools to represent the operation of the system. • show how information about a system is used to create a model, e.g., kinetic molecular theory (KMT) 2.3 Find and use mathematical models that behave in the same manner as the processes under investigation. • show how mathematical models (equations) describe a process, e.g., combined gas law

Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

			2.4 Compare predictions to actual observations, using test models. • compare experimental results to a predicted value, e.g., percent error **Interdisciplinary Problem Solving** Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results. If students are asked to do a project, then the project would require students to: • work effectively • gather and process information • generate and analyze ideas • observe common themes • realize ideas • present results **NYS Regents Chemistry Reference Tables-** Table N Table O

Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

			Periodic Table of Elements Table S

STAGE TWO: Determine Acceptable Evidence	
	Assessment Evidence
Criteria to assess understanding: *(This is used to build the scoring tool.)* • how well the game shows your understanding of the periodic table • how well the game enables players to learn about the periodic table • how interesting the game is to play • how long the game takes to play • whether the game is sequential or can be continued.	Performance Task focused on Transfer: Your challenge in this chapter is to develop a game related to Mendeleev's periodic table of the elements. How the game is played—on a table, with cards, on a computer—is up to you. You might emphasize some aspects of the periodic table over others, such as why the elements are grouped the way they are or how the electrons of the elements are configured. You may choose to focus on some types of information related to the table, like the discovery of atomic structure, how the elements combine to form compounds, or why some are radioactive. Keep in mind the criteria you and your teacher establish.
	Other Assessment Evidence: Journaling What do you see? What do you think? What do you think now? Chem Essential Questions Chem to Go questions Chapter Mini-challenge – Section quizzes Chapter test

East High School, Rochester, NY

Based on UbD (ASCD) by G. Wiggins and J. McTighe

Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

East High School, Rochester,
NY

Based on UbD (ASCD) by G. Wiggins and J. McTighe

Subject: Regents Chem Grade: 9-12 Unit #: 2 Title: Fun with the Periodic Table

T, M, A *(Code for Transfer, Meaning Making and Acquisition)*	**STAGE THREE: Plan Learning Experiences**	
	Learning Events:	Evidence of learning: *(formative assessment)*

East High School, Rochester, NY

Based on UbD (ASCD) by G. Wiggins and J. McTighe