Standard ID	Standard Text	Edgenuity Lesson Name
EALR 1.9-12 SYS	Systems	
1.9-12 SYS	Systems In prior grades students learned how to simplify and analyze complex situations by thinking about them as systems. In grades 9-12 students learn to construct more sophisticated system models, including the concept of feedback. Students are expected to determine whether or not systems analysis will be helpful in a given situation and if so, to describe the system, including subsystems, boundaries, flows, and feedbacks. The next step is to use the system as a dynamic model to predict changes. Students are also expected to recognize that even the most sophisticated models may not accurately predict how the real world functions. This deep understanding of systems and ability to use systems analysis is an essential tool both for scientific inquiry and for technological design.	
1.9-12 SYSA	Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.	
1.9-12 SYSA.1	Give examples of a positive feedback system and explain its regulatory mechanism (e.g., global warming causes Earth's ice caps to melt, reflecting less energy to space, increasing temperatures).	
		The Endocrine and Exocrine Systems
1.9-12 SYSA.2	Give examples of a negative feedback system and explain its regulatory mechanism (e.g., when a human body overheats, it produces sweat that cools the body by evaporation).	
		The Endocrine and Exocrine Systems
1.9-12 SYSB	Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.	
1.9-12 SYSB.1	Determine if a systems approach will be helpful in answering a question or solving a problem.	
1.9-12 SYSB.2	Represent the system with a diagram specifying components, boundaries, flows, and feedbacks.	
1.9-12 SYSB.3	Describe relevant subsystems and the larger system that contains the system being analyzed.	
		Properties of Water The Endocrine and Exocrine Systems
1.9-12 SYSB.4	Determine how the system functions with respect to other systems.	
		Properties of Water The Endocrine and Exocrine Systems

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1.9-12 SYSC	In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.	
1.9-12 SYSC.1	Create a simplified model of a complex system. Trace the possible consequences of a change in one part of the system and explain how the simplified model may not be adequate to reliably predict consequences.	Atomic Numbers and Electron Configurations Covalent Bonding Scientific Methods The Historical Development of Atomic Theory The Modern Atomic Theory
1.9-12 SYSD	Systems can be changing or in equilibrium.	
1.9-12 SYSD.1	Analyze whether or not a system (e.g., population) is changing or in equilibrium.	Equilibria of Acids and Bases
1.9-12 SYSD.2	Determine whether a state of equilibrium is static or dynamic (e.g., inflows equal outflows).	Equilibria of Acids and Bases
EALR 2.9-12 INQ	Inquiry	
2.9-12 INQ	Inquiry In prior grades students learned to revise questions so they can be answered scientifically. In grades 9-12 students extend and refine their understanding of the nature of inquiry and their ability to formulate questions, propose hypotheses, and design, conduct, and report on investigations. Refinement includes an increased understanding of the kinds of questions that scientists ask and how the results reflect the research methods and the criteria that scientific arguments are judged by. Increased abilities include competence in using mathematics, a closer connection between student-planned investigations and existing knowledge, improvements in communication and collaboration, and participation in a community of learners.	
2.9-12 INQA	Scientists generate and evaluate questions to investigate the natural world.	
2.9-12 INQA.1	Generate and evaluate a question that can be answered through a scientific investigation. Critique questions generated by others and explain whether or not the questions are scientific.	Formulating Scientific Questions
2.9-12 INQB	Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data.	
2.9-12 INQB.1	Plan and conduct a scientific investigation, choosing a method appropriate to the question being asked.	Designing Scientific Investigations Safety in Science Scientific Methods

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2.9-12 INQB.2	Collect, analyze, and display data using calculators, computers, or other technical devices when available.	Lab: Measurement Tools, Technology, and Measurement
2.9-12 INQC	Conclusions must be logical, based on evidence, and consistent with prior established knowledge.	
2.9-12 INQC.1	Draw conclusions supported by evidence from the investigation and consistent with established scientific knowledge.	Analyzing Data and Drawing Conclusions
2.9-12 INQC.2	Analyze alternative explanations and decide which best fits the data and evidence.	Analyzing Data and Drawing Conclusions Analyzing Evidence
2.9-12 INQD	The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.	
2.9-12 INQD.1	Write a detailed laboratory report that includes: the question that motivated the study, a justification for the kind of investigation chosen, hypotheses (if any), a description of what was done, a summary of data in tables and graphs, and a conclusion, based on the evidence, that responds to the question.	Science-Based Communication
2.9-12 INQE	The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.	
2.9-12 INQE.1	Formulate one or more hypotheses based on a model or theory of a causal relationship. Demonstrate creativity and critical thinking to formulate and evaluate the hypotheses.	Designing Scientific Investigations Hypotheses, Laws, and Theories
2.9-12 INQF	Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.	
2.9-12 INQF.1	Evaluate an investigation to determine if it was a valid means of answering the question, and whether or not the results were reliable.	Analyzing Data and Drawing Conclusions Analyzing Evidence Evaluating Scientific Design
2.9-12 INQF.2	Describe the development of a scientific theory that illustrates logical reasoning, creativity, testing, revision, and replacement of prior ideas in light of new evidence.	Hypotheses, Laws, and Theories The Progress of Scientific Knowledge

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2.9-12 INQG	Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings.	
2.9-12 INQG.1	Participate in a scientific discussion about one's own investigations and those performed by others.	
2.9-12 INQG.2	Respond to questions and criticisms, and if appropriate, revise explanations based on these discussions.	
2.9-12 INQH	Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.	
2.9-12 INQH.1	Provide appropriate citations for all ideas, findings, and information used in any and all written reports.	
2.9-12 INQH.2	Explain the consequences for failure to provide appropriate citations.	
EALR 3.9-12 APP	Application	
3.9-12 APP	Application In prior grades students learn to work with other members of a team to apply the full process of technological design and relevant science concepts to solve problems. In grades 9-12 students apply what they have learned to address societal issues and cultural differences. Students learn that science and technology are interdependent, that science and technology influence society, and that society influences science and technology. Students continue to increase their abilities to work with other students and to use mathematics and information technologies (when available) to solve problems. They transfer insights from those increased abilities when considering local, regional, and global issues. These insights and capabilities will help prepare students to solve societal and personal problems in future years.	
3.9-12 APPA	Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded.	
3.9-12 APPA.1	Describe ways that scientific ideas have influenced society or the development of differing cultures.	The Nature of Chemistry
3.9-12 APPA.2	List questions that scientists investigate that are stimulated by the needs of society (e.g., medical research, global climate change).	Formulating Scientific Questions The Nature of Chemistry
3.9-12 APPB	The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.	
3.9-12 APPB.1	Work collaboratively with other students to generate ideas for solving a problem. Identify criteria and constraints, research the problem, and generate several possible solutions.	

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3.9-12 APPC	Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.	
3.9-12 APPC.1	Choose the best solution for a problem, create a model or drawing of the final design, and devise a way to test it. Redesign the solution, if necessary, then present it to peers.	Atomic Numbers and Electron Configurations Covalent Bonding Scientific Methods The Historical Development of Atomic Theory The Modern Atomic Theory
3.9-12 APPD	The ability to solve problems is greatly enhanced by use of mathematics and information technologies.	
3.9-12 APPD.1	Use proportional reasoning, functions, graphing, and estimation to solve problems.	Dimensional Analysis Scientific Notation and Significant Figures Using Math to Analyze Data
3.9-12 APPD.2	Use computers, probes, and software when available to collect, display, and analyze data.	Tools, Technology, and Measurement
3.9-12 APPE	Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.	
3.9-12 APPE.1	Analyze a societal issue that may be addressed through science and/or technology. Compare alternative solutions by considering trade-offs and unintended consequences (e.g., removing dams to increase salmon spawning).	Nuclear Radiation The Nature of Chemistry
3.9-12 APPF	It is important for all citizens to apply science and technology to critical issues that influence society.	
3.9-12 APPF.1	Critically analyze scientific information in current events to make personal choices or to understand public-policy decisions.	Analyzing Evidence The Nature of Chemistry

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EALR 4.9-11 PS	Physical Science	
4.9-11 PS2	Matter: Properties and Change In prior years, students learned the basic concepts behind the atomic nature of matter. In grades 9-11 students learn about chemical reactions, starting with the structure of an atom. They learn that the Periodic Table groups elements with similar physical and chemical properties. With grounding in atomic structure, students learn about the formation of molecules and ions, compounds and solutions, and the details of a few common chemical reactions. They also learn about nuclear reactions and the distinction between fusion and fission. These concepts about the fundamental properties of matter will help students understand chemical and nuclear reactions that are important in modern society and lay the groundwork for both chemistry and life science.	
4.9-11 PS2A	Atoms are composed of protons, neutrons, and electrons. The nucleus of an atom takes up very little of the atom's volume but makes up almost all of the mass. The nucleus contains protons and neutrons, which are much more massive than the electrons surrounding the nucleus. Protons have a positive charge, electrons are negative in charge, and neutrons have no net charge.	
4.9-11 PS2A.1	Describe the relative charges, masses, and locations of the protons, neutrons, and electrons in an atom of an element.	
		The Historical Development of Atomic Theory The Modern Atomic Theory The Structure of the Atom
4.9-11 PS2B	Atoms of the same element have the same number of protons. The number and arrangement of electrons determines how the atom interacts with other atoms to form molecules and ionic crystals.	
4.9-11 PS2B.1	Given the number and arrangement of electrons in the outermost shell of an atom, predict the chemical properties of the element.	
		Atomic Numbers and Electron Configurations Changes in Matter Electrons and the Periodic Table Evidence of Chemical Reactions Lab: Ionic and Covalent Bonds Lab: Physical and Chemical Changes Metallic Bonding Types of Chemical Bonds
4.9-11 PS2C	When elements are listed in order according to the number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties. This Periodic Table is a consequence of the repeating pattern of outermost electrons.	
4.9-11 PS2C.1	Given the number of protons, identify the element using a Periodic Table.	
		The History and Arrangement of the Periodic Table

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4.9-11 PS2C.2	Explain the arrangement of the elements on the Periodic Table, including the significant relationships among elements in a given column or row.	Electrons and the Periodic Table Periodic Trends The History and Arrangement of the Periodic Table
4.9-11 PS2D	Ions are produced when atoms or molecules lose or gain electrons, thereby gaining a positive or negative electrical charge. Ions of opposite charge are attracted to each other, forming ionic bonds. Chemical formulas for ionic compounds represent the proportion of ion of each element in the ionic crystal.	
4.9-11 PS2D.1	Explain how ions and ionic bonds are formed (e.g., sodium atoms lose an electron and chlorine atoms gain an electron, then the charged ions are attracted to each other and form bonds).	Ionic Bonding
4.9-11 PS2D.2	Explain the meaning of a chemical formula for an ionic crystal (e.g., NaCl).	Nomenclature of Ionic Compounds
4.9-11 PS2E	Molecular compounds are composed of two or more elements bonded together in a fixed proportion by sharing electrons between atoms, forming covalent bonds. Such compounds consist of well-defined molecules. Formulas of covalent compounds represent the types and number of atoms of each element in each molecule.	
4.9-11 PS2E.1	Give examples to illustrate that molecules are groups of two or more atoms bonded together (e.g., a molecule of water is formed when one oxygen atom shares electrons with two hydrogen atoms).	Covalent Bonding Elements, Compounds, and Mixtures Intermolecular Forces
4.9-11 PS2E.2	Explain the meaning of a chemical formula for a molecule (e.g., CH4 or H2O).	Nomenclature of Covalent Compounds
4.9-11 PS2F	All forms of life are composed of large molecules that contain carbon. Carbon atoms bond to one another and other elements by sharing electrons, forming covalent bonds. Stable molecules of carbon have four covalent bonds per carbon atom.	
4.9-11 PS2F.1	Demonstrate how carbon atoms form four covalent bonds to make large molecules. Identify the functions of these molecules (e.g., plant and animal tissue, polymers, sources of food and nutrition, fossil fuels).	Amino Acids and Proteins Carbohydrates and Lipids Metabolism Nucleic Acids Organic Compounds

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4.9-11 PS2G	Chemical reactions change the arrangement of atoms in the molecules of substances. Chemical reactions release or acquire energy from their surroundings and result in the formation of new substances.	
4.9-11 PS2G.1	Describe at least three chemical reactions of particular importance to humans (e.g., burning of fossil fuels, photosynthesis, rusting of metals).	Lab: Types of Reactions Types of Reactions
4.9-11 PS2G.2	Use a chemical equation to illustrate how the atoms in molecules are arranged before and after a reaction.	Introduction to Stoichiometry Molar Masses Writing and Balancing Chemical Equations
4.9-11 PS2G.3	Give examples of chemical reactions that either release or acquire energy and result in the formation of new substances (e.g., burning of fossil fuels releases large amounts of energy in the form of heat).	Calorimetry Energy Heat Lab: Calorimetry and Specific Heat Reaction Pathways Thermochemical Equations
4.9-11 PS2H	Solutions are mixtures in which particles of one substance are evenly distributed through another substance. Liquids are limited in the amount of dissolved solid or gas that they can contain. Aqueous solutions can be described by relative quantities of the dissolved substances and acidity or alkalinity (pH).	
4.9-11 PS2H.1	Give examples of common solutions. Explain the differences among the processes of dissolving, melting, and reacting.	Evidence of Chemical Reactions Lab: Solubility Mixtures and Solutions Phase Changes Properties of Water Solutions and Solubility
4.9-11 PS2H.2	Predict the result of adding increased amounts of a substance to an aqueous solution, in concentration and pH.	Colligative Properties Equilibria of Acids and Bases Lab: Measuring pH Measures of Concentration: Molarity pH Properties of Acids and Bases

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4.9-11 PS2I	The rate of a physical or chemical change may be affected by factors such as temperature, surface area, and pressure.	
4.9-11 PS2I.1	Predict the effect of a change in temperature, surface area, or pressure on the rate of a given physical or chemical change.	Catalysts Gas Laws Gases Lab: Boyle's Law Lab: Charles's Law Lab: Reaction Rate Liquids Pressure Reaction Pathways Reaction Rate Solids and Plasmas The Ideal Gas Law
4.9-11 PS2J	The number of neutrons in the nucleus of an atom determines the isotope of the element. Radioactive isotopes are unstable and emit particles and/or radiation. Though the timing of a single nuclear decay is unpredictable, a large group of nuclei decay at a predictable rate, making it possible to estimate the age of materials that contain radioactive isotopes.	
4.9-11 PS2J.1	Given the atomic number and atomic mass number of an isotope, students draw and label a model of the isotope's atomic structure (number of protons, neutrons, and electrons).	The Structure of the Atom
4.9-11 PS2J.2	Given data from a sample, use a decay curve for a radioactive isotope to find the age of the sample. Explain how the decay curve is derived.	Half-Life Lab: Half-Life Types of Radioactive Decay
4.9-11 PS2K	Nuclear reactions convert matter into energy, releasing large amounts of energy compared with chemical reactions. Fission is the splitting of a large nucleus into smaller pieces. Fusion is the joining of nuclei and is the process that generates energy in the Sun and other stars.	
4.9-11 PS2K.1	Distinguish between nuclear fusion and nuclear fission by describing how each process transforms elements present before the reaction into elements present after the reaction.	Nuclear Energy Nuclear Fission and Nuclear Fusion Nuclear Radiation The Discovery of Radioactivity The Nucleus