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2022-2023 Vertical Alignment Matrix

Science – Grade 5 - High School (Integrated Physics & Chemistry [IPC], Biology, Chemistry, Physics)

Grade 8	IPC	Biology	Chemistry	Physics
PS SCI.8.1A Demonstrate safe practices during laboratory and field investigations as outlined in Texas Education Agency approved safety standards	PS IPC.1A Demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles or chemical splash goggles, and fire extinguishers.	PS BIOL.1A Demonstrate safe practices during laboratory and field investigations.	PS CHEM.1A Demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles or chemical splash goggles, as appropriate, and fire extinguishers.	PS PHYS.1A Demonstrate safe practices during laboratory and field investigations.
	PS IPC.1B Know specific hazards of chemical substances such as flammability, corrosiveness, and radioactivity as summarized on the Safety Data Sheets (SDS).		PS CHEM.1B Know specific hazards of chemical substances such as flammability, corrosiveness, and radioactivity as summarized on the Safety Data Sheets (SDS).	
PS SCI.8.1B Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials.	PS IPC.1C Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.	PS BIOL.1B Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.	PS CHEM.1C Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.	PS PHYS.1B Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.
	PS IPC.2A Know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section.	PS BIOL.2A Know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section.	PS CHEM.2A Know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section.	PS PHYS.2A Know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section.
		PS BIOL.2B Know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories.	PS CHEM.2B Know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories.	PS PHYS.2B Know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence.
		PS BIOL.2C Know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.	PS CHEM.2C Know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.	PS PHYS.2C Know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly reliable explanations, but may be subject to change.
		PS BIOL.2D Distinguish between scientific hypotheses and scientific theories.	PS CHEM.2D Distinguish between scientific hypotheses and scientific theories.	

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PS SCI.8.2A Plan and implement comparative and descriptive investigations by making observations, asking well-defined questions, and using appropriate equipment and technology.	PS IPC.2B Plan and safely implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.	PS BIOL.2E Plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology.	PS CHEM.2E Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology, including graphing calculators, computers and probes, electronic balances, an adequate supply of consumable chemicals and sufficient scientific glassware.	PS PHYS.2D Design and implement investigative procedures including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, evaluating numerical answers for reasonableness, and identifying causes and effects of uncertainties in measured data.
PS SCI.8.2B Design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and selecting equipment and technology.				PS PHYS.2E Demonstrate the use of course apparatus, equipment, techniques, and procedures including multimeters (current, voltage, resistance), balances, batteries, dynamics demonstration equipment, collision apparatus, lab masses, magnets, plane mirrors, convex lenses, stopwatches, trajectory apparatus, graph paper, magnetic compasses, protractors, metric rulers, spring scales, thermometers, slinky springs, and/or other equipment and materials that will produce the same results.
				PS PHYS.2F Use a wide variety of additional course apparatuses, equipment, techniques, materials, and procedures as appropriate.
PS SCI.8.2C Collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers.	PS IPC.2C Collect data and make measurements with accuracy and precision.	PS BIOL.2F Collect and organize data and make measurements with accuracy and precision.	PS CHEM.2F Collect data and make measurements with accuracy and precision.	PS PHYS.2G Make measurements with accuracy and precision and record data using scientific notation and International System (SI) units.
			PS CHEM.2G Express and manipulate chemical quantities using scientific conventions and mathematical procedures including dimensional analysis, scientific notation, and significant figures.	
PS SCI.8.2E Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.	PS IPC.2D Organize, analyze, evaluate, make inferences, and predict trends from data.	PS BIOL.2G Analyze, evaluate, make inferences, and predict trends from data.	PS CHEM.2H Organize, analyze, evaluate, make inferences, and predict trends from data.	PS PHYS.2H Organize, evaluate and make inferences from data including the use of tables, charts, and graphs.

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	PS IPC.2E Communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphs, journals, summaries, oral reports, and technology based reports.	PS BIOL.2H Communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	PS CHEM.2I Communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.	PS PHYS.2I Communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.
PS SCI.8.2D Construct tables, using repeated trials and means to organize data and identify patterns.				PS PHYS.2J Express relationships among physical variables quantitatively, including the use of graphs, charts, and equations.
PS SCI.8.3A Analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning and experimental and observational testing, including examining all sides of the scientific evidence of those scientific explanations so as to encourage critical thinking by the student.	PS IPC.3A Analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning and experimental and observational testing, so as to encourage critical thinking by the student.	PS BIOL.3A Analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student.	PS CHEM.3A Analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student.	PS PHYS.3A Analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student.
	PS IPC.3B Communicate and apply scientific information extracted from various sources such as current events, published journal articles and marketing materials.	PS BIOL.3B Communicate and apply scientific information extracted from various sources such as current events, published journal articles and marketing materials.	PS CHEM.3B Communicate and apply scientific information extracted from various sources such as current events, published journal articles and marketing materials.	PS PHYS.3B Communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles and marketing materials.
	PS IPC.3C Draw inferences based on data related to promotional materials for products and services.	PS BIOL.3C Draw inferences based on data related to promotional materials for products and services.	PS CHEM.3C Draw inferences based on data related to promotional materials for products and services.	
PS SCI.8.3D Relate the impact of research on scientific thought and society including the history of science and contributions of scientists as related to the content.	PS IPC.3D Evaluate the impact of research on scientific thought, society, and the environment.	PS BIOL.3D Evaluate the impact of research on scientific thought, society, and the environment.	PS CHEM.3D Evaluate the impact of research on scientific thought, society, and the environment.	PS PHYS.3C Explain the impacts of the scientific contributions of a variety of historical and contemporary scientists on scientific thought and society.
	PS IPC.3E Describe connections between physics and chemistry and future careers.		PS CHEM.3E Describe the connection between chemistry and future careers.	PS PHYS.3D Describe the connection between chemistry and future careers.

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PS SCI.8.3B Use models to represent aspects of the natural world such as an atom, a molecule, space, or a geologic feature.				
PS SCI.8.3C Identify advantages and limitations of models such as size, scale, properties, and materials.		PS BIOL.3E Evaluate models according to their limitations in representing biological objects or events.		
	PS IPC.3F Research and describe the history of physics, chemistry, and contributions of scientists.	PS BIOL.3F Research and describe the history of biology and contribution of scientists.	PS CHEM.3F Describe the history of chemistry and contributions of scientists.	
PS SCI.8.4A Use appropriate tools to collect, record, and analyze information including: journals/notebooks, beakers, meter sticks, graduated cylinders, anemometers, psychrometers, hot plates, test tubes, spring scales, balances, microscopes, thermometers, calculators, computers, spectroscopes, timing devices, and other necessary equipment as needed to teach the curriculum.				PS PHYS.3E Express and interpret relationships symbolically in accordance with accepted theories to make predictions and solve problems mathematically including problems requiring proportional reasoning and graphical vector addition.
PS SCI.8.4B Use preventative safety equipment including chemical splash goggles, aprons, and gloves and be prepared to use emergency safety equipment including an eye/face wash, a fire blanket, and a fire extinguisher.				
		R BIOL.10A Describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals.		
		S BIOL.10C Analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.		
		S BIOL.11A Summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems.		

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		® BIOL.11B Describe how events and processes that occur during ecological succession can change populations and species diversity.		
		® BIOL.9B Compare the reactants and products of photosynthesis and cellular respiration in terms of energy, energy conversions and matter.		
		® BIOL.9C Identify and investigate the role of enzymes.		
® SCI.8.11A Describe producer/consumer, predator/prey, and parasite/host relationships as they occur in food webs in marine, freshwater and terrestrial ecosystems.		® BIOL.12A Interpret relationships including predation, parasitism, commensalism, mutualism, and competition among organisms.		
		® BIOL.12B Compare variations and adaptations of organisms in different ecosystems.		
® SCI.8.11B Investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition.		® BIOL.12C Analyze the flow of matter and energy through different trophic levels using various models including food chains, food webs, and ecological pyramids.		
		® BIOL.12D Describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles.		
® SCI.8.11C Explore how short and long-term environmental changes affect organisms and traits in subsequent populations.		® BIOL.12E Describe how environmental change can impact ecosystem stability.		
		® BIOL.9A Compare the functions of different types of		

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Grade 8	IPC	Biology	Chemistry	Physics
		biomolecules including carbohydrates, lipids, proteins, and nucleic acids.		
		Ⓢ BIOL.4A Compare and contrast prokaryotic and eukaryotic cells, including their complexity and compare and contrast scientific explanations for cellular complexity.		
		Ⓡ BIOL.4B Investigate and explain cellular processes including homeostasis, and transport of molecules.		
		Ⓢ BIOL.4C Compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases, such as human immunodeficiency virus (HIV) and influenza.		
		Ⓡ BIOL.10B Describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants.		
		Ⓢ BIOL.5B Describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation.		
		Ⓡ BIOL.6A Identify components of DNA, identify how information for specifying the traits of an organism is carried in the DNA, and examine scientific explanations for the origin of DNA.		
		Ⓢ BIOL.6B Recognize that components that make up the genetic code are common to all organisms.		



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		Ⓢ BIOL.6C Explain the purpose and process of transcription and translation using models of DNA and RNA.		
		Ⓢ BIOL.6D Recognize that gene expression is a regulated process.		
		Ⓡ BIOL.6E Identify and illustrate changes in DNA and evaluate the significance of these changes.		
		Ⓢ BIOL.5C Recognize that disruptions of the cell cycle lead to diseases such as cancer.		
		Ⓡ BIOL.6F Predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses, and non-Mendelian inheritance.		
		Ⓡ BIOL.5A Describe the stages of the cell cycle, including deoxyribonucleic acid (DNA) replication and mitosis, and the importance of the cell cycle to the growth of organisms.		
		Ⓢ BIOL.6G Recognize the significance of meiosis to sexual reproduction.		
		Ⓢ BIOL.8A Define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community.		
		Ⓡ BIOL.8B Categorize organisms using a hierarchical		

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		classification system based on similarities and differences shared among groups.		
		Ⓢ BIOL.8C Compare characteristics of taxonomic groups including archaea, bacteria, protists, fungi, plants, and animals.		
		Ⓡ BIOL.7A Analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies including anatomical, molecular, and developmental.		
		Ⓢ BIOL.7B Examine scientific explanations of abrupt appearance and stasis in the fossil record.		
		Ⓢ BIOL.7C Analyze and evaluate how natural selection produces change in populations, not individuals.		
		Ⓢ BIOL.7D Analyze and evaluate how the elements of natural selection including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources result in differential reproductive success.		
		Ⓡ BIOL.7E Analyze and evaluate the relationship of natural selection to adaptation, and to the development of diversity in and among species.		
		Ⓢ BIOL.7F Analyze other evolutionary mechanisms including genetic drift, gene flow, mutation, and recombination.		

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	IPC.5D Investigate the law of conservation of energy.		Ⓢ CHEM.11B Describe the law of conservation of energy and the processes of heat transfer in terms of calorimetry.	Ⓡ PHYS.6D Demonstrate and apply the law of conservation of energy and conservation of momentum in one dimension.
			Ⓢ CHEM.11A Describe energy and its forms including kinetic, potential, chemical, and thermal energies.	Ⓢ PHYS.6E Explain everyday examples that illustrate the four laws of thermodynamics and the processes of thermal energy transfer.
Ⓢ SCI.8.10A Recognize that the sun provides the energy that drives convection within the atmosphere and oceans, producing winds.	IPC.5E Investigate and demonstrate the movement of thermal energy through solids, liquids, and gases by convection, conduction, and radiation, such as in weather, living, and mechanical systems.			
	IPC.7D Classify energy changes that accompany chemical reactions such as those occurring in heat packs, cold packs, and glow sticks and classify them as exothermic or endothermic reactions.		Ⓡ CHEM.11C Classify reactions as exothermic or endothermic and represent energy changes that occur in chemical reactions using thermochemical equations or graphical analysis.	
	IPC.5H Analyze energy transformations of renewable and nonrenewable resources.			Ⓡ PHYS.6A Investigate and calculate with the work-energy theorem in various situations.
			Ⓢ CHEM.11D Perform calculations involving heat, mass, temperature change, and specific heat.	
	IPC.5I Critique the advantages and disadvantages of various energy sources and their impact on society and the environment.			
	IPC.5F Evaluate the transfer of electrical energy in series and parallel circuits, and conductive materials.			Ⓡ PHYS.5F Investigate and calculate in terms of current through, potential difference across, resistance of, and power used by electrical circuit elements connected in both series and parallel combinations.
	IPC.5C Demonstrate that moving electric charges			

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	produce magnetic forces and moving magnets produce electric forces.			
				Ⓢ PHYS.5D Identify and describe examples of electric and magnetic forces and fields in everyday life such as generators, motors, and transformers.
				Ⓢ PHYS.5E Characterize materials as conductors or insulators based on their electric properties.
				Ⓡ PHYS.6C Calculate the mechanical energy of, power generated within, impulse applied to, and momentum of a physical system.
	IPC.7E Describe types of nuclear reactions such as fission and fusion and their roles in applications such as medicine and energy production.		Ⓢ CHEM.12B Compare fission and fusion reactions.	Ⓢ PHYS.8C Calculate and describe the application of mass-energy equivalence.
				Ⓢ PHYS.8D Give examples of applications of atomic and nuclear phenomena using the standard model such as nuclear stability, fission and fusion, radiation therapy, diagnostic imaging, semiconductors, superconductors, solar cells, and nuclear power and examples of applications of quantum phenomena.
			Ⓢ CHEM.12A Describe the characteristics of alpha, beta, and gamma radioactive decay processes in terms of balanced nuclear equations.	
				Ⓢ PHYS.7A Examine and describe oscillatory motion and wave propagation in various types of media.
Ⓡ SCI.8.8A Describe components of the universe, including stars, nebulae, and galaxies, and use models such as the Hertzsprung-Russell diagram for classification.				

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Ⓢ SCI.8.8B Recognize that the Sun is a medium-sized star located in a spiral arm of the Milky Way galaxy and that the Sun is many thousands of times closer to Earth than any other star				
Ⓢ SCI.8.8C Explore how different wavelengths of the electromagnetic spectrum such as light and radio waves are used to measure distances and sizes in the universe.			Ⓢ CHEM.6B Describe the mathematical relationships between energy, frequency, and wavelength of light using the electromagnetic spectrum	Ⓢ PHYS.7C Compare characteristics and behaviors of transverse waves including electromagnetic waves and the electromagnetic waves and the electromagnetic spectrum and characteristics and behaviors of longitudinal waves including sound waves.
Ⓡ SCI.8.8D Research how scientific data are used as evidence to develop scientific theories to describe the origin of the universe.				
				Ⓡ PHYS.7B Investigate and analyze characteristics of waves including velocity, frequency, amplitude, and wavelength and calculate using the relationship between wave speed, frequency, and wavelength.
	IPC.5G Explore the characteristics and behaviors of energy transferred by waves including acoustic, seismic, light and waves on water as they reflect, refract, diffract, interfere with one another, and are absorbed by materials.			Ⓡ PHYS.7D Investigate behaviors of waves including reflection, refraction, diffraction, interference, resonance, and the Doppler effect.
				Ⓢ PHYS.7E Describe and predict image formation as a consequence of reflection from a plane mirror and refraction through a thin convex lens.
	IPC.6A Examine differences in physical properties of solids, liquids, and gases as explained by the arrangement and motion of atoms or molecules.		Ⓡ CHEM.4A Differentiate between physical and chemical changes and properties.	

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® SCI.8.5B Identify that protons determine an element's identity, and valence electrons determine the chemical properties including reactivity.	IPC.6B Relate chemical properties of substances to the arrangement of their atoms.			
	IPC.6C Analyze physical and chemical properties of elements and compounds such as color, density, viscosity, buoyancy, boiling point, freezing point, conductivity, and reactivity.		Ⓢ CHEM.4C Compare solids, liquids, and gases in terms of compressibility, structure, shape, and volume.	
			Ⓢ CHEM.4B Identify extensive properties such as mass and volume and intensive properties such as density and melting point.	
® SCI.8.5A Describe the structure of atoms including the masses, electrical charges and locations of protons and neutrons in the nucleus and electrons in the electron cloud.			Ⓢ CHEM.6A Describe the experimental design and conclusions used in the development of modern atomic theory including Dalton's Postulates, Thomson's discovery of electron properties, Rutherford's nuclear atom, and Bohr's nuclear atom.	
				® PHYS.8A Describe the photoelectric effect and the dual nature of light.
				Ⓢ PHYS.8B Compare and explain the emission spectra produced by various atoms.
			Ⓢ CHEM.6C Calculate average atomic mass of an element using isotopic composition.	
			® CHEM.6D Express the arrangement of electrons in atoms through electron configurations and Lewis valence electron dot structures.	
			® CHEM.7A Name ionic compounds containing main group or transition metals, covalent compounds, acids and	

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			bases, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules.	
® SCI.8.5D Recognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts.			® CHEM.7B Write the chemical formulas of ionic compounds containing representative elements, transition metals and common polyatomic ions, covalent compounds, and acids and bases.	
			® CHEM.7C Construct electron dot formulas to illustrate ionic and covalent bonds.	
			§ CHEM.7D Describe metallic bonding and explain metallic properties such as thermal and electrical conductivity, malleability, and ductility.	
			§ CHEM.7E Classify molecular structure for molecules with linear, trigonal planar, and tetrahedral electron pair geometries as explained by Valence Shell Electron Pair Repulsion (VSEPR) theory.	
			§ CHEM.5A Explain the use of chemical and physical properties in the historical development of the Periodic Table.	
® SCI.8.5C Interpret the arrangement of the Periodic Table including groups and periods, to explain how properties are used to classify elements.	IPC.6D Relate the placement of an element on the Periodic Table to its physical and chemical behavior, including bonding and classification.		® CHEM.5B Identify and explain the properties of chemical families including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals using the Periodic Table.	
			® CHEM.5C Interpret periodic trends including atomic radius, electronegativity, and ionization energy using the Periodic Table.	
			® CHEM.4D	

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			Classify matter as pure substances or mixtures through investigation of their properties.	
			® CHEM.9A Describe and calculate the relations between volume, pressure, number of moles, and temperature for an ideal gas, as described by Boyle's Law, Charles' Law, Avogadro's Law, Dalton's Law of Partial Pressure, and the Ideal Gas Law.	
			Ⓢ CHEM.9B Describe the postulates of kinetic molecular theory.	
	IPC.7A Investigate changes of state as it relates to the arrangement of particles of matter and energy transfer.			
® SCI.8.5E Investigate how evidence of chemical reactions indicates that new substances with different properties are formed and how that relates to the law of conservation of mass.	IPC.7B Recognize that chemical changes can occur when substances react to form different substances and that these interactions are largely determined by the valence electrons.			
			Ⓢ CHEM.8A Define and use the concept of a mole.	
			® CHEM.8B Calculate the number of atoms, ions, or molecules in a sample of material using Avogadro's number.	
			Ⓢ CHEM.8C Calculate percent composition of compounds.	
			Ⓢ CHEM.8D Differentiate between empirical and molecular formulas.	
	IPC.7C Demonstrate that mass is conserved when substances undergo chemical change and that the number and kind of atoms are the same in the reactants and products.		® CHEM.8E Use the law of conservation of mass to write and balance chemical equations.	

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			Ⓢ CHEM.8F Differentiate among double replacement (ion-swap) reactions, including acid-base reactions and precipitation reactions and oxidation-reduction reactions such as synthesis, decomposition, single replacement, and combustion reactions.	
			Ⓢ CHEM.8G Perform stoichiometric calculations including determination of mass relationships between reactants and products, calculation of limiting reagents and percent yield.	
			Ⓢ CHEM.8H Describe the concept of limiting reactants in a balanced chemical equation.	
	IPC.7F Research and describe the environmental and economic impact of the end-products of chemical reactions such as those that may result in acid rain, degradation of water and air quality, and ozone depletion.			
	IPC.6E Relate the structure of water to its function as a solvent.		Ⓢ CHEM.10A Describe the unique role of water in solutions in terms of polarity.	
	IPC.6F Investigate the properties of water solutions and factors affecting solid solubility, including nature of solute, temperature, and concentration.			
			® CHEM.10B Apply the general rules regarding solubility through investigations with aqueous solutions.	
			Ⓢ CHEM.10C Calculate the concentration of solutions in units of Molarity.	
			Ⓢ CHEM.10D Calculate the dilutions of solutions using molarity.	

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Science – Grade 5 - High School (Integrated Physics & Chemistry [IPC], Biology, Chemistry, Physics)

Grade 8	IPC	Biology	Chemistry	Physics
			® CHEM.10E Distinguish among types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions; and strong and weak acids and bases.	
			® CHEM.10F Investigate factors that influence solid and gas solubilities and rates of dissolution such as temperature, agitation, and surface area.	
			Ⓢ CHEM.10G Define acids and bases and distinguish between Arrhenius and Bronsted-Lowery definitions; and predict products in acid-base reactions that form water.	
			Ⓢ CHEM.10H Define pH and use the hydrogen or hydroxide ion concentrations to calculate the pH of a solution.	
® SCI.8.6A Demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion.	IPC.4A Describe and calculate an object's motion in terms of position, displacement, speed, and acceleration.			® PHYS.4B Describe and analyze motion in one dimension using equations and graphical vector addition with the concepts of distance, displacement, speed, average velocity, instantaneous velocity, frames of reference and acceleration.
Ⓢ SCI.8.6B Differentiate between speed, velocity, and acceleration.				Ⓢ PHYS.4C Analyze and describe accelerated motion in two dimensions, including using equations, graphical vector addition, and projectile and circular examples.
	IPC.4B Measure and graph distance and speed as a function of time.			® PHYS.4A Generate and interpret graphs and charts describing different types of motion including investigations using real-time technology such as motion detectors or photogates.
Ⓢ SCI.8.6C	IPC.4C			® PHYS.4D Calculate the effect of forces on objects

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2022-2023 Vertical Alignment Matrix

Science – Grade 5 - High School (Integrated Physics & Chemistry [IPC], Biology, Chemistry, Physics)

Grade 8	IPC	Biology	Chemistry	Physics
Investigate and describe applications of Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches	Investigate how an object's motion changes only when a net force is applied, including activities and equipment such as toy cars, vehicle restraints, sports activities, and classroom objects.			including the law of inertia, the relationship between force and acceleration, and the nature of force pairs between objects using methods including free-body force diagrams.
	IPC.4D Describe and calculate the relationship between force, mass, and acceleration using equipment such as dynamic carts, moving toys, vehicles, and falling objects.			
	IPC.4E Explain the concept of conservation of momentum using action and reaction forces.			
	IPC.4F Describe the gravitational attraction between objects of different masses at different distances.			® PHYS.5B Describe and calculate how the magnitude of the gravitational force between two objects depends on their masses and the distance between their centers.
				Ⓢ PHYS.5A Describe the concepts of gravitational, electromagnetic, weak nuclear, and strong nuclear forces.
	IPC.4G Examine electrical force as a universal force between any two charged objects.			Ⓢ PHYS.5C Describe and calculate how the magnitude of the electric force between two objects depends on their charges and the distance between their centers.
	IPC.5A Recognize and demonstrate that objects and substances in motion have kinetic energy such as vibration of atoms, water flowing down a stream moving pebbles, and bowling balls knocking down pins.			® PHYS.6B Investigate examples of kinetic and potential energy and their transformations.
	IPC.5B Recognize and demonstrate common forms of potential energy including gravitational, elastic, and chemical, such as a ball on an inclined plane, springs, and batteries.			

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