Vertical Alignment Chart: 6th Grade – Physics

Science TEKS 2010

Objective: Scientific Investigation and Reasoning

6th	7th	8th	IPC	Biology	Chemistry	Physics
1.A Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.	**1.A** Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.	**1.A** Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.	**1.A** Demonstrates safe practices during laboratory and field investigations.	**1.A** Demonstrates safe practices during laboratory and field investigations.	**1.A** Demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles and fire extinguishers.	**1.A** Demonstrates safe practices during laboratory and field investigations.
					1.B Know specific hazards of chemical substances such as flammability, corrosiveness and radioactivity as summarized on the Material Safety Data Sheets (MSDS).	
1.B Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials.	**1.B** Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials.	**1.B** Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials.	**1.B** Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.	**1.B** Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.	**1.C** Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.	**1.B** Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.
			2.A Know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section.	**2.A** Know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section.	**2.A** Know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section.	**2.A** Know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section.
			(b)(2) Nature of science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically			
				2.B 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.	**2.B** Know that scientific 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.	**2.B** Know that scientific 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.

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				2.C 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 or science and new technologies are developed.	**2.C** Know that 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 as new areas of science and new technologies are developed.	**2.C** Know that 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 as new areas of science and new technologies are developed.
				2.D Distinguish between scientific hypotheses and scientific theories.	**2.D** Distinguish between scientific hypotheses and scientific theories.	**2.D** Distinguish between scientific hypotheses and scientific theories.
2.A Plan and implement comparative and descriptive investigations by making observations, asking well-defined questions, and using appropriate equipment and technology.	**2.A** Plan and implement comparative and descriptive investigations by making observations, asking well-defined questions and using appropriate equipment and technology.	**2.A** Plan and implement comparative and descriptive investigations by making observations, asking well-defined questions, and selecting and using appropriate equipment and technology.	**2.B** Plan and implement investigate procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.	**2.E** Plan and implement descriptive, comparative and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology.	**2.E** Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; including graphing calculators, computers and probes, sufficient scientific glassware such as beakers, Erlenmeyer flasks, pipettes, graduated cylinders, volumetric flasks, safety goggles, burettes, electronic balances and an adequate supply of consumable chemicals.	**2.E** Design and implement investigative procedures including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness.
2.B Design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology.	**2.B** Design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology.	**2.B** Design and implement comparative and experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses and selecting and using appropriate equipment and technology.				
2.C Collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers.	**2.C** Collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers.	**2.C** Collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers.	**2.C** Collect data and make measurements with precision.	**2.F** Collect and organize qualitative and quantitative data, and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware,	**2.F** Collect data and make measurements with accuracy and precision.	**2.H** Make measurements with accuracy and precision and record data using scientific notation and International System (SI) units.

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				microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams or samples of biological specimens or structures.	**2.G** Express and manipulate chemical quantities using scientific conventions and mathematical procedures including dimensional analysis, scientific notation, and significant figures.	
						2.I Identify and quantify causes and effects of uncertainties in measured data.
2.D Construct tables, using repeated trials and means to organize data and identify patterns.	**2.D** Construct tables and graphs, using repeated trials and means to organize data and identify patterns.	**2.D** Construct tables and graphs, using repeated trials and means, to organize data and identify patterns.				
2.E Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.	**2.E** Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.	**2.E** Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.	**2.D** Organize, analyze, evaluate, make inferences, and predict trends from data.	**2.G** Analyze, evaluate, make inferences, and predict trends from data.	**2.H** Organize, analyze, evaluate, make inferences, and predict trends from data.	**2.J** Organize and evaluate data and make inferences from data including the use of tables, charts, and graphs.
			2.E Communicate valid conclusions.	**2.H** 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.	**2.I** Communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphs, journals, summaries, oral reports and technology-based reports.	**2.K** Communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.
						2.L Express and manipulate relationships among physical variables quantitatively including the use of graphs, charts, and equations.

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3.A In all fields of science, 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.	**3.A** In all fields of science, 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.	**3.A** In all fields of science, 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.	**3.A** In all fields of science, 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.	**3.A** In all fields of science, 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.	**3.A** In all fields of science, 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.	**3.A** In all fields of science, 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.
			3.B Communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles and marketing materials.	**3.B** Communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles and marketing materials.	**3.B** Communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles and marketing materials.	**3.B** Communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles and marketing materials.
			3.C Draw inferences based on data related to promotional materials for products and services.	**3.C** Draw inferences based on data related to promotional materials for products and services.	**3.C** Draw inferences based on data related to promotional materials for products and services.	**3.C** Draw inferences based on data related to promotional materials for products and services.
						3.F 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.
3.B Use models to represent aspects of the natural world such as a model of Earth's layers.	**3.B** Use models to represent aspects of the natural world such as human body systems, and plant and animal cells.	**3.B** Use models to represent aspects of the natural world such as an atom, a molecule, space or a geologic feature.				
3.C Identify advantages and limitations of models such as size, scale, properties, and materials.	**3.C** Identify advantages and limitations of models such as size, scale, properties, and materials.	**3.C** Identify advantages and limitations of models such as size, scale, properties, and materials.		**3.E** Evaluate models according to their limitations in representing biological objects or events.		

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3.D Relate the impact of research on scientific thought and society including the history of science and contributions of scientists as related to the content.	**3.D** Relate the impact of research on scientific thought and society, including history of science and contributions of scientists as related to the content.	**3.D** Relate the impact of research on scientific thought and society including the history of science and contributions of scientists as related to the content.	**3.D** Evaluate the impact of research on scientific thought, society, and the environment. **3.F** Research and describe the history of physics, chemistry and contributions of scientists.	**3.D** Evaluate the impact of scientific research on society and the environment. **3.F** Research and describe the history of biology and contributions of scientists.	**3.D** Evaluate the impact of research on scientific thought, society, and the environment. **3.F** Research and describe the history of chemistry and contributions of scientists.	**3.D** Explain the impacts of the scientific contributions of a variety of historical and contemporary scientists on scientific thought and society.
			3.E Describe connections between physics and chemistry and future careers.		**3.E** Describe the connection between chemistry and future careers.	**3.E** Research and describe the connections between physics and future careers.
4.A Use appropriate tools to collect, record, and analyze information including: journals/notebooks, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, triple beam balances, microscopes, thermometers, calculators, computers, timing devices, and other equipment as needed to teach the curriculum.	**4.A** Use appropriate tools to collect, record, and analyze information including: life science models, hand lens, stereoscopes, microscopes, beakers, Petri dishes, microscope slides, graduated cylinders, test tubes, meter sticks, metric rulers, metric tape measures, timing devices, hot plates, balances, thermometers, calculators, water test kits, computers, temperature and pH probes, collecting nets, insect traps, globes, digital cameras and journals/notebooks and other equipment as needed to teach the curriculum.	**4.A** Use appropriate tools to collect, record, and analyze information including: lab 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 equipment as needed to teach the curriculum.				**2.F** Demonstrate the use of course apparatus, equipment, techniques, and procedures including multimeters (current, voltage, resistance), triple beam balances, batteries, clamps, dynamics demonstration equipment, collision apparatus, data acquisition probes, discharge tubes with power supply (H, He, Ne, Ar), hand-held visual spectroscopes, hot plates, slotted and hooked lab masses, bar magnets, horseshoe magnets, plane mirrors, convex lenses, pendulum support, power supply, ring clamps, ring stands, stopwatches, trajectory apparatus, tuning forks, carbon paper, graph paper, magnetic compasses, polarized film, prisms, protractors, resistors, friction blocks, mini lamps (bulbs) and sockets, electrostatics kits, 90-degree rod clamps, metric rulers, spring scales, knife blade switches, Celsius thermometers, meter sticks, scientific calculators, graphing technology, computers, cathode ray

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						tubes with horseshoe magnet, ballistic carts or equivalent, resonance tubes, spools of nylon thread or string, containers of iron filings, rolls of white craft paper, copper wire, Periodic Table, electromagnetic spectrum charts, slinky springs, wave motion ropes, and laser pointers.
						2.G Use a wide variety of additional course apparatuses, equipment, techniques, materials, and procedures as appropriate such as ripple tank with wave generator, wave motion rope, micrometer, caliper, radiation monitor, computer, ballistic pendulum, electroscope, inclined plane, optics bench, optics kit, pulley with table clamp, resonance tube, ring stand screen, four-inch ring, stroboscope, graduated cylinders, and ticker timer.
4.B 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.	**4.B** 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.	**4.B** 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.				

Objective: Matter and Energy

6th	7th	8th	IPC	Biology	Chemistry	Physics
5.A Know that an element is a pure substance represented by chemical symbols.	****6.A** Identify that organic compounds contain carbon and other elements such as hydrogen, oxygen, phosphorus, nitrogen or sulfur.				***4.D** Classify matter as pure substances or mixtures through investigation of their properties.	
5.B Recognize that a limited number of the many known elements comprise the largest portion of solid Earth, living matter, oceans, and the atmosphere.						
					****6.A** Understand 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.	
****5.C** Differentiate between elements and compounds on the most basic level.		***5.A** 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.			***6.E** Express the arrangement of electrons in atoms through electron configurations and Lewis valence electron dot structures.	
					***7.A** Name ionic compounds containing main group or transition metals, covalent compounds, acids, and bases, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules.	
		***5.D** Recognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts.			***7.B** Write the chemical formulas of common polyatomic ions, ionic compounds containing main group or transition metals, covalent compounds, acids and bases.	
		***5.B** Identify that protons determine an element's identity, and valence electrons determine its chemical properties including reactivity.	**6.B** Relate chemical properties of substances to the arrangement of their atoms or molecules.		****5.A** Explain the use of chemical and physical properties in the historical development of the Periodic Table.	

6th	7th	8th	IPC	Biology	Chemistry	Physics
		***5.C** Interpret the arrangement of the Periodic Table including groups and periods, to explain how properties are used to classify elements.	**6.D** Relate the physical and chemical behavior of an element including bonding and classification to its placement on the Periodic Table.		***5.B** Use the Periodic Table to identify and explain the properties of chemical families including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals.	
					***5.C** Use the Periodic Table to identify and explain periodic trends including atomic and ionic radii, electronegativity, and ionization energy.	
					****6.D** Use isotopic composition to calculate average atomic mass of an element.	
****6.A** Compare metals, nonmetals, and metalloids using physical properties such as luster, conductivity or malleability.			**6.C** Analyze physical and chemical properties of elements and compounds such as, color, density, viscosity, buoyancy, boiling point, freezing point, conductivity, and reactivity.		***4.A** Differentiate between physical and chemical changes and properties.	
****6.B** Calculate density to identify an unknown substance.					****4.B** Identify extensive and intensive properties.	
6.C Test the physical properties of minerals including hardness, color, luster, and streak.						
					***7.C** Construct electron dot formulas to illustrate ionic and covalent bonds.	
					****7.D** Describe the nature of metallic bonding and apply the theory to explain metallic properties such as thermal and electrical conductivity, malleability and ductility.	****5.E** Characterize materials as conductors or insulators based on their electrical properties.
					****7.E** Predict molecular structure for molecules with linear, trigonal planar, or tetrahedral electron pair geometries using Valence Shell Electron Pair Repulsion (VSEPR) theory.	
5.D Identify the formation of a new substance by using the evidence of a possible chemical change such as production of a gas, change in temperature, production of a precipitate, or color change.	****6.B** Distinguish between physical and chemical changes in matter in the digestive system.	***5.E** Investigate how evidence of chemical reactions indicate that new substances with different properties are formed.	**7.B** Recognize that chemical changes can occur when substances react to form different substances and that these interactions are largely determined by the valence electrons.			

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	6.C Recognize how large molecules are broken down into smaller molecules, such as carbohydrates can be broken down into sugars.					
					****8.A** Define and use the concept of a mole.	
					***8.B** Use the mole concept to calculate the number of atoms, ions or molecules in a sample of material.	
					****8.C** Calculate percent composition and empirical and molecular formulas.	
			6.A Examine differences in physical properties of solids, liquids and gases as explained by the arrangement and motion of atoms, ions or molecules of the substances and the strength of the forces of attraction between those particles.		****4.C** Compare solids, liquids, and gases in terms of compressibility, structure, shape, and volume.	
					***9.A** 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.	
					****9.B** Perform stoichiometric calculations including determination of mass and volume relationships between reactants and products for reactions involving gases.	
			7.A Investigate changes of state as it relates to the arrangement of particles of matter and energy transfer.		****9.C** Describe the postulates of kinetic molecular theory.	
		****5.F** Recognize whether a chemical equation containing coefficients is balanced or not and how that relates to the law of conservation of mass.	**7.C** 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.		***8.D** Use the law of conservation of mass to write and balance chemical equations.	

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					**8.E Perform stoichiometric calculations including determination of mass relationships betweens reactants and products, calculation of limiting reagents and percent yield.	
					*10.H Understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions.	
					**10.G Define acids and bases and distinguish between Arrhenius and Bronsted-Lowery definitions; and predict products in acid base reactions that form water.	
			7.F 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.			
					**10.A Describe the unique role of water in chemical and biological systems.	
			6.E Relate the structure of water to its function as a solvent and investigate the properties of solutions and factors affecting gas and solid solubility including nature of solute, temperature, pressure, pH, and concentration.		*10.B Develop and use general rules regarding solubility through investigations with aqueous solutions.	
					*10.F Investigate factors that influence solubilities and rates of dissolution such as temperature, agitation, and surface area.	
					**10.C Calculate the concentration of solutions in units of molarity.	
					**10.D Use molarity to calculate the dilutions of solutions.	
					*10.E Distinguish between types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions.	
					**10.I Define pH and use the hydrogen or hydroxide ion concentrations to calculate the pH of a solution.	

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					****10.J** Distinguish between degrees of dissociation for strong and weak acids and bases.	
						***8.A** Describe the photoelectric effect and the dual nature of light.
					****6.B** Understand the electromagnetic spectrum and the mathematical relationships between energy, frequency, and wavelength of light.	****8.B** Compare and explain the emission spectra produced by various atoms.
					****6.C** Calculate the wavelength, frequency and energy of light using Planck's constant and the speed of light.	
					****12.A** Describe the characteristics of alpha, beta and gamma radiation.	
					***12.B** Describe radioactive decay process in terms of balanced nuclear equations.	
			7.E Describe types of nuclear reactions such as fission and fusion and their roles in applications such as medicine and energy production.		****12.C** Compare fission and fusion reactions.	***8.C** Describe the significance of mass–energy equivalence and apply it in explanations of phenomena such as nuclear stability, fission, and fusion.
						****8.D** Give examples of applications of atomic and nuclear phenomena such as radiation therapy, diagnostic imaging, and nuclear power and examples of applications of quantum phenomena such as digital cameras.
					****11.A** Understand energy and its forms including kinetic, potential, chemical and thermal energies.	
			5.D Investigate the law of conservation of energy.		****11.B** Understand the law of conservation of energy and the processes of heat transfer.	
			7.D Analyze 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.		***11.C** Use thermochemical equations to calculate energy changes that occur in chemical reactions and classify reactions as exothermic or endothermic.	

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					**11.D Perform calculations involving heat, mass, temperature change and specific heat.	
					**11.E Use calorimetry to calculate the heat of a chemical process.	
7.A Research and debate the advantages and disadvantages of using coal, oil, natural gas, nuclear power, biomass, wind, hydropower, geothermal, and solar resources.			**5.I** Critique the advantages and disadvantages of various energy sources and their impact on society and the environment.			
			5.H Analyze energy conversions such as those from radiant, nuclear, and geothermal sources, fossil fuels such as coal, gas, oil, and the movement of water or wind.			
7.B Design a logical plan to manage energy resources in the home, school or community.						
	5.A Recognize that radiant energy from the sun is transformed into chemical energy through the process of photosynthesis.					
	5.B Demonstrate and explain the cycling of matter within living systems, such as in the decay of biomass in a compost bin.					
	5.C Diagram the flow of energy through living systems including food chains, food webs and energy pyramids.					

Objective: Force, Motion and Energy

6th	7th	8th	IPC	Biology	Chemistry	Physics
****8.A** Compare and contrast potential and kinetic energy.			**5.A** 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.		****11.A** Understand energy and its forms including kinetic, potential, chemical and thermal energies.	*__6.B__ Investigate examples of kinetic and potential energy and their transformations.
			5.B Demonstrate common forms of potential energy including gravitational, elastic, and chemical, such as a ball on an inclined plane, springs and batteries.			
8.B Identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces.	**7.C** Demonstrate and illustrate forces that affect motion in everyday life, such as emergence of seedlings, turgor pressure, and geotropism.	*__6.A__ Demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion.	**4.A** Describe and calculate an object's motion in terms of position, displacement, speed and acceleration.			*__4.A__ Generate and interpret graphs and charts describing different types of motion including the use of real-time technology such as motion detectors or photogates.
****8.C** Calculate average speed using distance and time measurements. ****8.D** Measure and graph changes in motion.		****6.B** Differentiate between speed, velocity and acceleration.	**4.B** Measure and graph distance and speed as a function of time using moving toys.			*__4.B__ Describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, average velocity, instantaneous velocity, and acceleration.
						****4.C** Analyze and describe accelerated motion in two dimensions using equations including projectile and circular examples.
		*__6.C__ Investigate and describe applications of Newton's law of inertia, law of force and acceleration and law of action-reaction, such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.	**4.C** 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.			*__4.D__ Calculate the effect of forces on objects including the law of inertia, the relationship between force and acceleration, and the nature of force pairs between objects.
						****4.E** Develop and interpret free-body force diagrams.
						****4.F** Identify and describe motion relative to different frames of reference.

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8.E Investigate how inclined planes and pulleys can be used to change the amount of force to move an object.	****7.A** Contrast situations where work is done with different amounts of force to situations where no work is done such as moving a box with a ramp and without a ramp, or standing still.		**4.D** Assess the relationship between force, mass and acceleration, noting the relationship is independent of the nature of the force, using equipment such as dynamic carts, moving toys, vehicles and falling objects.			***6.A** Investigate and calculate with the work-energy theorem in various situations.
						***6.C** Calculate the mechanical energy of, power generated within, impulse applied to, and momentum of a physical system.
			4.E Apply the concept of conservation of momentum using action and reaction forces such as is illustrated by students on skateboards.			***6.D** Demonstrate and apply the laws of conservation of energy and conservation of momentum in one dimension.
						****5.A** Research and describe the historical development of the concepts of gravitational, electromagnetic, weak nuclear, and strong nuclear forces.
			4.F Describe the gravitational attraction between objects of different masses at different distances including satellites.			***5.B** Describe and calculate how the magnitude of the gravitational force between two objects depends on their masses and the distance between their centers.
			4.G Examine electrical force as a universal force between any two charged objects; and compare the relative strength of the electrical force and gravitational force.			****5.C** Describe and calculate how the magnitude of the electrical force between two objects depends on their charges and the distance between them.
						****6.G** Analyze and explain everyday examples that illustrate the laws of thermodynamics, including the law of conservation of energy and the law of entropy.
9.A Investigate methods of thermal energy transfer including conduction, convection, and radiation.			**5.E** 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.			****6.F** Contrast and give examples of different processes of thermal energy transfer including conduction, convection, and radiation.

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9.B Verify through investigations that thermal energy moves in a predictable pattern from warmer to cooler until all the substances attain the same temperature such as an ice cube melting.						****6.E** Describe how the macroscopic properties of a thermodynamic system such as temperature, specific heat, and pressure are related to the molecular level of matter including kinetic or potential energy of atoms.
****9.C** Demonstrate energy transformations such as the energy in a flashlight battery changes from chemical energy to electrical energy to light energy.	**7.B** Illustrate the transformation of energy within an organism such as the transfer from chemical energy to heat and thermal energy in digestion.		**5.G** Explore the characteristics and behaviors of energy transferred by waves including acoustic, seismic, light and waves on water as they superpose on one another, bend around corners, reflect off surfaces, are absorbed by materials and change direction when entering new materials.			****7.A** Examine and describe oscillatory motion and wave propagation in various types of media.
						***7.B** Investigate and analyze characteristics of waves including velocity, frequency, amplitude, and wavelength and calculate using the relationship between wavespeed, frequency, and wavelength.
						****7.C** Compare characteristics and behaviors of transverse waves including electromagnetic waves and the electromagnetic spectrum and characteristics and behaviors of longitudinal waves including sound waves.
						***7.D** Investigate behaviors of waves including reflection, refraction, diffraction, interference, resonance, and the Doppler effect.
						****7.E** Describe and predict image formation as a consequence of reflection from a plane mirror and refraction through a thin convex lens.
						****7.F** Describe the role of wave characteristics and behaviors in medical and industrial applications.
						****5.D** Identify examples of electric and magnetic forces in everyday life.

6th	7th	8th	IPC	Biology	Chemistry	Physics
			5.C Demonstrate that moving electric charges produce magnetic forces and moving magnets produce electric forces.			****5.G** Investigate and describe the relationship between electric and magnetic fields in applications such as generators, motors, and transformers.
						****5.E** Characterize materials as conductors or insulators based on their electrical properties.
						***5.F** Design, construct, and calculate in terms of current through, potential difference across, resistance of, and power used by electric circuit elements connected in both series and parallel combinations.
			5.F Evaluate the transfer of electrical energy in series and parallel circuits, and conductive materials.			****5.H** Describe evidence for and effects of the strong and weak nuclear forces in nature.

Objective: Earth and Space

6th	7th	8th	IPC	Biology	Chemistry	Physics
10.A Build a model to illustrate the structural layers of Earth including the inner core, outer core, mantle, crust, asthenosphere, and lithosphere.						
10.C Identify the major tectonic plates including Eurasian, African, Indo-Australian, Pacific, North American, and South American.		****9.A** Describe the historical development of evidence that supports plate tectonic theory.				
10.B Classify rocks as metamorphic, igneous, or sedimentary by the processes of their formation.						
10.D Describe how plate tectonics causes major geological events, such as ocean basins, earthquakes, volcanic eruptions, and mountain building.	**8.A** Predict and describe how different types of catastrophic events impact ecosystems, such as floods, hurricanes, or tornadoes.	***9.B** Relate plate tectonics to the formation of crustal features.				
	8.B Analyze the effects of weathering, erosion, and deposition on the environment in ecoregions of Texas.	***9.C I**nterpret topographic maps and satellite views to identify land and erosional features and predict how these features may be reshaped by weathering.				
	✔**8.C** Model the effects of human activity on ground water and surface water in a watershed.					
		****10.A** Recognize that the Sun provides the energy that drives convection within the atmosphere and oceans, producing winds and ocean currents.				
		****10.B** Identify how global patterns of atmospheric movement influence local weather using weather maps that show high and low pressures and fronts.				
		****10.C** Identify the role of the oceans in the formation of weather systems, such as hurricanes.				
11.A Describe the physical properties, locations, and movements of the Sun, planets, Galilean moons, meteors, asteroids, and comets.	**9.A** Analyze the characteristics of objects in our solar system that allow life to exist such as the proximity of the Sun, presence of water, and composition of the atmosphere.					
		***7.A** Model and illustrate how the tilted Earth rotates on its axis, causing day and night, and revolves around the sun causing changes in seasons.				
		***7.B** Demonstrate and predict the sequence of events in the lunar cycle.				
****11.B** Understand that gravity is the force that governs the motion of our solar system.		****7.C** Relate the position of the Moon and Sun to their effect on ocean tides.				
		***8.A** Describe components of the universe including stars, nebulae and galaxies, and use models such as the Herztsprung-Russell diagram for classification.				
		****8.B** Recognize that the Sun is a medium-sized star near the edge of a disc-shaped galaxy of stars and that the Sun is many thousands of times closer to Earth than any other star.				

6th	7th	8th	IPC	Biology	Chemistry	Physics
		**8.C Explore how different wavelengths of the electromagnetic spectrum such as light and radio waves are used to gain information about distances and properties of components in the universe.				
		**8.D Model and describe how light years are used to measure distances and sizes in the universe.				
		8.E Research how scientific data are used as evidence to develop scientific theories to describe the origin of the universe.				
11.C Describe the history and future of space exploration including the types of equipment and transportation needed for space travel.	**9.B** Identify the accommodations, considering the characteristics of our solar system, that enabled manned space exploration.					

Objective: Organisms and Environments

6th	7th	8th	IPC	Biology
				***9.A** Compare the structures and functions of different types of biomolecules including carbohydrates, lipids, proteins, and nucleic acids.
	5.A Recognize that radiant energy from the sun is transformed into chemical energy through the process of photosynthesis.			****9.B** Compare the reactants and products of photosynthesis and cellular respiration in terms of energy and matter.
				****9.C** Identify and investigate the role of enzymes.
				****9.D** Analyze and evaluate the evidence regarding formation of simple organic molecules and their organization into long complex molecules having information such as the DNA molecule for self-replicating life.
12.B Recognize the presence of a nucleus determines whether a cell is prokaryotic or eukaryotic.				****4.A** Compare and contrast prokaryotic and eukaryotic cells.
	****12.D** Differentiate between structure and function in plant and animal cell organelles including cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole.			
	12.E Compare the functions of a cell to the functions of organisms such as waste removal.			***4.B** Investigate and explain cellular processes including homeostasis, energy conversions, transport of molecules, and synthesis of new molecules.
				***4.C** 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.
	****12.F** Recognize that according to cell theory all organisms are composed of cells and cells carry on similar functions such as extracting energy from food to sustain life.			
				****5.B** Examine specialized cells including roots, stems, and leaves of plants; and animal cells such as blood, muscle, and epithelium.
				****5.C** Describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation.
	****14.C** Recognize that inherited traits of individuals are governed in the genetic material found in the genes within the chromosomes in the nucleus.			****6.A** Identify components of DNA, and describe how information for specifying the traits of an organism is carried in the DNA.
				****6.B** Recognize that components that make up the genetic code are common to all organisms.
				****6.C** Explain the purpose and process of transcription, and translation using models of DNA and RNA.

6th	7th	8th	IPC	Biology
				****6.D** Recognize that gene expression is a regulated process.
	****14.B** Compare the results of uniform or diverse offspring from sexual reproduction or asexual reproduction.			***5.A** 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.
				****6.G** Recognize the significance of meiosis to sexual reproduction.
				****5.D** Recognize that disruptions of the cell cycle lead to diseases such as cancer.
				****6.H** Describe how techniques such as DNA fingerprinting, genetic modifications and chromosomal analysis are used to study the genomes of organisms.
12.A Understand that all organisms are composed of one or more cells.	**12.C** Recognize levels of organization in plants and animals including cells, tissues, organs, organ systems, and organisms.			****10.C** Analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.
	****12.B** Identify the main functions of the systems of the human organism including the circulatory, respiratory, skeletal, muscular, digestive, excretory, reproductive, integumentary, nervous, and endocrine systems.			***10.A** Describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals.
				***10.B** Describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants.
				****11.C** Summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems.
				****8.A** Define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community.
12.C Recognize the broadest taxonomic classification of living organisms is divided into currently recognized Domains.				****8.C** Compare characteristics of taxonomic groups including archaea, bacteria, protists, fungi, plants, and animals.
****12.D** Identify the basic characteristics of organisms, including prokaryotic or eukaryotic, unicellular or multicellular, autotrophic or heterotrophic, and mode of reproduction, that further classify them in the currently recognized Kingdoms.	****11.A** Examine organisms or their structures, such as insects or leaves, and use dichotomous keys for identification.			***8.B** Categorize organisms using a hierarchical classification system based on similarities and differences shared among groups.
	14.A Define heredity as the passage of genetic instructions from one generation to the next generation.			***6.F** Predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses and non-Mendelian inheritance.
	****11.C** Identify some changes in genetic traits that can have occurred over several generations through natural selection and selective breeding such as the Galapagos Medium Ground Finch (*Geospiza fortis*) or domestic animals.			***6.E** Identify and illustrate changes in DNA and evaluate the significance of these changes

6th	7th	8th	IPC	Biology
				***7.A** Analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies including anatomical, molecular, and developmental.
				****7.B** Analyze and evaluate scientific explanations concerning any data of sudden appearance, stasis and sequential nature of groups in the fossil record.
				****7.C** Analyze and evaluate how natural selection produces change in populations, not individuals.
				****7.D** 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.
	11.B Explain variation within a population or species by comparing external features, behaviors, or physiology of organisms that enhance their survival such as migration, hibernation, or storage of food in a bulb.			***7.E** Analyze and evaluate the relationship of natural selection to adaptation, and to the development of diversity in and among species.
				****7.F** Analyze and evaluate the effects of other evolutionary mechanisms including genetic drift, gene flow, mutation, and recombination.
				****7.G** Analyze and evaluate scientific explanations concerning the complexity of the cell.
	12.A Investigate and explain how internal structures of organisms have adaptations that allow specific functions, such as gills in fish, hollow bones in birds, or xylem in plants.			
	13.A Investigate how organisms respond to external stimuli found in the environment such as phototropism and fight or flight.			****11.B** Investigate and analyze how organisms, populations, and communities respond to external factors.
	13.B Describe and relate responses in organisms that may result from internal stimuli such as wilting in plants and fever or vomiting in animals that allow them to maintain balance.			****11.A** Describe the role of internal feedback mechanisms in the maintenance of homeostasis.
	7.B Illustrate the transformation of energy within an organism such as the transfer from chemical energy to heat and thermal energy in digestion.			***12.C** Analyze the flow of matter and energy through trophic levels using various models including food chains, food webs, and ecological pyramids.
	5.C Diagram the flow of energy through living systems including food chains, food webs and energy pyramids.			
	5.B Demonstrate and explain the cycling of matter within living systems, such as in the decay of biomass in a compost bin.			****12.E** Describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles.

6th	7th	8th	IPC	Biology
12.E Describe biotic and abiotic parts of an ecosystem in which organisms interact.	**10.A** Observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms.	***11.B** 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.		****12.D** Recognize that long-term survival of species is dependent on changing resource bases that are limited.
12.F Diagram the levels of organization within an ecosystem including organism, population, community, and ecosystem.				
		***11.A** Describe producer/consumer, predator/prey, and parasite/host relationships as they occur in food webs in marine, freshwater and terrestrial ecosystems.		**12.A** Interpret relationships including predation, parasitism, commensalism, mutualism, and competition among organisms.
	****10.B** Describe how biodiversity contributes to the sustainability of an ecosystem.			****12.B** Compare variations and adaptations of organisms in different ecosystems.
	****10.C** Observe, record, and describe the role of ecological succession such as in a microhabitat of a garden with weeds.			***11.D** Describe how events and processes that occur during ecological succession can change populations and species diversity.
		***11.C** Explore how short and long-term environmental changes affect organisms and traits in subsequent populations.		***12.F** Describe how environmental change can impact ecosystem stability.
		****11.D** Recognize human dependence on ocean systems and explain how human activities such as runoff, artificial reefs, or use of resources have modified these systems.		