# Integrated Physics and Chemistry (IPC) Side-by-Side

| 2021 Knowledge and Skill Statement/Student Expectation | 2021 Text | 2017 Knowledge and Skill Statement/Student Expectation | 2017 Text | Notes from TEA Staff |
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| SCIENCE.IPC.1 | Scientific and engineering practices. The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to: | IPC.1 | Scientific ~~processes.~~ The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, ~~environmentally appropriate, and ethical practices.~~ The student is expected to: | |
| | | IPC.2 | Scientific ~~processes.~~ The student uses scientific practices ~~during~~ laboratory and field investigations. The student is expected to: | |
| SCIENCE.IPC.1.A | ask questions and define problems based on observations or information from text, phenomena, models, or investigations; | IPC.2.B | plan and ~~implement~~ investigative ~~procedures, including~~ asking questions, ~~formulating testable hypotheses, and selecting equipment and technology;~~ | |
| SCIENCE.IPC.1.B | apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems; | | | |
| SCIENCE.IPC.1.C | use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards; | IPC.1.A | ~~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;~~ | |
| SCIENCE.IPC.1.D | use appropriate tools such as Safety Data Sheets (SDS), scientific or graphing calculators, computers and probes, electronic balances, an adequate supply of consumable chemicals, and sufficient scientific glassware such as beakers, Erlenmeyer flasks, pipettes, graduated cylinders, volumetric flasks, and burettes; | IPC.1.A | ~~know specific hazards of chemical substances such as flammability, corrosiveness, and radioactivity as summarized on the~~ Safety Data Sheets (SDS); and | |
| | | ~~IPC.2.B~~ | ~~plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting equipment and technology;~~ | |
| SCIENCE.IPC.1.E | collect quantitative data using the International System of Units (SI) and qualitative data as evidence; | IPC.2.C | collect data ~~and make measurements with accuracy and precision;~~ | |
| SCIENCE.IPC.1.F | organize quantitative and qualitative data using oral or written lab reports, labeled drawings, particle diagrams, charts, tables, graphs, journals, summaries, or technology-based reports; | IPC.2.D | organize, ~~analyze, evaluate, make inferences, and predict trends from~~ data; and | |
| SCIENCE.IPC.1.G | develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and | | | |
| SCIENCE.IPC.1.H | distinguish between scientific hypotheses, theories, and laws. | | | |
| | | ~~IPC.1.C~~ | ~~demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.~~ | The use and conservation of resources are covered in elementary and middle school science. |
| SCIENCE.IPC.2 | Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to: | | | |
| SCIENCE.IPC.2.A | identify advantages and limitations of models such as their size, scale, properties, and materials; | | | |

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| **SCIENCE.IPC.2.B** | analyze data by identifying significant statistical features, patterns, sources of error, and limitations; | | | |
| **SCIENCE.IPC.2.C** | use mathematical calculations to assess quantitative relationships in data; and | | | |
| **SCIENCE.IPC.2.D** | evaluate experimental and engineering designs. | | | |
| | | ~~**IPC.2.A**~~ | ~~know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;~~ | |
| **SCIENCE.IPC.3** | Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to: | ~~**IPC.3**~~ | ~~Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions. The student is expected to:~~ | |
| **SCIENCE.IPC.3.A** | develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories; | **IPC.3.C** | ~~draw inferences based on~~ data ~~related to promotional materials for products and services;~~ | |
| **SCIENCE.IPC.3.B** | communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and | **IPC.2.E** | communicate ~~valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphs, journals, summaries, oral reports, and technology-based reports.~~ | Students are now being asked to communicate not only as scientists but also as engineers. |
| **SCIENCE.IPC.3.C** | engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence. | ~~**IPC.3.B**~~ | ~~communicate and apply~~ scientific ~~information extracted from various sources such as current events, published journal articles, and marketing materials;~~ | |
| **SCIENCE.IPC.4** | Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to: | | | |
| **SCIENCE.IPC.4.A** | analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student; | **IPC.3.A** | 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; | |
| **SCIENCE.IPC.4.B** | relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and | **IPC.3.D** | ~~evaluate~~ the impact of research on scientific thought, society, ~~and the environment;~~ | |
| **SCIENCE.IPC.4.C** | research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to investigate STEM careers. | **IPC.3.E** | ~~describe connections between physics and chemistry and future~~ careers; and | |
| | | ~~**IPC.3.F**~~ | ~~research and describe the history of physics and chemistry and contributions of scientists.~~ | |
| **SCIENCE.IPC.5** | Science concepts. The student knows the relationship between force and motion in everyday life. The student is expected to: | **IPC.4** | Science concepts. The student knows ~~concepts of~~ force and motion ~~evident~~ in everyday life. The student is expected to: | |
| **SCIENCE.IPC.5.A** | investigate, analyze, and model motion in terms of position, velocity, acceleration, and time using tables, graphs, and mathematical relationships; | **IPC.4.A** | ~~describe and calculate an object's~~ motion in terms of position, ~~displacement, speed, and~~ acceleration; | Speed is covered in Grade 7. |
| | | **IPC.4.B** | ~~measure and~~ graph ~~distance and speed as a function of~~ time; | |
| | | **IPC.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;~~ | |

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| **SCIENCE.IPC.5.B** | analyze data to explain the relationship between mass and acceleration in terms of the net force on an object in one dimension using force diagrams, tables, and graphs; | **IPC.4.D** | ~~describe and calculate~~ the relationship between force, mass, and acceleration ~~using equipment such as dynamic carts, moving toys, vehicles, and falling~~ objects; | |
| **SCIENCE.IPC.5.C** | apply the concepts of momentum and impulse to design, evaluate, and refine a device to minimize the net force on objects during collisions such as those that occur during vehicular accidents, sports activities, or the dropping of personal electronic devices; | **IPC.4.E** | ~~explain~~ the concept ~~of conservation~~ of momentum ~~using action and reaction forces;~~ | |
| **SCIENCE.IPC.5.D** | describe the nature of the four fundamental forces: gravitation; electromagnetic; the strong and weak nuclear forces, including fission and fusion; and mass-energy equivalency; and | ~~**IPC.4.G**~~ | ~~examine electrical force as a universal force between any two charged objects.~~ | |
| **SCIENCE.IPC.5.E** | construct and communicate an explanation based on evidence for how changes in mass, charge, and distance affect the strength of gravitational and electrical forces between two objects. | **IPC.4.F** | ~~describe the gravitational attraction between objects of different~~ masses ~~at different~~ distances; and | |
| **SCIENCE.IPC.6** | Science concepts. The student knows the impact of energy transfer and energy conservation in everyday life. The student is expected to: | **IPC.5** | Science concepts. The student ~~recognizes multiple forms of energy and~~ knows the impact of energy transfer and energy conservation in everyday life. The student is expected to: | Forms of energy are covered in Grades K-5. |
| **SCIENCE.IPC.6.A** | design and construct series and parallel circuits that model real-world circuits such as in-home wiring, automobile wiring, and simple electrical devices to evaluate the transfer of electrical energy; | **IPC.5.F** | evaluate the transfer of electrical energy ~~in~~ series and parallel circuits ~~and conductive materials;~~ | |
| **SCIENCE.IPC.6.B** | design, evaluate, and refine a device that generates electrical energy through the interaction of electric charges and magnetic fields; | **IPC.5.C** | ~~demonstrate that moving~~ electric charges ~~produce~~ magnetic ~~forces and moving magnets produce electric forces;~~ | |
| **SCIENCE.IPC.6.C** | plan and conduct an investigation to provide evidence that energy is conserved within a closed system; | **IPC.5.D** | investigate ~~the law of~~ conservation of energy; | |
| **SCIENCE.IPC.6.D** | investigate and demonstrate the movement of thermal energy through solids, liquids, and gases by convection, conduction, and radiation such as weather, living, and mechanical systems; | **IPC.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; | |
| **SCIENCE.IPC.6.E** | plan and conduct an investigation to evaluate the transfer of energy or information through different materials by different types of waves such as wireless signals, ultraviolet radiation, and microwaves; | **IPC.5.G** | ~~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;~~ | |
| **SCIENCE.IPC.6.F** | construct and communicate an evidence-based explanation for how wave interference, reflection, and refraction are used in technology such as medicine, communication, and scientific research; and | | | |
| **SCIENCE.IPC.6.G** | evaluate evidence from multiple sources to critique the advantages and disadvantages of various renewable and nonrenewable energy sources and their impact on society and the environment. | **IPC.5.I** | critique the advantages and disadvantages of various energy sources and their impact on society and the environment. | |
| | | ~~**IPC.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;~~ | Kinetic energy is covered in Grade 7. |
| | | ~~**IPC.5.B**~~ | ~~recognize and demonstrate common forms of potential energy, including gravitational, elastic, and chemical, such as a ball on an inclined plane, springs, and batteries;~~ | Potential energy is covered in Grade 6. |
| | | ~~**IPC.5.H**~~ | ~~analyze energy transformations of renewable and nonrenewable resources; and~~ | Energy transformations are covered in Grades 4-8. |

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| **SCIENCE.IPC.7** | Science concepts. The student knows that relationships exist between the structure and properties of matter. The student is expected to: | **IPC.6** | Science concepts. The student knows that relationships exist between the structure and properties of matter. The student is expected to: | |
| **SCIENCE.IPC.7.A** | model basic atomic structure and relate an element's atomic structure to its bonding, reactivity, and placement on the Periodic Table; | **IPC.6.D** | relate the placement of an element on the Periodic Table ~~to its~~ physical and chemical ~~behavior, including~~ bonding ~~and classification;~~ | |
| **SCIENCE.IPC.7.B** | use patterns within the Periodic Table to predict the relative physical and chemical properties of elements; | | | |
| **SCIENCE.IPC.7C** | explain how physical and chemical properties of substances are related to their usage in everyday life such as in sunscreen, cookware, industrial applications, and fuels; | | | |
| **SCIENCE.IPC.7D** | explain how electrons can transition from a high energy level to a low energy state, emitting photons at different frequencies for different energy transitions; | | | |
| **SCIENCE.IPC.7E** | explain how atomic energy levels and emission spectra present evidence for the wave particle duality; and | | | |
| **SCIENCE.IPC.7F** | plan and conduct an investigation to provide evidence that the rate of reaction or dissolving is affected by multiple factors such as particle size, stirring, temperature, and concentration. | | | |
| | | **~~IPC.6.A~~** | ~~examine differences in physical properties of solids, liquids, and gases as explained by the arrangement and motion of atoms or molecules;~~ | The concept of physical properties was covered in Grades 3-8. |
| | | **~~IPC.6.B~~** | ~~relate chemical properties of substances to the arrangement of their atoms;~~ | The concept of chemical properties was deleted from IPC. |
| | | **~~IPC.6.C~~** | ~~analyze physical and chemical properties of elements and compounds such as color, density, viscosity, buoyancy, boiling point, freezing point, conductivity, and reactivity;~~ | The concepts of physical properties are covered in Grades 3-8. Chemical properties were deleted from IPC. |
| | | **~~IPC.6.E~~** | ~~relate the structure of water to its function as a solvent; and~~ | The concept of the structure of water was deleted from IPC. |
| | | **~~IPC.6.F~~** | ~~investigate the properties of water solutions and factors affecting solid solubility, including nature of solute, temperature, and concentration.~~ | The concept of solubility in water is covered in Grades 5-8. |
| **SCIENCE.IPC.8** | Science concepts. The student knows that changes in matter affect everyday life. The student is expected to: | **IPC.7** | Science concepts. The student knows that changes in matter affect everyday life. The student is expected to: | |
| **SCIENCE.IPC.8.A** | investigate how changes in properties are indicative of chemical reactions such as hydrochloric acid with a metal, oxidation of metal, combustion, and neutralizing an acid with a base; | **IPC.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~~; | |
| **SCIENCE.IPC.8.B** | develop and use models to balance chemical equations and support the claim that atoms, and therefore mass, are conserved during a chemical reaction; | **IPC.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;~~ | |
| **SCIENCE.IPC.8.C** | research and communicate the uses, advantages, and disadvantages of nuclear reactions in current technologies; and | **IPC.7.E** | ~~describe types~~ of nuclear reactions ~~such as fission and fusion and their roles in applications such as medicine and energy production~~; and | |
| **SCIENCE.IPC.8.D** | construct and communicate an evidence-based explanation of the environmental impact of the end-products of chemical reactions such as those that may result in degradation of water, soil, air quality, and global climate change. | **IPC.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~~. | |

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| | | ~~IPC.7.A~~ | ~~investigate changes of state as it relates to the arrangement of particles of matter and energy transfer;~~ | The concept of particle arrangements in states of matter is covered in Grade 5. |
| | | ~~IPC.7.D~~ | ~~classify energy changes that accompany chemical reactions such as those occurring in heat packs, cold packs, and glow sticks as exothermic or endothermic reactions;~~ | The concepts of endothermic and exothermic were deleted from IPC. |
| **KEY** | Blue double underline: indicates content new to the grade level | | ~~Orange strike through: indicates content was deleted~~ | |