

## Texas Standards Correlation

*Texas Administrative Code  
Title 19, Part II: Texas Education Agency  
Chapter 112 Texas Essential Knowledge and Skills for Science  
Subchapter C. High School*

This correlation includes all science concepts required for 112.47 Physics, as well as some science concepts required for 112.42 Integrated Physics and Chemistry, 112.48 Astronomy and 112.45 Chemistry.

	<b>Physics for Scientists and Engineers</b>	<b>Principles of Physics</b>	<b>Conceptual Physics</b>
<b>112.47 Physics</b>			
<b>(c) Knowledge and skills</b>			
(4) <b>Science concepts.</b> The student knows the laws governing motion. The student is expected to:			
(A) generate and interpret graphs describing motion including the use of real-time technology;	2.6 - 2.9, 2.13	2.6 - 2.9	2.6 - 2.7
(B) analyze examples of uniform and accelerated motion including linear, projectile, and circular;	Chapters 2, 4, & 9	Chapters 2, 4, & 9	Chapters 2, 4, & 8
(C) demonstrate the effects of forces on the motion of objects;	Chapters 5 & 6	Chapters 5 & 6	Chapter 5
(D) develop and interpret a free-body diagram for force analysis; and	5.14 - 5.15	5.14 - 5.15	5.14 - 5.15
(E) identify and describe motion relative to different frames of reference.	4.22 - 4.25	4.21 - 4.23	4.14 - 4.15
(5) <b>Science concepts.</b> The student knows that changes occur within a physical system and recognizes that energy and momentum are conserved. The student is expected to:			
(A) interpret evidence for the work-energy theorem;	7.9 - 7.14, 7.17, 7.20	7.7 - 7.11, 7.14, 7.17	6.5 - 6.8, 6.11, 6.14
(B) observe and describe examples of kinetic and potential energy and their transformations;	Chapters 7 & 8	Chapters 7 & 8	Chapters 6 & 7
(C) calculate the mechanical energy and momentum in a physical system such as billiards, cars, and trains; and	Chapters 7 & 8	Chapters 7 & 8	Chapters 6 & 7
(D) demonstrate the conservation of energy and momentum.	Chapters 7 & 8	Chapters 7 & 8	Chapters 6 & 7
(6) <b>Science concepts.</b> The student knows forces in nature. The student is expected to:			
(A) identify the influence of mass and distance on gravitational forces;	13.1	13.1	12.1
(B) research and describe the historical development of the concepts of gravitational, electrical, and magnetic force;	13.0, 13.12 - 13.13, 30.0	13.0, 13.8 - 13.9, 30.0	12.0, 12.7 - 12.8, 28.0
(C) identify and analyze the influences of charge and distance on electric forces;	23.9	23.9	22.8

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	<b>Physics for Scientists and Engineers</b>	<b>Principles of Physics</b>	<b>Conceptual Physics</b>
(D) demonstrate the relationship between electricity and magnetism;	Chapters 31, 32, 34 & 35	Chapters 31, 32 & 34	28.20 - 28.22, Chapter 29
(E) design and analyze electric circuits; and	Chapters 27, 28, 29 & 33	Chapters 27, 28, 29 & 33	Chapters 25, 26 & 27
(F) identify examples of electrical and magnetic forces in everyday life.	23.2, 23.5, 23.15, 25.16, 27.14 - 27.18, 28.4, 28.14, 28.19, 29.27, 29.32, 30.4 - 30.5, 30.27, 32.4, 32.17, 32.24, 33.35	23.2, 23.5, 23.15, 25.11, 27.9 - 27.13, 28.4, 28.11, 28.16, 29.27, 29.32, 30.4 - 30.5, 30.26, 32.4, 32.14, 32.21, 33.26	22.2, 22.4, 22.12, 24.8, 25.8 - 25.11, 26.3, 26.6, 26.11, 28.4 - 28.5, 28.19, 29.4, 29.16
(7) <b>Science concepts.</b> The student knows the laws of thermodynamics. The student is expected to:			
(A) analyze and explain everyday examples that illustrate the laws of thermodynamics; and	19.10, 19.13, 19.14, 19.23, 19.25 - 19.29, 19.31, 21.3, 22.6, 22.8, 22.14, 22.16	19.8, 19.11, 19.12, 19.20, 19.22 - 19.26, 19.28, 21.3, 22.6, 22.8, 22.13, 22.15	18.7, 18.10, 18.11, 18.16, 18.17 - 18.20, 20.3, 21.5, 21.9, 21.10
(B) evaluate different methods of heat energy transfer that result in an increasing amount of disorder.	Chapter 22	Chapter 22	Chapter 21
(8) <b>Science concepts.</b> The student knows the characteristics and behavior of waves. The student is expected to:			
(A) examine and describe a variety of waves propagated in various types of media and describe wave characteristics such as velocity, frequency, amplitude, and behaviors such as reflection, refraction, and interference;	Chapters 15, 16, 17, 18, 35, 36, 37, 39 & 40	Chapters 15, 16, 17, 18, 34, 35, 36, 38 & 39	Chapters 14, 15, 16, 17, 30, 31, 32 & 34
(B) identify the characteristics and behaviors of sound and electromagnetic waves; and	Chapters 17 & 35	Chapters 17 & 34	Chapters 16 & 30
(C) interpret the role of wave characteristics and behaviors found in medicinal and industrial applications.	15.32, 17.11, 17.21, 18.21, 35.26, 35.27, 39.16, 40.3, 40.17, 40.22, 42.24	15.27, 17.9, 17.18, 18.18, 34.22, 34.23, 38.12, 39.3, 39.14, 39.16, 41.23	14.13, 16.5, 16.9, 30.10, 34.10, 36.20
(9) <b>Science concepts.</b> The student knows simple examples of quantum physics. The student is expected to:			
(A) describe the photoelectric effect; and	42.6 - 42.8	41.6 - 41.8	36.5 - 36.7
(B) explain the line spectra from different gas-discharge tubes.	42.2, 42.12	41.2, 41.11	36.2, 36.9

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	Physics for Scientists and Engineers	Principles of Physics	Conceptual Physics
<b>112.42 Integrated Physics and Chemistry, (c) Knowledge and skills</b>			
(4) <b>Science concepts.</b> The student knows concepts of force and motion evident in everyday life. The student is expected to:			
(A) calculate speed, momentum, acceleration, work, and power in systems such as in the human body, moving toys, and machines;	Chapters 2, 7 & 8	Chapters 2, 7 & 8	Chapters 2, 6 & 7
(B) investigate and describe applications of Newton's laws such as in vehicle restraints, sports activities, geological processes, and satellite orbits;	Chapters 5, 6, & 13	Chapters 5, 6, & 13	Chapters 5 & 12
(C) analyze the effects caused by changing force or distance in simple machines as demonstrated in household devices, the human body, and vehicles; and	Chapters 11 & 12	Chapters 11 & 12	Chapters 10 & 11
(D) investigate and demonstrate mechanical advantage and efficiency of various machines such as levers, motors, wheels and axles, pulleys, and ramps.	Chapters 5, 6, 7, 11 & 12	Chapters 5, 6, 7, 11 & 12	Chapters 5, 6, 10, 11
(5) <b>Science concepts.</b> The student knows the effects of waves on everyday life. The student is expected to:			
(A) demonstrate wave types and their characteristics through a variety of activities such as modeling with ropes and coils, activating tuning forks, and interpreting data on seismic waves;	16.2	16.2	15.2
(B) demonstrate wave interactions including interference, polarization, reflection, refraction, and resonance within various materials;	Chapters 18, 36, 37, 39, 40	Chapters 18, 35, 36, 38, 39	Chapters 17, 31, 32 & 34
(C) identify uses of electromagnetic waves in various technological applications such as fiber optics, optical scanners, and microwaves; and	35.8, 35.14, 35.17 - 35.18, 35.26 - 35.27, 37.13, 38.18, 40.3, 40.17, 40.22, 42.24	34.5, 34.13 - 34.14, 34.22 - 34.23, 36.12, 37.16, 39.3, 39.14, 39.16, 41.23	30.5, 30.10, 33.12, 34.10, 36.20
(D) demonstrate the application of acoustic principles such as in echolocation, musical instruments, noise pollution, and sonograms.	17.2 - 17.6, 17.11 - 17.21, 18.7, 18.10, 18.18, 18.21, 18.22	17.2 - 17.6, 17.9 - 17.18, 18.7, 18.10, 18.17 - 18.19	16.2 - 16.3, 16.5 - 16.9, 17.4, 17.8
(6) <b>Science concepts.</b> The student knows the impact of energy transformations in everyday life. The student is expected to:			
(A) describe the law of conservation of energy;	7.22	7.19	6.16

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	Physics for Scientists and Engineers	Principles of Physics	Conceptual Physics
(B) investigate and demonstrate the movement of heat through solids, liquids, and gases by convection, conduction, and radiation;	19.25 - 19.31	19.22 - 19.28	18.17 - 18.20
(E) measure the thermal and electrical conductivity of various materials and explain results;	19.26 - 19.27, 27.5, 27.8 - 27.11	19.23 - 19.24, 27.5 - 27.7	18.18, 25.5 - 25.6
(F) investigate and compare series and parallel circuits;	Chapter 29	Chapter 29	Chapter 27
(G) analyze the relationship between an electric current and the strength of its magnetic field using simple electromagnets; and	31.1 - 31.4	31.1 - 31.4	28.20 - 28.22
(H) analyze the effects of heating and cooling processes in systems such as weather, living, and mechanical.	19.31, Chapter 22	19.28, Chapter 22	Chapter 21
(7) <b>Science concepts.</b> The student knows relationships exist between properties of matter and its components. The student is expected to:			
(A) investigate and identify properties of fluids including density, viscosity, and buoyancy;	Chapter 14	Chapter 14	Chapter 13
(C) identify constituents of various materials or objects such as metal salts, light sources, fireworks displays, and stars using spectral-analysis techniques;	42.2, 42.12	41.2, 41.11	36.2, 36.9
(8) <b>Science concepts.</b> The student knows that changes in matter affect everyday life. The student is expected to:			
(D) describe types of nuclear reactions such as fission and fusion and their roles in applications such as medicine and energy production; and	44.13 - 44.21	43.13 - 43.21	38.13 - 38.18
<b>112.48 Astronomy,</b> <b>(c) Knowledge and skills</b>			
(6) <b>Science concepts.</b> The student knows the characteristics and the life cycle of stars. The student is expected to:			
(A) describe nuclear reactions in stars;	44.14	43.14	38.14
(7) <b>Science concepts.</b> The student knows how mathematical models, computer simulations, and exploration can be used to study the universe. The student is expected to:			
(A) demonstrate the use of units of measurement in astronomy such as light year and Astronomical Units;	13.19 - 13.20	13.15 - 13.16	12.14

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	Physics for Scientists and Engineers	Principles of Physics	Conceptual Physics
(B) research and describe the historical development of the laws of universal gravitation and planetary motion and the theory of special relativity;	Chapters 13 & 41	Chapters 13 & 40	Chapters 12 & 35
(C) analyze a model that simulates planetary motion and universal gravitation;	Chapter 13	Chapter 13	Chapter 12
(8) <b>Science concepts.</b> The student knows the role of the Sun in our solar system. The student is expected to:			
(B) identify the source of energy within the Sun and explain that the Sun is the major source of energy for the Earth; and	44.14	43.14	38.14
(C) describe the Sun's effects on the Earth.	19.30 - 19.31, 35.11 - 35.12	19.27 - 19.28, 34.8 - 34.9	30.6
(9) <b>Science concepts.</b> The student knows that planets of different size, composition, and surface features orbit around the Sun. The student is expected to:			
(D) relate the role of gravitation to the motion of the planets around the Sun and to the motion of moons and satellites around the planets.	Chapter 13	Chapter 13	Chapter 12
<b>112.45 Chemistry,</b> <b>(c) Knowledge and skills</b>			
(4) <b>Science concepts.</b> The student knows the characteristics of matter. The student is expected to:			
(B) analyze examples of solids, liquids, and gases to determine their compressibility, structure, motion of particles, shape, and volume;	12.11 - 12.16, Chapter 14	12.10 - 12.15, Chapter 14	11.5 - 11.9, Chapter 13
(5) <b>Science concepts.</b> The student knows that energy transformations occur during physical or chemical changes in matter. The student is expected to:			
(A) identify changes in matter, determine the nature of the change, and examine the forms of energy involved;	19.9, 19.21	19.7, 19.18	18.6, 18.14
(C) measure the effects of the gain or loss of heat energy on the properties of solids, liquids, and gases.	Chapter 19	Chapter 19	Chapter 18
(6) <b>Science concepts.</b> The student knows that atomic structure is determined by nuclear composition, allowable electron cloud, and subatomic particles. The student is expected to:			
(A) describe the existence and properties of subatomic particles;	44.1 - 44.3, 44.22	43.1 - 43.3, 43.22	38.1 - 38.3, 38.19

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	Physics for Scientists and Engineers	Principles of Physics	Conceptual Physics
(B) analyze stable and unstable isotopes of an element to determine the relationship between the isotope's stability and its application; and	44.8 - 44.21	43.8 - 43.21	38.8 - 38.18
(7) <b>Science concepts.</b> The student knows the variables that influence the behavior of gases. The student is expected to:			
(A) describe interrelationships among temperature, particle number, pressure, and volume of gases contained within a closed system; and	Chapter 20	Chapter 20	Chapter 19
(B) illustrate the data obtained from investigations with gases in a closed system and determine if the data are consistent with the Universal Gas Law.	Chapter 20	Chapter 20	Chapter 19
(9) <b>Science concepts.</b> The student knows the processes, effects, and significance of nuclear fission and nuclear fusion. The student is expected to:			
(A) compare fission and fusion reactions in terms of the masses of the reactants and products and the amount of energy released in the nuclear reactions;	44.9, 44.13, 44.14	43.9, 43.13, 43.14	38.9, 38.13, 38.14
(B) investigate radioactive elements to determine half-life;	44.18 - 44.21	43.18 - 43.21	38.17 - 38.18
(C) evaluate the commercial use of nuclear energy and medical uses of radioisotopes; and	44.13, 44.20	43.13, 43.20	38.13
(11) <b>Science concepts.</b> The student knows that balanced chemical equations are used to interpret and describe the interactions of matter. The student is expected to:			
(B) demonstrate the use of symbols, formulas, and equations in describing interactions of matter such as chemical and nuclear reactions; and	44.16	43.16	
(C) explain and balance chemical and nuclear equations using number of atoms, masses, and charge.	44.15 - 44.17	43.15 - 43.17	38.15 - 38.16