Vertical Alignment of Energy Transfer

TEKS in Focus highlights key concepts and student expectations to assist educators in implementing the science Texas Essential Knowledge and Skills (TEKS). The vertical progression of a concept within the science TEKS is provided along with a side-by-side view of the changes implemented in 2024.

Elementary School

Level of Study	Prior Science TEKS	TEKS Implemented in 2024
Kindergarten	_____	_____
Grade 1	1.5.B predict and **identify** changes in materials caused by heating and cooling;	1.6.B **explain** and predict changes in materials caused by heating and cooling; and
Grade 2	**2.6.C trace and compare patterns of movement of objects such as sliding, rolling, and spinning over time.**	**2.7.A explain how objects push on each other and may change shape when they touch or collide; and** **2.7.B plan and conduct a descriptive investigation to demonstrate how the strength of a push and pull changes an object's motion.**
Grade 3	3.5.C predict, observe, and record changes in the state of matter caused by heating or cooling such as ice becoming liquid water, condensation forming on the outside of a glass of ice water, or liquid water being heated to the point of becoming water vapor;	3.6.C predict, observe, and record changes in the state of matter caused by heating or cooling in a **variety of substances** such as ice becoming liquid water, condensation forming on the outside of a glass, or liquid water being heated to the point of becoming water vapor **(gas)**; and
Grade 4	4.6.A **differentiate among forms of** energy, **including mechanical,** sound, **electrical, light, and thermal;** 4.6.C demonstrate **that** electricity travels in a closed path, **creating an electrical circuit**.	4.8.A **investigate and identify the transfer of** energy **by objects in motion, waves in water, and** sound; 4.8.C demonstrate **and describe how** electrical energy travels in a closed path **that can produce light and thermal energy**.
Grade 5	5.5.A **classify** matter based on measurable, testable, and observable physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating using water as a reference point), solubility in water, and the ability to conduct or insulate thermal energy or electric energy; 5.6.A **explore the uses of energy, including mechanical,** light, **thermal,** electrical, **and sound energy;** 5.6.B demonstrate that **the flow of** electricity **in closed** circuits can **produce** light, **heat**, or sound;	5.6.A **compare and contrast** matter based on measurable, testable, or observable physical properties, including mass, magnetism, relative density (sinking and floating using water as a reference point), physical state (solid, liquid, gas), **volume**, solubility in water, and the ability to conduct or insulate thermal energy and electric energy; 5.8.A i**nvestigate and describe the transformation of energy in systems such as energy in a flashlight battery that changes from chemical energy to** electrical **energy to** light **energy**; 5.8.B demonstrate that electrical **energy in complete** circuits can **be transformed into motion**, light, sound, **or thermal energy and identify the requirements for a functioning electrical circuit;** and

Key Changes in Energy Transfer: Elementary

- **Grade 1:** The rigor increased from identifying changes in materials to explaining changes in materials.
- **Grade 2:** The rigor of expectation shifts from comparing patterns of motion to explaining how objects are impacted by forces, alongside adding student-planned investigations.
- **Grade 3:** Added specificity calls for students to observe substances other than water.
- **Grade 4:** The rigor increases from identifying forms of energy to investigating energy transfers, with added specificity for students to describe how electrical energy travels.
- **Grade 5:** The rigor increases from classifying to comparing, and the specificity shifts the focus from uses of energy to transformations of energy within systems.

Middle School

Level of Study	Prior Science TEKS	TEKS Implemented in 2024
Grade 6	**6.9 Force, motion, and energy. The student knows that the Law of Conservation of Energy states that energy can neither be created nor destroyed, it just changes form. The student is expected to:** **6.9.A investigate methods of thermal energy transfer, including conduction, convection, and radiation;** **6.9.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; and** 6.9.C **demonstrate** energy transformations **such as energy in a flashlight battery changes from chemical energy to electrical energy to light energy**	---------- ---------- ---------- 6.8.B **describe how** energy **is conserved through transfers and** transformations **in systems such as electrical circuits, food webs, amusement park rides, or photosynthesis; and** **6.8.C explain how energy is transferred through transverse and longitudinal waves.**
Grade 7	**7.5.A recognize that radiant energy from the Sun is transformed into chemical energy through the process of photosynthesis; and** **7.7.A illustrate the transformation of energy within an organism such as the transfer from chemical energy to thermal energy; and** ---------- ----------	---------- ---------- **7.8.A investigate methods of thermal energy transfer into and out of systems, including conduction, convection, and radiation;** **7.8.B investigate how thermal energy moves in a predictable pattern from warmer to cooler until all substances within the system reach thermal equilibrium; and**
Grade 8	8.6 Force, motion, and energy. The student knows **that there is a relationship between force, motion, and** energy. The student is expected to:	8.8 Force, motion, and energy. The student knows **how** energy **is transferred through waves**. The student is expected to

Key Changes in Energy Transfer: Middle School

- **Grade 6:** The inclusion of energy transfers and an emphasis on conservation of energy in systems increases rigor. The concept of energy transfers through waves is new to Grade 6. Thermal energy transfer was moved to Grade 7.
- **Grade 7:** Thermal equilibrium and energy transfers through conduction, convection, and radiation moved from Grade 6 to Grade 7. The introduction of chemical energy and energy transformations moved to Grade 5.

High School

Level of Study	Prior Science TEKS	TEKS Implemented in 2024
Integrated Physics and Chemistry (IPC)	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; 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**	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.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.6.F c**onstruct 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**
Chemistry	Chem.11.B **describe the law of conservation of energy and the** processes of heat transfer **in terms of** calorimetry; Chem.11.D perform calculations involving heat, mass, temperature change, and specific heat.	Chem.13.B **investigate** the process of heat transfer using calorimetry; Chem.13.D perform calculations involving heat, mass, temperature change, and specific heat.
Physics	Phys.6.A **investigate and calculate quantities** using the work-energy theorem **in various situations;** Phys.6.E **explain everyday examples that illustrate the four laws of thermodynamics and the processes of thermal energy transfer.** Phys.7.A examine and describe **oscillatory** motion and wave propagation in various types of media;	Phys.7.C **apply the concept of conservation of energy** using the work-energy theorem, **energy diagrams, and energy transformation equations, including transformations between kinetic, potential, and thermal energy;** Phys.8.A examine and describe **simple harmonic** motion **such as masses on springs and** pendulums **and** wave **energy** propagation in various types of media **such as surface waves on a body of water and pulses in ropes;**

Key Changes in Energy Transfer: High School

- **IPC:** In the student expectations describing wave characteristics and behaviors, the rigor increased from explore to evaluate and explain, and the standard was split into two student expectations.
- **Chemistry:** In the student expectation related to calorimetry, the rigor increased from describe to investigate.
- **Physics:** Thermodynamics was moved to Chemistry. In the student expectations related to the work-energy theorem, rigor increased from investigate to apply, and specificity increased.

TEKS in Focus spotlights concepts or student expectations monthly to bolster TEKS alignment, rigor, and collective understanding. It does not suggest an order or timing but helps with comprehension of TEKS changes, serving as a guide when relevant to classroom instruction.