

TASC Test Assessing Secondary Completion™ Tutorials are based on specifications found in TASC Test information for publishers which includes alignment to Common Core State Standards and provide students a less stressful and more successful preparation effort as they work to achieve a TASC test passing score.

In each module, the Learn It and Try It make complex ideas accessible to students through focused content, guided analysis, and practice with personalized feedback so students are empowered to increase their Exam Readiness. The Review It offers an engaging and high impact video summary of key concepts and important to grasp connections. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers, linking a student's performance to ACT key idea details and score ranges. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are ready for test day and where they need to continue their review and practice.

This Tutorial is aligned to specifications found in TASC Test information for publishers for Mathematics, Science, Social Studies, Reading, and Writing test subject areas.

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## 1. NATURE OF SCIENCE

- **WHAT IS SCIENCE?**
- **TYPES OF INVESTIGATIONS**
- **USING MODELS**

## 2. MEASUREMENT AND DATA

- **TOOLS AND MEASUREMENT**
- **DISPLAYING AND INTERPRETING DATA**

## 3. NATURE OF LIFE

- **FROM ATOMS TO BIOSPHERE**
  - **HS-LS1-2** *Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.*
- **CHARACTERISTICS OF LIFE**
  - **HS-LS1-2** *Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.*

## 4. CELL STRUCTURE

- **BIOMOLECULES**
  - **HS-LS1-6** *Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.*
- **PROKARYOTIC AND EUKARYOTIC CELLS**
  - **HS-LS1-4** *Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining*

## 5. CELLULAR ENERGETICS

### ● CHEMISTRY OF LIFE

- **HS-LS1-5** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

### ● PHOTOSYNTHESIS

- **HS-LS1-5** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- **HS-LS2-5** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

### ● CELLULAR RESPIRATION

- **HS-LS1-7** Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.
- **HS-LS2-3** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

## 6. CELL GROWTH AND REPRODUCTION

### ● THE CELL CYCLE

- **HS-LS1-4** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

### ● MITOSIS

- **HS-LS1-4** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

## 7. DNA STRUCTURE AND FUNCTION

### ● COMPONENTS OF DNA

- **HS-LS1-1** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.

### ● THE GENETIC CODE

- **HS-LS3-1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

### ● DNA REPLICATION

- **HS-LS1-1** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
- **HS-LS3-1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

## 8. GENE EXPRESSION

### ● TRANSCRIPTION

- **HS-LS1-1** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
- **HS-LS3-1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

- **TRANSLATION**

- **HS-LS1-1** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
- **HS-LS1-6** Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
- **HS-LS3-1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

## 9. MUTATIONS

- **GENETIC CHANGES IN DNA**

- **HS-LS3-2** Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
- **HS-LS3-1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- **HS-LS4-2** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

- **GENETIC CHANGES IN CHROMOSOMES**

- **HS-LS3-1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- **HS-LS4-2** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
- **HS-LS3-2** Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

## 10. HEREDITY

- **MENDELIAN LAWS OF HEREDITY**

- **HS-LS3-3** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

- **MULTIPLE ALLELES AND ALLELES WITHOUT DOMINANCE**

- **HS-LS3-3** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
- **HS-LS4-3** Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

## 11. REPRODUCTION

- **MEIOSIS**

- **HS-LS3-1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

- **SEXUAL AND ASEQUAL REPRODUCTION**

- **HS-LS3-1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

## 12. EVOLUTION

### • MULTIPLE LINES OF EVIDENCE

- **HS-LS4-1** Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- **HS-LS4-2** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

### • NATURAL SELECTION

- **HS-LS2-8** Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.
- **HS-LS4-4** Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

### • EVOLUTION OF SPECIES

- **HS-LS4-5** Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

## 13. HOMEOSTASIS

### • HOMEOSTASIS AND DYNAMIC EQUILIBRIUM

- **HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

### • FEEDBACK MECHANISMS IN ANIMALS

- **HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- **HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

## 14. FUNCTIONS OF ANIMAL SYSTEMS

### • THE IMMUNE AND LYMPHATIC SYSTEMS

- **HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

### • THE NERVOUS SYSTEM

- **HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

## 15. FUNCTIONS OF PLANT SYSTEMS

### • PLANT TISSUES

- **HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

### • PLANT RESPONSES

- **HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

## 16. MATTER AND ENERGY

### • FOOD CHAINS AND WEBS

- **HS-LS2-4** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

- **PYRAMIDS OF ENERGY, NUMBERS, AND BIOMASS**

- **HS-LS2-4** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

## 17. CYCLES IN NATURE

- **THE CARBON CYCLE**

- **HS-LS2-3** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
- **HS-LS2-4** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
- **HS-LS2-5** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

- **THE NITROGEN AND PHOSPHORUS CYCLES**

- **HS-LS2-4** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

## 18. ECOLOGY OF SUCCESSION

- **SUCCESSION IN COMMUNITIES**

- **HS-LS2-2** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- **HS-LS2-1** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- **HS-LS2-6** Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

- **SUCCESSION AND ECOSYSTEM STABILITY**

- **HS-LS2-7** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

- **NATURAL IMPACTS ON ECOSYSTEMS**

- **HS-LS2-1** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- **HS-LS2-2** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

## 19. PLANET EARTH AND THE GEOSPHERE

- **EARTH'S STRUCTURE AND CYCLES**

- **HS-ESS2-6** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
- **HS-ESS2-1** Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
- **HS-ESS2-3** Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

- **THE ROCK CYCLE**

- **HS-ESS2-1** Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

- **SOIL**

- **HS-ESS2-1** *Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.*

## 20. THE ATMOSPHERE, HYDROSPHERE, AND CRYOSPHERE

- **FRESHWATER AND ICE**

- **HS-ESS2-5** *Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.*

- **OCEANS**

- **HS-ESS2-1** *Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.*
- **HS-ESS2-5** *Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.*

- **THE ATMOSPHERE**

- **HS-ESS2-4** *Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.*

## 21. WEATHER AND CLIMATE

- **WEATHER**

- **HS-ESS2-5** *Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.*
- **HS-ESS3-1** *Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.*

- **SEVERE WEATHER**

- **HS-ESS2-5** *Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.*
- **HS-ESS3-1** *Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.*

- **CLIMATE**

- **HS-ESS2-4** *Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.*
- **HS-ESS3-1** *Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.*
- **HS-ESS2-2** *Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.*
- **HS-ESS3-5** *Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.*

## 22. HUMANS AND EARTH'S RESOURCES

- **NATURAL RESOURCES**

- **HS-ESS3-1** *Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.*
- **HS-ESS3-4** *Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*
- **HS-ESS3-2** *Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*

- **HS-ESS3-3** Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.

- **IMPACTS OF HUMANS**

- **HS-ESS2-6** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
- **HS-ESS3-1** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- **HS-ESS3-6** Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
- **HS-LS4-6** Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
- **HS-ESS3-4** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- **HS-ESS3-2** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
- **HS-ESS3-3** Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.

## 23. OUR CHANGING PLANET

- **DEFORMING EARTH'S CRUST**

- **HS-ESS2-1** Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

- **WEATHERING AND EROSION**

- **HS-ESS2-5** Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
- **HS-ESS2-1** Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
- **HS-ESS3-1** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- **HS-ESS2-2** Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

- **GEOLOGICAL TIME**

- **HS-ESS1-6** Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
- **HS-ESS2-7** Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

## 24. EARTH'S PLATES

- **PLATE TECTONICS**

- **HS-ESS1-5** Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

- **EARTHQUAKES AND VOLCANOES**

- **HS-ESS1-5** Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

## 25. THE SOLAR SYSTEM

- **SUN-EARTH-MOON SYSTEM**

- **HS-ESS1-4** Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

- **OUR SOLAR SYSTEM**

- **HS-ESS1-4** Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

## 26. EXPLORING THE UNIVERSE

- **THE UNIVERSE**

- **HS-ESS1-4** Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
- **HS-ESS1-2** Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

- **OUR SUN AND OTHER STARS**

- **HS-ESS1-1** Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
- **HS-ESS1-3** Communicate scientific ideas about the way stars, over their life cycle, produce elements.

## 27. NATURE OF MATTER

- **WHAT IS MATTER?**

- **HS-PS1-3** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

- **ATOMIC STRUCTURE**

- **HS-PS1-3** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

- **THE PERIODIC TABLE**

- **HS-PS1-1** Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
- **HS-PS1-2** Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
- **HS-PS1-3** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

## 28. CHANGES IN MATTER: PART 1

- **MIXTURES OF MATTER**

- **HS-PS1-5** Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

- **PHYSICAL AND CHEMICAL CHANGES**

- **HS-PS1-5** Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
- **HS-PS1-4** Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

## 29. CHANGES IN MATTER: PART 2

- **CHANGES OF STATE**

- **HS-PS1-4** Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
- **HS-PS1-5** Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.



- **HS-PS1-6** Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

- **CHEMICAL EQUATIONS**

- **HS-PS1-4** Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
- **HS-PS1-7** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

## 30. FORCE AND MOTION

- **DESCRIBING FORCES**

- **HS-PS3-5** Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
- **HS-PS2-5** Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
- **HS-PS2-4** Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

- **DESCRIBING MOTION**

- **HS-PS2-1** Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

- **EFFECTS OF FORCES**

- **HS-PS2-1** Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
- **HS-PS2-2** Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

## 31. NONCONTACT FORCES

- **ELECTROMAGNETIC FORCES**

- **HS-PS2-5** Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
- **HS-PS2-4** Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
- **HS-PS2-6** Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
- **HS-PS3-5** Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

- **GRAVITATIONAL FORCE**

- **HS-PS2-4** Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
- **HS-PS3-5** Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

## 32. ENERGY

- **DESCRIBING ENERGY**

- **HS-PS3-1** Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
- **HS-PS2-3** Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a

macroscopic object during a collision.

- **ENERGY TRANSFER AND TRANSFORMATION**

- **HS-PS3-1** Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
- **HS-PS3-3** Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
- **HS-PS1-8** Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
- **HS-PS2-3** Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
- **HS-PS3-2** Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative position of particles (objects).
- **HS-PS3-5** Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
- **HS-PS1-7** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

### 33. THERMAL ENERGY AND HEAT

- **THERMAL ENERGY AND TEMPERATURE**

- **HS-PS3-4** Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

- **HEAT AND THERMAL ENERGY**

- **HS-PS3-4** Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

- **ENERGY TRANSFER AND TECHNOLOGY**

- **HS-PS3-4** Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

### 34. WAVES

- **MECHANICAL WAVES**

- **HS-PS4-1** Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

- **ELECTROMAGNETIC WAVES**

- **HS-PS4-1** Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

### 35. APPLICATIONS OF WAVES

- **INTERACTIONS OF WAVES AND MATTER**

- **HS-PS4-4** Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
- **HS-PS4-5** Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

- **WAVES AND TECHNOLOGY**

- **HS-PS4-1** *Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.*
- **HS-PS4-5** *Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*
- **HS-PS4-2** *Evaluate questions about the advantages of using digital transmission and storage of information.*