

Integrated Physics and Chemistry Overview 2022 – 2023

This document is designed to provide parents/guardians/community an overview of the curriculum taught in the FBISD classroom. This document supports families in understanding the learning goals for the course, and how students will demonstrate what they know and are able to do. The overview offers suggestions or possibilities to reinforce learning at home.

Included at the end of this document, you will find:

- A [glossary](#) of curriculum components
- The content area [instructional model](#)
- [Parent resources](#) for this content area

To advance to a particular grading period, click on a link below.

- [Grading Period 1](#)
- [Grading Period 2](#)
- [Grading Period 3](#)
- [Grading Period 4](#)

Process Standards

The process standards describe ways in which students are expected to engage in the content. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use knowledge learned efficiently and effectively in daily life.

I.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

I.1(B) know specific hazards of chemical substances such as flammability, corrosiveness, and radioactivity as summarized on the Safety Data Sheets (SDS)

I.1(C) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials

I.2(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section

I.2(B) plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting equipment and technology

I.2(C) collect data and make measurements with accuracy and precision

I.2(D) organize, analyze, evaluate, make inferences, and predict trends from data

I.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

I.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

I.3(B) communicate and apply scientific information extracted from various sources such as current events, published journal articles, and marketing materials

I.3(C) draw inferences based on data related to promotional materials for products and services

I.3(D) evaluate the impact of research on scientific thought, society, and the environment

I.3(E) describe the connection between physics and chemistry and future careers

I.3(F) research and describe the history of physics and chemistry and contributions of scientists

Grading Period 1

Unit 1: Properties of Matter

Estimated Date Range: August 10 – August 31

Estimated Time Frame: 16 days

Unit Overview:

In this unit, students will review safety rules for laboratory investigations and differentiate between physical and chemical properties and use physical and chemical properties of matter to classify, describe, and identify matter. Determine or calculate the physical properties of a substance, including boiling point, melting point, freezing point, and density. By the end of the unit, students will be able to list and identify physical properties of elements and chemical properties of compounds. In 6th grade, students learned that the properties of elements and compounds do not change, which is a foundational concept that will be built upon throughout this course.

At home connections:

- Have a conversation with students about safety practices and rules/procedures that are used at home.
- With adult supervision, students can determine the density of objects by seeing if they will sink or float in water. This can be done in a sink or large bowl containing water. Students should not use sharp or dangerous objects and need to be mindful of the safety rules.

Concepts within Unit #1

[Link to TEA High School Science TEKS](#)

Success Criteria for this concept

Concept #1: Safety
I.1A, I.1B, I.2A

- List/describe all the general safety rules regarding conduct, clothing, accidents, glassware, heating/fire, animals, etc.
- Follow all the safety rules during laboratory/field investigations

Concept #2: Properties of Matter
I.2B, I.2C, I.2D, I.6B, I.6C

- Describe physical and chemical properties of an unknown sample
- Design an experiment to identify the physical and chemical properties of various substances
- Use physical and chemical properties to identify unknown substances
- Calculate the density of an object
- Determine the viscosity of various substances
- Explain buoyancy and relate it to Archimedes' principle
- Identify and explain the boiling and freezing points of water

Unit 2: Changes in State

Estimated Date Range: September 1– September 20

Estimated Time Frame: 13 days

Unit Overview:

In this unit, students will examine the cause-and-effect relationship between adding or removing thermal energy to/from a substance and the expansion or contraction of that substance. Students will explain each phase change. Evaluate a phase change diagram; explain what is happening at various points along the curve.

At home connections:

- Students can find real world pictures to represent each state of matter. Have students explain the motion of particles for each state of matter.

Concepts within Unit # 2

[Link to TEA High School Science TEKS](#)

Success Criteria for this concept

<p>Concept #1: States of Matter I.2C, I.2D, I.2E, I.6A, I.7A</p>	<ul style="list-style-type: none"> • Describe the three states of matter by describing the properties of molecules in each state • Describe the motion of particles of each state of matter. • Explain a phase change graph/diagram • Investigate changes of state as it relates to the arrangement of particles of matter and energy transfer in: <ul style="list-style-type: none"> ○ changing states of matter ○ investigation of ice to water to steam ○ sublimation
<p>Unit 3: Periodic Table Estimated Date Range: September 21 – October 7 Estimated Time Frame: 12 days</p>	
<p>Unit Overview: In this unit, students will identify an element, given the number of protons (or a diagram that contains the protons) from information on the periodic table. Students will understand the names and chemical reactivity of the main groups on the periodic table. Students will learn how the elements in a group are related to each other. IPC students will know how to find atomic mass and atomic number from the periodic table and to explain the significance of these numbers, and to understand what isotopes are. Students will determine the number of valence electrons that an element contains. In middle school, students learn to interpret the arrangement of the Periodic Table, including groups and periods, and to explain how properties are used to classify elements.</p> <p>At home connections:</p> <ul style="list-style-type: none"> • Adults can ask students to point out household items that are made from the elements on the Periodic Table (refer to a picture of a Periodic Table). Students can identify the family in which the element belongs, the atomic number, protons, electrons, and neutrons. 	
<p>Concepts within Unit # 3 Link to TEA High School Science TEKS</p>	<p>Success Criteria for this concept</p>
<p>Concept #1: Atoms and the Periodic Table I.2B, I.2D, I.3F, I.6D</p>	<ul style="list-style-type: none"> • Identify alkali metals, alkaline earth metals, transition metals, halogens and noble gases based on their location on the periodic table • Determine an element’s number of protons, number of neutrons, number of electrons, atomic number, and atomic mass using the Periodic Table • Explain the properties of the chemical families: <ul style="list-style-type: none"> ○ Alkali metals ○ Alkaline earth metals ○ Halogens ○ Noble gases ○ Transition metals • Describe the trends for the physical properties of elements on the Periodic Table including phase, number of protons, atomic mass, valence electrons, number of energy levels, boiling point, freezing point, and conductivity.

Grading Period 2

Unit 4: Chemical Bonding

Estimated Date Range: October 11 – November 4

Estimated Time Frame: 18 days

Unit Overview:

In this unit, students will understand the relationship between valence electrons and bonding. Students will determine which elements accept or donate electrons using the periodic table. When given a Periodic Table, students will determine the ion formed for any given element. IPC students will write chemical formulas for ionic compounds, including those with polyatomic ions. Students will distinguish between ionic and covalent compounds and determine the properties of each type of compound. Students will draw Lewis and Bohr diagrams to illustrate ionic and covalent bonding.

At home connections:

- Students can give examples or search the internet for pictures of household items that have chemically bonded together. For example, students can explain which elements are bonded together to make table salt. **Students should not complete a lab investigation or use any household chemicals.**

Concepts within Unit # 4

[Link to TEA High School Science TEKS](#)

Concept #1 Chemical Bonding
I.1B, I.1C, I.2D, I.3F, I.6D, I.7B

Success Criteria for this concept

- Predict the types of bonds formed by elements depending on their position on the Periodic Table
- Explain the types of bonds that form based on their placement on the periodic table in relation to valence electrons
- Explain trends in reactivity within groups/families and periods of representative elements

Unit 5: Chemical Reactions and Conservation of Mass

Estimated Date Range: November 7 – December 16

Estimated Time Frame: 25 days

Unit Overview:

In this unit, students will explain how energy changes occur during a chemical reaction. Students will provide evidence of chemical changes and how valence electrons play a role in chemical change. Students will explain the energy transformations in phase changes. Students will relate the phase of matter to the density of the substance in that phase. If shown a reaction, students should be able to explain that the mass is conserved due to the law of conservation of mass. If the mass has not been conserved, students should be able to explain what has caused the difference. Students are expected to balance chemical equations successfully.

At home connections:

- Students can search the internet to find pictures showing that a chemical reaction has occurred. Students will look for pictures showing the following:
 - Production of gas
 - Change in temperature
 - Production of a precipitate
 - Color change

Concepts within Unit # 5

[Link to TEA High School Science TEKS](#)

Concept #1: Chemical Reactions and Conservation of Mass
I.1A, I.1C, I.2B, I.7C, I.7D, I.7F

Success Criteria for this concept

- Identify and describe the evidence that proves that a possible chemical change occurred, and a new substance was formed:
 - Production of gas

- | | |
|--|---|
| | <ul style="list-style-type: none">○ Change in temperature○ Production of a precipitate○ Color change● Explain how the law of conservation of mass related to chemical reactions● Illustrate how the number and kinds of atoms stay remain in a chemical reaction● Explain how energy changes occur during a chemical reaction● Classify reactions as endothermic or exothermic after a chemical reaction takes place based on:<ul style="list-style-type: none">○ Mass gained○ Mass lost○ Mass conserved● Explain how energy is absorbed and released when forming and breaking chemical bonds |
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Grading Period 3

Unit 6: Nuclear Reactions

Estimated Date Range: January 5 - January 17

Estimated Time Frame: 8 days

Unit Overview:

In this unit, IPC students will learn about the relationship between nuclear forces and nuclear stability. Students will understand the importance of neutrons in nuclear reactions, as well as the roles of nuclear fission and nuclear fusion in nuclear reactions. Students will understand the importance of nuclear reactions in energy production. In, sixth grade students research the advantages and disadvantages of different energy resources.

At home connections:

- Students can search the internet to view information about the advantages and disadvantages of using fission and fusion in the medical field.

Concepts within Unit # 6

[Link to TEA High School Science TEKS](#)

Concept #1: Nuclear Reactions
I.2B, I.2C, I.2E, I.7E

Success Criteria for this concept

- Describe alpha, beta, and gamma radiation.
- Balance a nuclear equation and describe what type of decay occurred.
- Explain and give examples of fission and fusion
- Compare and contrast fission and fusion.
- Explain how fission and fusion are used in the medical field and to produce electricity.

Unit 7: Solutions Chemistry and Properties of Water

Estimated Date Range: January 18 – January 30

Estimated Time Frame: 9 days

Unit Overview:

In this unit, students will observe the properties of water and relate the structure of water to its function as a solvent. Students will investigate the properties of solutions and factors affecting gas and solid solubility, including nature of solute, temperature, pressure, pH, and concentration.

At home connections:

- Have students create a scenario for solubility. For example, students can explain what happens when sugar dissolves in iced tea and hot tea, or coffee crystal dissolving in hot water and cold water. **Students should not complete a lab investigation or use any substances hot or cold. Students should not eat or drink any of the items.**

Concepts within Unit # 7

[Link to TEA High School Science TEKS](#)

Concept #1: Solutions Chemistry and Properties of Water
I.2B, I.2C, I.2D, I.2E, I.6E, I.6F

Success Criteria for this concept

- Describe the structure of water including hydrogen bonds
- Identify and describe the solubility of a solute using a solubility graph
- Identify solutes that are soluble and those that are insoluble in water based on their type of chemical bonding and polarity
- Investigate and demonstrate my understanding of the properties of solutions including conductivity and concentration
- Investigate and demonstrate solubility of a gas in terms of temperature and pressure.
- Investigate and demonstrate solubility of a solid in terms of temperature and pressure

Unit 8: Force and Motion

Estimated Date Range: January 31 – February 24
Estimated Time Frame: 17 days

Unit Overview:

In this unit, students will compare speed, velocity, and acceleration. Students will determine speed from a distance-time graph. IPC students will know how to calculate speed, velocity, and acceleration and how to determine acceleration from a velocity-time graph. Students will learn how to define momentum and how to calculate it. IPC students will recognize that all moving objects have momentum and be able to apply the law of conservation of momentum to everyday situations, such as two objects crashing.

At home connections:

- Adults can ask students to tell them real world examples for each of Newton’s Laws of Motion. For example, a kid being pushed in a rolling chair would be an example of Newton’s 1st law.

Concepts within Unit # 8 Link to TEA High School Science TEKS	Success Criteria for this concept
Concept #1: Motion I.2B, I.2C, I.2D, I.2E, I.4A, I.4B	<ul style="list-style-type: none"> Calculate the speed of an object Compare speed and velocity Calculate the acceleration of an object Compare speed, average velocity, instantaneous velocity, and acceleration Create a graph from data that describes: <ul style="list-style-type: none"> Distance vs. Time Velocity vs. Time Acceleration vs. Time Analyze a graph and data tables to determine types of motion
Concept #2: Force I.2B, I.2C, I.2D, I.2E, I.4C, I.4D, I.4E	<ul style="list-style-type: none"> Identify the forces acting on an object resulting in a net balanced or unbalanced force including friction and gravity Calculate force, mass, and acceleration using $F=ma$ Explain what happens to force as mass changes using the equation $F=ma$, for the following objects: <ul style="list-style-type: none"> Toy cars Vehicle restraints Sports activities Classroom objects Describe and give examples of Newton’s three laws of motion Calculate momentum of an object ($p=mv$). Describe the law of conservation of momentum.

Unit 9: Energy

Estimated Date Range: February 27 – March 10
Estimated Time Frame: 10 days

Unit Overview:

In this unit, students will recognize kinetic energy is energy in the form of motion and is dependent upon the mass and velocity of the moving object. Students will identify and describe the energy possessed by moving objects.

Students will recognize potential energy is energy of position (stored energy) and is dependent on the mass of the object, height above the ground and the acceleration due to gravity. Students will identify and describe the different forms of potential energy stored in various objects. Students will demonstrate, describe, and explain the Law of Conservation of Energy using energy transformations that occur in everyday life. Students will explain that thermal or heat energy always moves from warm to cooler. Students will compare conduction, convection, and radiation in various scenarios. Students will identify or list examples of conduction, convection, and radiation.

At home connections:

- Adults can have a conversation with students about the kinetic and potential energy. Students should be able to identify where kinetic and potential energy is occurring within a scenario such as when a ball is kicked, a rollercoaster is going on a track, or when a skateboarder is skating up and down a ramp.

Concepts within Unit # 9 Link to TEA High School Science TEKS	Success Criteria for this concept
Concept #1: Energy I.2B, I.2C, I.2D, I.2E, I.5A, I.5B, I.5D	<ul style="list-style-type: none"> • Explain the law of conservation of energy • Describe kinetic energy and provide examples • Describe potential energy and provide examples • Describe the (kinetic energy) motion of atoms for: <ul style="list-style-type: none"> ○ Water flowing down a stream ○ Moving pebbles ○ Bowling • Describe different forms of potential energy stored in <ul style="list-style-type: none"> ○ Gravitational ○ Elastic ○ Chemical ○ Inclined planes ○ Springs ○ Batteries • Create a scenario to explain the transformation of energy from one form to another

Grading Period 4

Unit 10: Thermal Energy

Estimated Date Range: March 20 – March 31

Estimated Time Frame: 10 days

Unit Overview:

In this unit, students will determine if examples demonstrate conduction, convection, or radiation. Students will understand that liquids and gases primarily transfer energy by convection and explain that solids do not transfer energy by convection, because of the structure of the solid. IPC students should identify a substance as a conductor or insulator. Students will relate the conduction/insulation property of a substance to its specific heat, and the color of a substance to its ability to absorb infrared radiation. In grade 6th, students demonstrate that new substances are made when 2 or more substances are chemically combined; in 7th grade, students examine everyday chemical phenomena, like rusting and tarnishing. Eighth grade students learn to recognize balanced chemical equations but are not expected to balance equations by adding coefficients.

At home connections:

- Students can create images that will help them remember and explain the meanings of each type of thermal energy (conduction, convection, and radiation). After creating the images, students can identify, label, and explain objects that act as insulators and conductors.

Concepts within Unit # 10

[Link to TEA High School Science TEKS](#)

Success Criteria for this concept

Concept #1: Thermal Energy
I.2B, I.2C, I.2D, I.2E, I.5E

- Describe the movement of molecules in a solid, liquid, and gas
- Describe conduction, convection, and radiation and give examples of each
- Describe a real-world example of an insulator
- Use a world map to show the locations of major rainforests and deserts
 - Show how convection currents form around the Earth's equator
- Create a scenario to describe the movement of thermal energy in systems such as weather, insulated rooms, heating systems, combustion engines, refrigerators, and air conditioners

Unit 11: Energy Sources

Estimated Date Range: April 3 – April 18

Estimated Time Frame: 10 days

Unit Overview:

In this unit, students will understand the Law of Conservation of Energy. Students will differentiate between open and closed systems. Students will define energy transformation and give examples of the types of transformation or conversion processes necessary for different energy sources to produce electricity such as the processes involved in the operation of a hair dryer. Students will know that energy transformation or conversion takes place in heat engines. IPC students will evaluate the efficiency of different transformation processes such as those that produce electricity from radiant, nuclear, and geothermal sources as well as moving water, wind, and fossil fuels, and relate the advantages and disadvantages of several energy sources.

At home connections:

- Students can search the internet to find pictures to identify areas around the world where geothermal energy is used. Students should explain why that form of energy is used in that area of the world.

Concepts within Unit # 11

[Link to TEA High School Science TEKS](#)

Success Criteria for this concept

Concept #1: Energy Sources
I.3B, I.3C, I.3D, I.3E, I.5H, I.5I

- Identify renewable and nonrenewable resources
- Describe the advantages and disadvantages of using renewable energy
- Explain the types of energy resources used at home or school

	<ul style="list-style-type: none"> • Explain how nonrenewable resources are transformed into another form of energy. • Explain how renewable resources are transformed into another form of energy. • Explain the advantages and disadvantages of the following energy source: <ul style="list-style-type: none"> ○ Energy from the Sun ○ Energy from water ○ Energy from wind ○ Energy from inside the Earth
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Unit 12: Properties of Waves Estimated Date Range: April 19 – May 2 Estimated Time Frame: 10 days	
<p>Unit Overview: In this unit, students will identify a wave as transverse or longitudinal. Students will identify the wavelength from a diagram of a wave and calculate speed, frequency, and wavelength. Students will identify interference, polarization, reflection, refraction, or resonance and to describe how waves change in diffraction. Students will understand the relationship between the pitch of a sound and the frequency of a sound wave.</p> <p>At home connections:</p> <ul style="list-style-type: none"> • With adult supervision, students can fill a tub or sink with water. Observe the behavior waves when two waves come together. Draw a picture and explain your observation. 	
Concepts within Unit # 12 Link to TEA High School Science TEKS	Success Criteria for this concept
Concept #1: Properties of Waves I.2C, I.2D, I.3A, I.5G	<ul style="list-style-type: none"> • Describe the characteristics of transverse and longitudinal waves • Explain, using models/evidence, the characteristics and behaviors of acoustic waves including compressions, rare fractions, and travel through different media • Describe the apparent changes in frequency of waves due to the motion of the source (Doppler Effect) • Explain, using models/evidence, the characteristics, and behaviors of: <ul style="list-style-type: none"> ○ light waves ○ seismic waves ○ surface (water) waves • Compare sound and light waves in terms of wave speed, wave type, wavelength, frequency, and medium

Unit 13: Electricity and Magnetism

Estimated Date Range: May 3 – May 25

Estimated Time Frame: 17 days

Unit Overview:

In this unit, students will draw and/or interpret circuit diagrams. Students will understand the importance of a closed circuit. IPC students will use Ohm’s law to solve problems (from both diagrams and word problems). Students will understand the effects of removing a pathway in series and parallel circuits.

At home connections:

- **Adults can consider the electrical wiring in a home or building. Have students turn a light switch on and off then explain what is happening within the circuit (open/closed).**

<p>Concepts within Unit # 13 Link to TEA High School Science TEKS</p>	<p>Success Criteria for this concept</p>
<p>Concept #1: Electricity and Magnetism I.2C, I.2D, I.2E, I.4F, I.4G, I.5C, I.5F</p>	<ul style="list-style-type: none"> • Explain how objects become electrically charged • Draw and/or interpret circuit diagrams • Distinguish between series and parallel circuits using diagrams • Explain magnetism and provide examples • Explain how an electromagnet works • Describe the Law of Gravitational Forces and its components

Glossary of Curriculum Components

Overview– The content in this document provides an overview of the pacing and concepts covered in a subject for the year.

TEKS – Texas Essential Knowledge and Skills (TEKS) are the state standards for what students should know and be able to do.

Unit Overview – The unit overview provides a brief description of the concepts covered in each unit.

Concept – A subtopic of the main topic of the unit.

Success Criteria—a description of what it looks like to be successful in this concept.

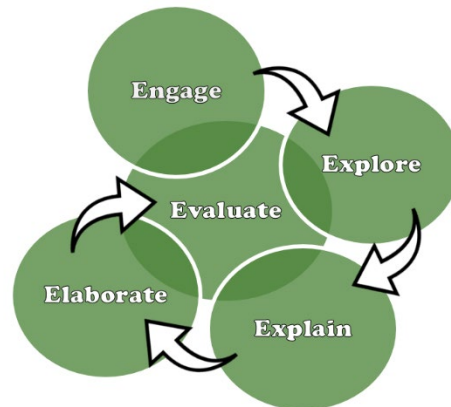
Parent Resources

The following resources provide parents with ideas to support students’ understanding. For sites that are password protected, your child will receive login information through their campus.

Resource	How it supports parents and students
Integrated Physics + Chemistry	This is the state adopted textbook for Integrated Physics and Chemistry. Click on the link for directions on accessing the textbook.
Khan Academy	This resource contains practice exercises, instructional videos, and a personalized learning dashboard where students can learn and study at their own pace.
Texas Gateways	This online resource contains lessons, videos, and interactive activities for various science concepts.
NSTA – Science Resources for Parents	This online resource has science activities for high school students and their families to help support learning at home.
NOAA – National Oceanic and Atmospheric Administration	This resource contains videos, images, interactive media, graphics, and data related to the ocean and atmosphere.

Instructional Model

The structures, guidelines or model in which students engage in a particular content that ensures understanding of that content.



- It is based on the constructivist learning theory, which states that learners build or construct new ideas based on their experiences.
- It represents a recursive cycle of cognitive stages in inquiry-based learning.
- Stages are intended to be completed sequentially; however, you may revisit a stage more than once during the 5E process.
- It capitalizes on hands-on activities, students' curiosity, and academic discussion among students.
- Typically, **NOT** all five stages would be experienced in a single classroom period, but all five would certainly be embedded in a series of lessons that would develop a particular concept, lasting days or weeks.
- It should be used to develop conceptual understanding over time with each stage building on the previous stage, rather than serve as a series of activities.
- It should be used in conjunction with other instructional strategies such as writing in science, graphing, graphic organizers, collaboration, etc.