

CURRICULUM

GUIDE

Chemistry

Providence
Schools

Background

Providence Schools teachers and administrators worked collaboratively with consultants from the Charles A. Dana Center at the University of Texas at Austin to develop the mathematics and science curriculum frameworks. The curriculum frameworks encompass two critical questions:

- Content Standards that establish clearly defined expectations for all students, helping to answer the question, ***What do students have to learn?***
- Performance Standards that determine performance expectations for content standards, helping to answer the question, ***How well do the students have to learn it?***

The curriculum framework provides a work plan that directs the instruction delivered in every classroom in every school in the district. Instruction—the way the curriculum is presented to students—will focus on the needs of students.

Purpose and Use of Curriculum Guides

Curriculum Guides for the curriculum for each grade and subject outline the approximate number of days that each unit in the curriculum will be taught; describe the content to be learned; and list the essential questions that students should be able to answer by the end of the unit.

Parents should become familiar with the Curriculum Guides. You should know when your child is being taught different topics. You should also know the essential questions that your child should be able to answer by the end of each unit.

It is important that you understand that you do not have to be familiar with the content that your child is learning in order to help them with their studies. There are basic questions that you can ask to determine if your child understands the content.

Ask your child what she is learning in each subject

Does she understand the topic? Is the unit exciting or boring? What specifically does she like or dislike about the topic? Does she understand how the topic relates to the real world?

You know your child better than anyone. You will be able to tell if she or he is benefiting from the instruction and understanding the content of the material by the way they answer you. Speak to your child's teacher if you suspect there is a problem.

Ask your child about his assignments

What is the required work? Has he finished the work on time? Is he having difficulty? If he is having difficulty, why?

Encourage your child to talk to her teachers if she is having difficulty understanding a concept or completing an assignment. If your child continues to experience difficulty, speak to the teacher yourself so that the two of you can work together to support your child.

Even if you do not understand the content that your child is learning, the fact that you are showing interest in his or her school work and believe that it is important that he or she does well sends a powerful message.

Sharon Contreras

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QUARTER I

Content students will be learning

Essential questions students should be able to answer by end of unit

Unit 1.1 - Chemical and Physical Properties (14 days)

- Understand that chemical and physical properties can be used to identify and classify substances.
- Collect appropriate data that can be used to distinguish two or more substances.
- Understand that intermolecular forces are unique to a substance and are responsible for the substance's chemical and physical properties.
- Understand that energy is involved in chemical and physical changes.

- » Explain how substances have different physical and chemical properties than their component elements.
- » How can physical and chemical properties be used to identify an unknown substance?
- » How do the physical and chemical properties of a substance determine the amount of energy needed for a physical or chemical change?
- » When examining the density of a substance, why is temperature an important factor to consider?

Unit 1.2 - Atomic Structure and Theory (10 days)

- Understand how advancements in technology allow scientists to discover and explain the structure of an atom.
- Identify elements based on their atomic structure.
- Understand how the mass or charge of an atom can change.
- Understand the significance of each discovery that led to modern atomic theory.

- » How can the same element have two different masses or two different charges?
- » How did the advances in technology allow scientists to revise the atomic theory?
- » How can the structure of an atom be determined from the periodic table?

Unit 1.3 - Nuclear Chemistry (10 days)

- Understand how alpha and beta decay can change an element.
- Explain the half-life of isotopes and how they are used to date materials.
- Express alpha, beta, and gamma decay in a nuclear equation.
- Distinguish between fission and fusion in nuclear reactions.

- » How can the type of decay for an isotope be determined?
- » How can use of an isotope's half-life determine the age of an artifact?
- » Why is fission considered the best way to produce nuclear energy?

Unit 1.4 - Chemistry and the Changing Earth (12 days)

- Understand how heat energy drives the rock cycle and the formation of different types of rocks.
- Describe how the crustal plates move and the results of these movements.
- Understand the processes that change the earth's crust and describe them in terms of physical or chemical changes.
- Explain conservation of mass in terms of earth processes.

- » Given a rock sample, what conditions were necessary for the formation of this sample?
- » Given a rock sample, how can the rock be changed into another type of rock?
- » How is energy involved in crustal plate movement?
- » How can the law of conservation of mass be validated through the study of earth changes?
- » How do physical and chemical processes alter the earth's crust?

QUARTER 2

Content students will be learning

Essential questions students should be able to answer by end of unit

Unit 2.1 - The Periodic Table (10 days)

- Understand the general arrangement of the periodic table.
- Relate chemical families/groups to properties and valence electrons.
- Use the periodic table to find information about a given element and make predictions about that element's properties.

- » How can the periodic table be used to predict chemical and physical properties of a given element?
- » What are the similarities and differences between an element from group 1 and an element from group 7?

Unit 2.2 - Periodic Trends (10 days)

- Understand general periodic trends both horizontally and vertically within the periodic table.
- Predict reactivity of an element based on its placement within the periodic table.
- Explain the arrangement of the modern periodic table.

- » Why do periodic trends vary both horizontally and vertically?
- » How did Mendeleev's periodic table leave room for the discovery of new elements?
- » How can knowledge of periodic trends be used to identify unknown elements or place new elements on the periodic table?

Unit 2.3 - Electron Configuration (12 days)

- Understand how electrons are arranged in the energy levels around the nucleus.
- Understand how an atom's electron configuration represents the energy of the electrons.
- Use electron configurations to predict the type of bonds between two or more atoms.
- Use ionization energy data to confirm electron configurations.

- » What is the relationship between an element's electron configuration and its oxidation state?
- » Based on the electron configuration of two given elements, compare the energy needed to remove or gain electrons.
- » How do electron configurations confirm the bond type in the molecule?

Unit 2.4 - Chemical Bonding (16 days)

- Understand how electron configurations of atoms can be used to determine the oxidation state of the element.
- Understand how electron dot structures can be used to determine the correct chemical formulas for basic compounds.
- Understand the scientific conventions for writing chemical formulas and naming compounds.
- Understand how the chemical bonds within a compound cause chemical forces to occur between individual particles of a sample.

- » How do intermolecular forces determine the physical and chemical properties of compounds?
- » How does the octet rule enable us to predict the type of bonds occurring between two different elements?
- » Given a molecule, such as water, how do electron configurations and the octet rule confirm the molecular structure and the intermolecular forces between molecules?
- » How is the periodic table used as a tool to help determine chemical formulas?

QUARTER 3

Content students will be learning

Essential questions students should be able to answer by end of unit

Unit 3.1 - Writing Simple Chemical Equations (10 days)

- Understand that matter and energy are conserved in a chemical change.
- Determine that patterns exist in chemical equations and use these patterns to predict products from the reaction.
- Understand that, for a chemical reaction to occur, reactants must be present in specific proportions.

- » How can you determine if a chemical equation is balanced or not?
- » How does a balanced chemical reaction illustrate that matter is conserved?
- » How does increasing one of the reactants in a chemical equation affect the amount of substances produced?
- » What information is needed in order to predict the products of a chemical reaction?

Unit 3.2 - Stoichiometry of Chemical Reactions (11 days)

- Understand and apply the mole theory to basic stoichiometric calculations.
- Determine the molar quantities of reactants and products for simple reactions including acidbase reactions.
- Distinguish acids and bases through chemical characteristics.

- » How can stoichiometry be used to determine the amount of reactant needed given a specified amount of product?
- » Why are experimental and theoretical yields from a chemical reaction seldom equal?
- » Why do chemists use the concept of moles to represent chemical quantities?

Unit 3.3 - Chemical Reactions (9 days)

- Understand that patterns exist and enable us to predict the products from chemical reactions.
- Understand how the solubility rules and reactivity series can be used to predict the nature of the products in chemical reactions.
- Understand there is a driving force that determines if chemical reactions will take place.
- Understand that chemical reactions are reversible.

- » How can the products and nature of the products be determined when given specific reactants?
- » If two soluble substances are combined and produce a precipitate, how can the identity of that substance be determined?
- » Why will certain substances react and others will not?
- » What information is needed in order to predict the products of a chemical reaction?

QUARTER 4

Content students will be learning

Essential questions students should be able to answer by end of unit

Unit 4.1 - Gas Laws (13 days)

- Understand that the physical properties of a gaseous substance can be altered by external conditions.
- Understand the mathematical relationships in the gas laws (Boyle's, Charles's, Gay-Lussac's, combined gas law, and ideal gas law).
- Apply gas laws and stoichiometry to chemical equations that use or produce gas.

- » How do changes in pressure or temperature affect the volume of a gas?
- » How is Gay-Lussac's law used to explain everyday situations such as a pressure cooker?
- » How does kinetic molecular theory explain the behavior of gases?
- » How do the number of molecules, the temperature of the molecules, and the size of the container affect the pressure of a gas?

Unit 4.2 - Energy and Chemical Reactions (19 days)

- Collect data with a calorimeter to describe heat lost or gained.
- Describe the relationship between the energy in the bonds of reactants and products of a chemical reaction.
- Use Hess's Law to determine if a reaction is exothermic or endothermic.
- Understand that the energy of a reaction is determined by the reactants and products.

- » How does energy flow through a chemical reaction?
- » How is a calorimeter used to collect data about energy flow in a given chemical reaction?
- » Why would energy flow, ionization energies, and electron configurations be necessary to understanding the behaviors of substances during chemical reactions?



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