

PUSD Science District Instructional Guides (Date Updated: September 27, 2019)

| Grade Level: 11 | | Time: Two Weeks | | | |
|---|--|---|--|---|--------------------------------------|
| Unit Title: Structure and Interactions of Matter | | Essential Questions: What determines the structure of matter? What determines the interactions that matter will undergo? What determines that state that matter exists in? What is the difference between physical and chemical properties of matter? What is the | | | |
| | | Phenomena: Dry ice sublimating from a solid to a gas. Has Absolute Zero ever been reached? | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| HS.P1U1.1 Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed in the Periodic Table and describe how these models are revised with new evidence. | Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function | Identify the various states of matter Explain on a particle level what causes different states of matter to exist Compare and contrast a chemical changes and properties versus a physical changes and properties Identify a chemical change with known indicators. Complete mathematical calculations using the Gas Law formulae Demonstrate safe lab practices | States of Matter, Solid, Liquid, Gas, Plasma, Bose-Einstein Condensate, Absolute Zero, Kelvin, Physical Change, Chemical Change, Physical Properties of Matter, Chemical Properties of Matter, Phase Changes, Sublimation Deposition, Melting, Boiling, Condensing, Evaporation, Charles's Law, Boyle's Law, Combined Gas Law, | Unit 1 Resource Folder | Flinn Lab Safety Test Unit 1 Exam |
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PUSD Science District Instructional Guides (Date Updated: September 27, 2019)

| Grade Level: 11 | | Time: Three Weeks | | | |
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| Unit Title: Discovery of Atomic Structure | | Essential Questions: What do the models of the atom look like? What is the historical progression of the understanding of the atom? What were the key experiments that led to the discovery of the atom and its substructures and the resulting theories? What does the | | | |
| | | Phenomena: Flame Testing, Observing gas spectroscopy | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| <p>HS.P1U1.1 Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed in the Periodic Table and describe how these models are revised with new evidence.</p> <p>HS.P1U1.3 Ask Questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors.</p> | <p>Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function</p> | <p>Describe the historical development of the atomic model</p> <p>Draw or represent the models of the atom</p> <p>List the main points of Dalton's Atomic Theory</p> <p>Explain how Thomson and Rutherford used data from experiments to produce their atomic models</p> <p>Identify the substructures of an atom</p> <p>Distinguish the atomic number of an element from the mass number of an isotope, and use these numbers to describe the structure of atoms.</p> <p>Describe Bohr's model of the atom and the evidence for energy levels</p> <p>Explain how the electron cloud model represents the behavior and location of electrons in atoms</p> <p>Distinguish the ground state from the excited states of an atom based on electron configurations</p> | <p>Atoms, Aristotle's Ideas of Substances, Democritus's Philosophy of Matter, Dalton's Atomic Theory, Thomson's Model of the Atom, Rutherford's Atomic Theory, Protons, Neutrons, Electrons, Nucleus, Isotopes, Atomic Number, Mass Number, Bohr's Atomic Model, Quantum Mechanical Model, Energy Levels, Ground State, Excited State, Electron Cloud Model, Electron Cloud, Atomic Orbitals, Electron Configuration</p> | | <p>Unit 2 Exam</p> |
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| Grade Level: 11 | | Time: Two Weeks | | | |
|---|--|---|--|---|--------------------|
| Unit Title: The Periodic Table and Chemical Properties | | Essential Questions: Why is the periodic table organized the way it is currently? What are the locations of groups of elements that have similar characteristics? What do the repeating patterns of the periodic table | | | |
| | | Phenomena: The Disappearing Spoon | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| HS.P1U1.1 Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed in the Periodic Table and describe how these models are revised with new evidence. | Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function | Explain why the periodic table is organized the way it is. Identify the locations of groups of elements on the periodic table. Relate the location of elements on the periodic table to their characteristics. Explain the relationship of the patterns observed on the periodic table to electrons. | Dmitri Mendeleev Periodic Table Period Group Periodic Law Alkali Metals Alkaline Earth Metals Transition Metals Metalloids Halogens Noble Gases Atomic Radii Essential Elements Valence Electrons | | Unit 3 Exam |
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| Grade Level: 11 | | Time: Two Weeks | | | |
|---|---|---|---|--|--------------------|
| Unit Title: Stable Forms of Matter and Nomenclature | | Essential Questions: What role do valence electrons play in the formation of chemical compounds? What are electron dot diagrams and how do they show electron transfer? What is the overall charge in a neutral compound? What are ionic compounds and how are | | | |
| | | Phenomena: Making Water from Hydrogen and Oxygen Gas | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| <p>HS.P1U1.2 Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes.</p> <p>HS.P1U1.3 Ask Questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors.</p> | <p>Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function</p> | <p>Describe the role valence electrons play in the formation of chemical compounds.</p> <p>Use electron dot diagrams to show electron transfer and compound formation.</p> <p>Describe how an ionic bond forms and how ionization energy affects the process.</p> <p>Predict the composition of an ionic compound from its chemical formula.</p> <p>Describe how covalent bonds form and the attractions that keep atoms together in molecules.</p> <p>Compare and contrast the attractions between polar and nonpolar molecules and the resulting bonds between them.</p> <p>Name and determine chemical</p> | <p>Electron dot diagram Ion Anion Cation Chemical bond Ionic bond Chemical formula Covalent bond Molecule Nomenclature Polar covalent bond Polyvalent ions Polyatomic ion Metallic bond Alloy</p> | | <p>Unit 4 Exam</p> |
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| Grade Level: 11 | | Time: Two Weeks | | | |
|---|---|---|--|---|--------------------|
| Unit Title: Conservation of Matter and Types of Chemical Reactions | | Essential Questions: How are matter and energy conserved in a chemical reaction? | | | |
| | | Phenomena: The Burning of Steel Wool | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| <p>HS.P1U1.2 Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes.</p> <p>HS.P1U1.3 Ask Questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors.</p> | <p>Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function</p> | <p>Describe the conservation of mass and energy during a chemical reaction.</p> <p>Balance a chemical reaction in order to apply the law of conservation of matter.</p> <p>Classify chemical reactions as combination, decomposition, displacement, double displacement, or combustion.</p> | <p>Reactants Products Balanced chemical Equation Coefficients Conservation of Energy Conservation of Mass Combination (Synthesis) reaction Decomposition reaction Displacement reaction Double displacement reaction Combustion reaction Precipitate</p> | | <p>Unit 5 Exam</p> |
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PUSD Science District Instructional Guides (Date Updated: September 27, 2019)

| Grade Level: 11 | | Time: Two Weeks | | | |
|---|---|---|---|--|--------------------|
| Unit Title: Chemical Quantities, Solutions and Concentrations | | Essential Questions: What is the unit of measurement for atomic quantities? How do you make atomic quantity calculations? What are the components of solutions? What is solubility? What factors affect solubility? How are solution concentrations calculated by | | | |
| | | Phenomena: How do cold packs work? | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| <p>HS.P1U1.2 Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes.</p> <p>HS.P1U1.3 Ask Questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors.</p> | <p>Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function</p> | <p>Convert between moles, mass, and atoms of a substance using molar mass.</p> <p>Calculate amounts of reactants or products using molar mass, mole ratios, and balanced chemical equations.</p> <p>Identify the components of a solution.</p> <p>Describe how a substance can dissolve in water by dissociation, dispersion, or ionization.</p> <p>Describe factors affecting the rate at which a solute dissolves in a solvent.</p> <p>Define solubility and describe factors affecting solubility.</p> <p>Classify solutions as unsaturated, saturated, or supersaturated.</p> <p>Calculate solution concentrations by</p> | <p>Mole</p> <p>Molar mass</p> <p>Mole ratios</p> <p>Solute</p> <p>Solvent</p> <p>Solution</p> <p>Dissociation</p> <p>Dispersion</p> <p>Ionization</p> <p>Solubility</p> <p>Saturated solution</p> <p>Supersaturated solution</p> <p>Concentration</p> <p>Molarity</p> | | <p>Unit 6 Exam</p> |
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PUSD Science District Instructional Guides (Date Updated: September 27, 2019)

| Grade Level: 11 | | Time: One Week | | | |
|---|---|--|---|---|--------------------|
| Unit Title: Acids and Bases | | Essential Questions: What are some general properties of acids and bases? What are the products of neutralization? What are proton donors and proton acceptors? How is pH used to describe the concentration of acids and bases? Why are strong acids and bases | | | |
| | | Phenomena: Lemon Battery | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| <p>HS.P1U1.2 Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes.</p> <p>HS.P1U1.3 Ask Questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors.</p> | <p>Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function</p> | <p>Define acid and describe some of the general properties of an acid.</p> <p>Define base and describe some of the general properties of a base.</p> <p>Identify a neutralization reaction, and describe the reactants and products of neutralization.</p> <p>Explain how acids and bases can be defined as proton donors and proton acceptors.</p> <p>Define pH, and relate pH to hydronium ion concentration in a solution.</p> <p>Explain how electrolytes can be classified.</p> | <p>Acid</p> <p>Base</p> <p>Indicator</p> <p>pH</p> <p>Neutralization</p> <p>Salt</p> <p>Electrolyte</p> <p>Hydronium ion</p> <p>Hydroxide ion</p> | | <p>Unit 7 Exam</p> |
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| Grade Level: 11 | | Time: One Week | | | |
|---|---|--|--|---|--------------------|
| Unit Title: Kinetics and Reaction Rates | | Essential Questions: What happens to chemical bonds during a chemical reaction? What happens to energy during a chemical reaction? What does a reaction rate tell you? What factors cause reaction rates to change? | | | |
| | | Phenomena: Elephant Toothpaste | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| <p>HS.P1U1.2 Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes.</p> <p>HS.P1U1.3 Ask Questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors.</p> | <p>Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function</p> | <p>Describe the energy changes that take place during a chemical reaction.</p> <p>Classify chemical reactions as either endothermic or exothermic.</p> <p>Explain how energy is conserved during a chemical reaction.</p> <p>Explain what a reaction rate is.</p> <p>Describe the factors affecting chemical reaction rates.</p> | <p>Chemical energy</p> <p>Exothermic reaction</p> <p>Endothermic reaction</p> <p>Activation energy</p> <p>Reaction rate</p> <p>Surface Area</p> <p>Concentration</p> <p>Catalyst</p> | | <p>Unit 8 Exam</p> |
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| Grade Level: 11 | | Time: One Week | | | |
|--|--|---|--|--|-------------|
| Unit Title: Equilibrium | | Essential Questions: Under what conditions do physical and chemical equilibria occur? How do equilibrium systems respond to change? | | | |
| | | Phenomena: Blue Bottle Equilibrium | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| HS.P1U1.2 Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes. HS.P1U1.3 Ask Questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors. | Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function | Identify and describe physical and chemical equilibria. Describe the factors affecting chemical equilibrium. | Equilibrium Le Chatelier's Principle Reversible Reaction Pressure | | Unit 9 Exam |
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PUSD Science District Instructional Guides (Date Updated: September 27, 2019)

| Grade Level: 11 | | Time: Two Weeks | | | |
|--|--|--|--|---|--------------------|
| Unit Title: Nuclear Chemistry and Ethical and Moral Judgements in Science | | Essential Questions: What happens during nuclear decay? What are three types of nuclear radiation? How does nuclear radiation affect atoms? What devices can detect nuclear radiation? How is nuclear radiation measured? How do nuclear decay rates differ | | | |
| | | Phenomena: The Manhattan Project | | | |
| Standards | Cross Cutting Concepts | Objectives (I Can) | Key Vocabulary | Resources (Activities/Lessons/Experiments) | Assessments |
| HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications. | Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Stability and Change, and Structure and Function | Describe the process of nuclear decay. Classify nuclear radiations as alpha particles, beta particles, or gamma rays. Identify sources of nuclear radiation, and describe how nuclear radiation affects matter. Describe methods of detecting and measuring nuclear radiation. Define half-life, and relate it to the age of a radioactive isotope. Compare and contrast nuclear reaction rates with chemical reaction rates. Describe how radioactive isotopes are used to estimate the age of materials. Compare and contrast nuclear forces. Compare and contrast nuclear fusion and fission. | Radioactivity Radioisotope Nuclear radiation Alpha particle Beta particle Gamma ray Background radiation Half-life Strong nuclear force Fission Chain reaction Critical mass Fusion Plasma Manhattan Project | | Unit 10 Exam |
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