

CHEMISTRY

UNIT	STRAND/ CONCEPT	P.O.	RESOURCES	ACTIVITIES	MATERIALS/ SUPPLIES	LINKAGES
ALL	Strand 1: Inquiry Process Concept 1: Observations, Questions & Hypotheses	PO 1. Evaluate scientific information for relevance to a given problem. PO 2. Develop questions from observations that transition into testable hypotheses. PO 3. Formulate a testable hypothesis. PO 4. Predict the probable outcome of an investigation based on the hypothesis using statistical evidence, probability, and modeling (not guessing or inferring).		Vocabulary Metric system Measurement techniques Labs		

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ALL	Strand 1: Inquiry Process Concept 2: Scientific Testing (Investigating & Modeling)	PO 1. Demonstrate safe and ethical procedures (e.g., use and care of technology, materials, organisms) and behavior in all science inquiry. PO 2. Identify the resources needed to conduct an investigation. PO 3. Design an appropriate protocol (written plan of action) for testing a hypothesis. <ul style="list-style-type: none"> • Identify dependent and independent variables in a controlled investigation. • Determine an appropriate method for data collection (e.g., using balances, thermometers, microscopes, spectrophotometer, using qualitative changes). • Determine an appropriate method for recording data (e.g., notes, sketches, photographs, videos, journals (logs), charts, computers/ calculators). PO 4. Conduct a scientific investigation that is based on a research design. PO 5. Record observations, notes, sketches, questions, and ideas using tools such as journals, charts, graphs, and computers.		Lab Safety Labs		

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ALL	Strand 1: Inquiry Process Concept 3: Analysis, Conclusions, and Refinement	PO 1. Interpret data that show a variety of possible relationships between variables, including: <ul style="list-style-type: none"> • positive relationship • negative relationship • no relationship PO 2. Evaluate whether investigational data support or do not support the proposed hypothesis. PO 3. Critique reports of scientific studies (e.g. published papers, student reports). PO 4. Evaluate the design of an investigation to identify possible sources of procedural error, including: <ul style="list-style-type: none"> • sample size • trials • controls • analyses PO 5. Design models (conceptual or physical) of the following to represent "real world" scenarios: <ul style="list-style-type: none"> • carbon cycle • water cycle • phase change • collisions 		Labs		
ALL	Strand 1: Inquiry Process Concept 3: Analysis, Conclusions, and Refinement	PO 7. Propose further investigations based on the findings of a conducted investigation.		Labs		

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ALL	Strand 1: Inquiry Process Concept 4: Communication	<p>PO 1. For a specific investigation, choose an appropriate method for communicating the results.</p> <p>PO 2. Produce graphs of data that communicate data.</p> <p>PO 3. Communicate results clearly and logically.</p> <p>PO 4. Support conclusions with logical scientific arguments.</p>		Labs		
ALL	Strand 2: History and Nature of Science Concept 1: History of Science as a Human Endeavor	<p>PO 1. Describe how human curiosity and needs have influenced science, impacting the quality of life worldwide.</p> <p>PO 2. Describe how diverse people and/or cultures, past and present, have made important contributions to scientific innovations.</p> <p>PO 3. Evaluate the contributions of early cultures to scientific knowledge and technological inventions.</p> <p>PO 4. Analyze how specific changes in science have affected society.</p> <p>PO 5. Analyze how specific cultural and/or societal issues promote or hinder scientific advancements.</p>	<p><u>Connections</u> videos (James Burke)</p> <p><u>NOVA</u> videos</p> <p>Miscellaneous videos</p>	Project: Good Old Days		Humanities

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ALL	Strand 2: History and Nature of Science Concept 2: Nature of Scientific Knowledge	PO 1. Specify the requirements of a valid, scientific explanation (theory), including that it be: <ul style="list-style-type: none"> • logical • subject to peer review • public • respectful of rules of evidence PO 2. Explain the process by which accepted ideas are challenged or extended by scientific innovation. PO 3. Distinguish between pure and applied science. PO 4. Describe how scientists continue to investigate and critically analyze aspects of theories.	<u>Connections</u> videos (James Burke) <u>NOVA</u> videos Miscellaneous videos			Humanities Biology Earth Science
ALL	Strand 3: Science in Personal and Social Perspectives Concept 2: Science and Technology in Society	PO 2. Recognize the importance of basing arguments on a thorough understanding of the core concepts and principles of science and technology. PO 3. Support a position on a science or technology issue.	<u>Connections</u> videos (James Burke) <u>NOVA</u> videos Miscellaneous videos	Point Fingers & Pass the Buck (Fish Kill Debate) Project: <ul style="list-style-type: none"> • Good Old Days • Chemistry of Foods 		Humanities Biology Earth Science
WATER: Properties (Weeks 1-2)	Strand 5: Physical Science Concept 1: Structure and Properties of Matter	PO 1. Describe substances based on their physical properties. PO 2. Describe substances based on chemical properties. PO 4. Separate mixtures of substances based on their physical properties.		Lab: <ul style="list-style-type: none"> • Separation of Mixtures • Foul water • Solid or Liquid? Water Use activities		

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WATER: Properties (Weeks 1-2)	Strand 6: Earth and Space Science Concept 1: Geochemical Cycles	PO 1. Identify ways materials are cycled within the Earth system (i.e., carbon cycle, water cycle, rock cycle). PO 5. Describe factors that impact current and future water quantity and quality including surface, ground, and local water issues.		Point Fingers & Pass the Buck (Fish Kill debate)		Humanities Biology Earth Science

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ATOMIC STRUCTURE (Week 3)	Strand 5: Physical Science Concept 1: Structure and Properties of Matter	<p>PO 6. Describe the following features and components of the atom:</p> <ul style="list-style-type: none"> • protons • neutrons • electrons • mass • number and type of particles • structure • organization <p>PO 7. Describe the historical development of the models of the atom.</p> <p>PO 8. Explain the details of atomic structure (e.g., electron configuration, energy levels, isotopes).</p> <p>HONORS:</p> <p>PO 2. Describe the fusion process that takes place in stars.</p> <p>PO 5. Explain the formation of the light elements in stars and the heavier elements (what astronomers call “metals”) in supernova explosions.</p>		<p>Lessons:</p> <ul style="list-style-type: none"> • Atomic structure • Isotopes • Electron configuration <p>Lab:</p> <ul style="list-style-type: none"> • Isotopic Pennies <p>HONORS: Stardust Essay</p>		Biology Earth Science Physics
ATOMIC STRUCTURE (Week 3)	Strand 5: Physical Science Concept 5: Interactions of Energy and Matter	<p>PO 7. Explain the relationship between the wavelength of light absorbed or released by an atom or molecule and the transfer of a discrete amount of energy.</p>		<p>Lessons:</p> <ul style="list-style-type: none"> • Ground state vs. excited state <p>Lab:</p> <ul style="list-style-type: none"> • Flame Testing 		Physics

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WATER: Ionic bonding & Solubility (Weeks 4-7)	Strand 3: Science in Personal and Social Perspectives Concept 1: Changes in Environments	PO 3. Assess how human activities (e.g., clear cutting, water management, tree thinning) can affect the potential for hazards.		Lessons: <ul style="list-style-type: none"> • Dissolved substances in water • heavy metals • acids/bases • molecular substances • gases Point Fingers & Pass the Buck (Fish Kill debate)		Humanities Biology Earth Science
WATER: Ionic bonding & Solubility (Weeks 4-7)	Strand 5: Physical Science Concept 4: Chemical Reactions	PO 2. Identify the indicators of chemical change, including formation of a precipitate, evolution of a gas, color change, absorption or release of heat energy. PO 12. Compare the nature, behavior, concentration, and strengths of acids and bases.		Lessons: <ul style="list-style-type: none"> • Valence electrons • Ions & ionic bonding • Solubility • Dissolved substances in water • heavy metals • acids/bases • molecular substances • gases Labs: <ul style="list-style-type: none"> • Water Testing • Solubility • Supersaturation 		Earth Science Biology Anatomy & Physiology Humanities: AZ year

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MATERIALS (Weeks 8-11)	Strand 5: Physical Science Concept 1: Structure & Properties of Matter	PO 3. Predict properties of elements and compounds using trends of the periodic table (e.g., metals, non-metals, bonding – ionic/covalent).		Lessons: <ul style="list-style-type: none"> • Chemical properties • Periodic variation • Solubility • Dissolved substances in water <ul style="list-style-type: none"> • heavy metals • acids/bases • molecular substances • gases Labs: <ul style="list-style-type: none"> • Striking It Rich? • Metal or Nonmetal? • Using Up a Metal • Reactivity of Metals 		

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MATERIALS (Weeks 8-11)	Strand 5: Physical Science Concept 4: Chemical Reactions	<p>PO 1. Apply the law of conservation of matter to changes in a system.</p> <p>PO 3. Represent a chemical reaction by using a balanced equation.</p> <p>PO 5. Describe the mole concept and its relationship to Avogadro's number.</p> <p>PO 6. Solve problems involving moles, mass, molecules, volume of a gas, and molarity using the mole concept and Avogadro's number.</p> <p>PO 8. Quantify the relationships between reactants and products in chemical reactions (e.g., stoichiometry, equilibrium, energy transfers).</p> <p>PO 9. Predict the products of a chemical reaction using types of reactions (e.g., synthesis, decomposition, replacement, combustion).</p> <p>PO 13. Determine the transfer of electrons in oxidation/reduction reactions.</p>		<p>Lessons:</p> <ul style="list-style-type: none"> • Redox • Conservation of matter • Balancing equations • Moles • Percent composition • Empirical formulas • Changing surface properties <p>Labs:</p> <ul style="list-style-type: none"> • Reactivity of Metals • Molar Masses • Copper Plating 		<p>Earth Science</p> <p>Biology</p> <p>P.E.</p> <p>Anatomy & Physiology</p> <p>Auto Tech</p>

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PETROLEUM (Weeks 12-14)	Strand 5: Physical Science Concept 3: Conservation of Energy and Increase in Disorder	PO 1. Describe the following ways in which energy is stored in a system: <ul style="list-style-type: none"> • mechanical • electrical • chemical • nuclear PO 2. Describe various ways in which energy is transferred from one system to another (e.g., mechanical contact, thermal conduction, electromagnetic radiation). PO 3. Recognize that energy is conserved in a closed system. PO 4. Calculate quantitative relationships associated with the conservation of energy. PO 5. Analyze the relationship between energy transfer and disorder in the universe (2 nd Law of Thermodynamics). PO 6. Distinguish between heat and temperature. PO 7. Explain how molecular motion is related to temperature and phase changes.		Lessons: <ul style="list-style-type: none"> • Hydrocarbon properties • Covalent bonding • Electron-dot & structural formulas • Alkanes • Energy storage & transfer • Conservation of energy Labs: <ul style="list-style-type: none"> • Calorimetry Demo: <ul style="list-style-type: none"> • Tar 		Earth Science Biology Physics P.E. Anatomy & Physiology Auto Tech Humanities: Transportation Economics

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PETROLEUM (Weeks 12-14)	Strand 5: Physical Science Concept 4: Chemical Reactions	PO 4. Distinguish among the types of bonds (ionic, covalent, metallic) PO 7. Predict the properties (e.g., melting point, boiling point, conductivity) of substances based upon bond type. PO 10. Explain the energy changes in chemical reactions using the law of conservation of energy.		Lessons: <ul style="list-style-type: none"> • Hydrocarbon properties • Covalent bonding • Electron-dot & structural formulas • Alkanes • Isomers • Multiple bonds-alkenes & alkynes • Functional groups Demo: <ul style="list-style-type: none"> • Tar Labs: <ul style="list-style-type: none"> • Modeling Alkanes/ Alkenes • Polymers & Toy Balls • Condensation/ Artificial Flavors 		Biology P.E. Anatomy & Physiology Auto Tech

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PETROLEUM (Weeks 12-14)	Strand 5: Physical Science Concept 5: Interactions of Energy and Matter	PO 1. Describe various ways in which matter and energy interact (e.g., photosynthesis, phase change). PO 4. Describe the basic assumptions of kinetic molecular theory. PO 5. Apply kinetic molecular theory to the behavior of matter (e.g., gas laws). PO 6. Analyze calorimetric measurements in simple systems and the energy involved in changes of state.		Lab: • Calorimetry • Gases		Biology P.E. Anatomy & Physiology Physics
FOOD (Weeks 15-18)	Strand 4: Life Science Concept 5: Matter, Energy, and Organization in Living Systems (Including Human Systems)	PO 2. Describe the role of organic and inorganic chemicals (e.g., carbohydrates, proteins, lipids, nucleic acids, water, ATP) important to living things.		Lessons: • Food Energy • Carbohydrates (energy sources) • Fats (energy storage) • Isomerism • Saturation • Proteins/ amino acids • Vitamins & Minerals • Additives Lab: • Analysis of Vitamin C Project: • Chemistry of Foods		Biology P.E. Anatomy & Physiology