Chemistry: Grade 1, Semester 2

L.O.8: Week 01 - Week 02

Learning Outcome: Explain how the chemical and physical properties of solutions, suspensions, colloids and Nano substances can be used in water treatment.

Key Concepts:

- 1. Pure substance.
- 2. Solution.
- 3. Solute.
- 4. Solvent.
- 5. Colloid.
- 6. Tyndall Effect.
- 7. Suspension.

Skills:

1. Separate mixtures by evaporation and filtration 2. Use laboratory techniques to differentiate colloids from true solutions 3. Differentiate suspension, solution, colloid 4. Explain how particle size influences physical and chemical properties.

Essential Questions: What are mixtures?

Textbook and Resource Materials: What are mixtures?

Evidence of Learning: -Students reflect on the properties of mayonnaise and make reasonable suggestions for the use of emulsions. -Students reflect on how the properties of different metals affect mixtures of these metals and alter their usefulness. -Students describe one characteristic of non-potable water and design a laboratory procedure to treat it.

Capstone Connection: One feature of house design may be treating household waste water.

Relations: ES.1.02; (Chemical structure, mixtures, parameters of compounds like minerals, chemical reactions and intermolecular and intramolecular forces, respectively) BIO.1.03; (Mixtures and their properties).

SEC Topic & Code: HSST-CH 1.04.

L.O.9: Week 03 - Week 04

Learning Outcome: Explain how the physical properties of different types of elements contribute to the properties of alloys, emulsions and composite materials.

Key Concepts:

- 1. Texture.
- 2. Uniformity.
- 3. Strength.
- 4. Elasticity.

- 5. Bounce.
- 6. Malleability.
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Skills:
1. Compare properties of emulsions to those of composites 2. Explore and analyze industrial uses of materials

Essential Questions: How do properties of matter relate to building and art?

Textbook and Resource Materials: How do properties of matter relate to building and art?

Evidence of Learning: -Students are able to list useful properties of new mixtures. -Students use the concepts of physical properties to describe their selection of materials for their sustainable structures in their capstone project.

Capstone Connection: Material properties at Nano and macro levels impact effectiveness for different roles of different building needs (e.g. structure vs. connector, roof vs. foundation, conductors vs. insulators vs. crystalline vs. transparent, etc.).

Relations: ES.1.02; (Chemical structure, mixtures, parameters of compounds like minerals, chemical reactions and intermolecular and intramolecular forces, respectively.) ES.1.04; () ES.1.05; () ES.1.06; (Chemical structure, types of bonds and parameters of mixtures.) BI.1.03; (Mixtures and their properties)

SEC Topic & Code: HSST-CH 1.04.

L.O.10: Week 05 - Week 06

Learning Outcome: Calculate quantities of products formed from known quantities of reactants and be able to discuss their precision and accuracy

Key Concepts:
- 1. Stoichiometry.
- 2. Mole.
- 3. Molar mass.
- 4. Standard temperature and pressure (STP).
- 5. Dimensional analysis (unit conversions).
- 6. Percentage yield.
- 7. Limiting reagent.

Skills:
1.Use basic laboratory techniques (to the accepted tolerance of instruments) to determine the amount, mass, or volume of a substance produced or required in a chemical reaction. 2. Precision, accuracy, experimental error

Essential Questions: How can chemists use fruit salad as a model for how to predict quantities of atoms?

Textbook and Resource Materials: How can chemists use fruit salad as a model for how to predict quantities of atoms?

Evidence of Learning: Presentation - group Written quiz - individual Students are able to effectively play the Equivalent Measures game and answers match those provided in this Teacher's Edition.

Capstone Connection: Measurement precision used for effective empirical analysis of chemistries is analogous to measurement precision for building specifications, including energy uses, flow etc.)

Relations: ES.1.08; (The stoichiometry of mineral ores.) PH. 1.01; ()

SEC Topic & Code: HSST-CH 1.08; HSST-CH 2.05

L.O.11: Week 07 - Week 07

Learning Outcome: Investigate four types of chemical reactions, generate and test for hydrogen, oxygen and carbon dioxide and determine the most effective ratio of hydrogen to oxygen for propulsion of a small rocket.

Key Concepts:

- 1. Synthesis reaction.
- 2. Decomposition reaction.
- 3. Single-replacement reaction.
- 4. Double-replacement reaction.

Skills: 1. Conduct laboratory tests to identify three different gases. 2. Use chemical reactions to make gases for propulsion. 3. Investigate different types of chemical reactions involve gases.

Essential Questions: How do chemists study quantities of atoms and molecules when they are too small to be measured?

Textbook and Resource Materials: How do chemists study quantities of atoms and molecules when they are too small to be measured?

Evidence of Learning: "Written quiz - individual Presentation - group Answers to questions in Part A are similar to those presented in this Teacher's Edition. Ideas proposed are reasonable. Answers to questions are similar to those presented in this Teacher's Edition. Answer's match those shown in this Teacher's Edition *****Are you planning to do this activity?
http://serc.carleton.edu/sp/mnstep/activities/26400.htm

Capstone Connection: Roles of hydrogen, oxygen and carbon dioxide in various forms of alternative energy

Relations: ES.1.02; (Chemical structure, mixtures, parameters of compounds like minerals, chemical reactions and intermolecular and intramolecular forces, respectively.)

SEC Topic & Code: HSST-CH 2.05

L.O.12: Week 08 - Week 08

Learning Outcome: Use two- and three-dimensional models and their understanding of bond polarity to illustrate polar and non-polar inter-molecular forces.

Key Concepts:

- 1. Intermolecular forces.
- 2. London dispersion force.
- 3. Dipole-dipole force.
- 4. Electronegativity.
- 5. Polarity.
- 6. VESPR theory.

Skills: 1. Describe how the size and shape of molecules affect their physical state. 2. Classify molecules as polar and non-polar. 3. Describe how molecules stay together and how their bonding affects their physical properties.

Essential Questions: What holds molecules together?

Textbook and Resource Materials: What holds molecules together?

Evidence of Learning: "Written quiz - individual Presentation - group Four pages of molecular representations are similar to those shown in this Teacher's Edition. Students make informed guesses as to which molecules are solids, liquids, or gases and explain their reasoning. Answer's match those found in this Teacher's Edition. Conclusion's match those found in this Teacher's Edition. Answers in students' Active Chemistry logs match those found in this Teacher's Edition."

Capstone Connection: Apply to selection of materials to use when considering alternative energy designs

Relations: ME.1.06; (Acceleration of particles and using it in different fields such as Nuclear Chemistry) ES.1.02; (Chemical structure, mixtures, parameters of compounds like minerals, chemical reactions and intermolecular and intramolecular forces, respectively.) PH. 1.02; ()

SEC Topic & Code: HSST-CH 1.03; HSST-CH 3.03.

L.O.13: Week 09 - Week 10

Learning Outcome: Use understanding of the metal activity series to explain why metals are found as they are in nature and discuss considerations (such as exposure to different kinds of solutions) for the use of metals in industry, construction and jewelry.

Key Concepts:

- 1. Metals.
- 2. Oxidation-reduction (redox) reaction.
- 3. Oxidation.
- 4. Reduction.
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Skills: 1. Test the chemical reactivity of metals 2. Use metals to light an LED and explain the procedure and how this can happen

Essential Questions: What enables metals to have the properties that they have?

Textbook and Resource Materials: What enables metals to have the properties that they have?

Evidence of Learning: Written quiz - individual Presentation - group Students are able to create an electrical circuit that lights an LED and provide answers that match those in this Teacher's Edition. Students successfully complete the Investigate steps and provide answers that match those in this Teacher's Edition.

Capstone Connection: Metal properties help to explain the choices made by builders for metals in dwellings (E.g., why not copper structural beams and steel electrical wires). Apply information to possible alternative forms of energy.

Relations: ES.1.09; (Using redox reaction that used in energy like solar cells.) MA.1.05; (Using function and relation from math in the study of LED.)

SEC Topic & Code: HSST-CH 1.06.

L.O.14: Week 11 - Week 11

Learning Outcome: Examine a variety of commercial batteries and use their understanding of electrochemistry to explain how they work and why the manufacturers used the materials they did.

Key Concepts:

- 1. Oxidation-reduction (redox) reaction.
- 2. Half-reactions.
- 3. Electrochemical cell.
- 4. Galvanic cell.
- 5. Spectator ions.

Skills: The student can design his own battery

Evidence of Learning: Students use the activity series to build an electrochemical cell with the greatest voltage. Students are able to carry out the investigation and draw conclusions about voltage from their data.

Capstone Connection: Battery properties can be analyzed to explain why batteries are an impractical energy storage approach at the whole-house level.

Relations:

SEC Topic & Code: HSST-CH 1.06 HSST-CH 3.06

L.O.15: Week 12 - Week 12

Learning Outcome: Determine, explain and illustrate how energy and disorder change during physical and chemical processes.

Key Concepts:

- 1. System.
- 2. Thermodynamic.
- 3. Kinetics.
- 4. Energy.
- 5. Heat.
- 6. Maximum work.
- 7. Law of conservation of energy.
- 8. Endothermic.
- 9. Exothermic.
- 10. Heat content.
- 11. Enthalpy change.
- 12. Energy diagram.
- 13. Activation energy.
- 14. Activated complex.
- 15. Entropy(S).
- 16. Spontaneity.
- 17. Gibbs free energy.
- 18. Catalyst.

Skills: 1. Determine the relation between the system and environment 2. Differentiate between thermodynamics and kinetic 3. Apply the law of conservation of energy in many systems 4. Compare between endothermic and exothermic system 5. Find ΔH and calculate it in physical and chemical change 6. Draw the energy diagram for endothermic and endothermic system 7. Determine the activated complex position in energy diagram 8. Determine the Gibbs free energy in endothermic and exothermic system 9. Explain the effect of surface areas and use of a catalyst on reaction rate

Essential Questions: What holds things together and how does thermodynamics effect on sustainable system?

Textbook and Resource Materials: What holds things together and how does thermodynamics effect on sustainable system?

Evidence of Learning: Written quiz - individual Presentation - group Students are able to generate CO2 gas using four different methods. Students use data they recorded from the various methods of CO2 gas production to select one that best achieves the desired results.

Capstone Connection: Energy and disorder change during various steps of the building process (from alloy forming for rebar to cement mixing and curing). Apply knowledge and understanding of energy and disorder to alternative energy designs.

Relations: PH.1.07; () PH.1.10; () PH.1.11; ()

SEC Topic & Code: HSST-CH 1.08.

L.O.16: Week 13 - Week 13

Learning Outcome: Use the Gas Laws to explain the principles of SCUBA diving.

Key Concepts:

- 1. Gas.
- 2. Natural law.
- 3. Pressure.
- 4. Atmosphere.
- 5. Barometers.
- 6. Boyle's Law.
- 7. Charles's Law.
- 8. Absolute Zero.
- 9. Kinetic Theory of Matter.
- 10. Idea Gas.

Skills: 1. Investigate the relationship between the volume and pressure of gases at constant temperature. 2. Use data concerning gas, volume, and pressure generate a mathematical relationship between. 3. Investigate the relationship between temperature and volume of a gas. 4. Plot temperature and pressure data to extrapolate absolute zero. 5. Create an explanation for the importance of using the Kelvin scale for gases. 6. Apply Charles's Law to ballooning 7. Predict what will happen when SCUBA tanks are filled.

Essential Questions: What does it mean when something is under pressure?

Textbook and Resource Materials: What does it mean when something is under pressure?

Evidence of Learning: Written quiz - individual Presentation - group Explanation of observations and answers to questions in Active Chemistry logs match those listed in this Teacher's Edition. Explanation of observations and answers to questions in Active Chemistry logs match those listed in this Teacher's Edition. Explanation of observations and answers to questions in Active Chemistry logs match those listed in this Teacher's Edition. Answer's match those presented in this Teacher's Edition. Answers to questions in Part A are similar to those presented in this Teacher's Edition. Answer's match those shown in this Teacher's Edition. Proposed ideas and solutions correctly apply the principle of Charles's law. Proposed ideas are reasonable. Answers to questions in Part A are similar to those presented in this Teacher's Edition. Answer's match those shown in this Teacher's Edition. Explanation includes correct application of Charles's law

Capstone Connection: Consider properties of gas in an alternative energy design for Egypt--how is the design affected by Egyptian climate?

Relations: MA.1.05; (Study the variables in the Gas Law) PH.1.08; ()

SEC Topic & Code: HSST-CH 1.07

L.O.17: Week 14

Learning Outcome: Determine the effect of molecular size on molecular motion. Use pictorial and physical models to determine the effect of mass on gas effusion rates. Describe the history, processes and economic impact of the scented oil industry in Egypt.

Key Concepts:

- 1. Diffusion.
- 2. Effusion.
- 3. Graham's Law of Effusion

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Skills: 1. Determine the effect of molecular size on molecular motion. 2. Research the scented oil industry in Egypt

Essential Questions: Why do colognes and aftershave lotions smell so strong, but perfumes do not?

Textbook and Resource Materials: Why do colognes and aftershave lotions smell so strong, but perfumes do not?

Evidence of Learning: Written quiz - individual Presentation - group Answers from students are similar to those in this Teacher's Edition. Answers from students are similar, if not identical, to those in this Teacher's Edition.

Capstone Connection: Understanding molecular properties of gases can inform the design of a gas-phase indicator of a gas leak for improve safety in the home.

Relations: PH.1.08; ()

SEC Topic & Code: HSST-CH 1.07

Chemistry

Grade 10

Semester 2