**Can You Copperplate?**
Lesson explores chemical engineering and explores how the processes of chemical plating and electroplating have impacted many industries. Students work in teams to copper plate a range of items using everyday materials. They develop a hypothesis about which materials and surface preparations will result in the best copper plate, present their plans to the class, test their process, evaluate their results and those of classmates, and share observations with their class.

| Grade 6 | Grade 7 | Grade 8 | IPC | Chemistry | Physics |
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| ***Strand:* *Scientific Investigation and Reasoning*** |
| 1.A Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards. | 1.A Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards. | 1.A Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards. | 1.A Demonstrate safe practices during laboratory and field investigations. | 1.A Demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles and fire extinguishers. | 1.A Demonstrate safe practices during laboratory and field investigations. |
|  |  |  |  | 1.BKnow specific hazards of chemical substances such as flammability, corrosiveness and radioactivity as summarized on the Material Safety Data Sheets (MSDS). |  |
| 1.B Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials. | 1.B Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials. | 1.B Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials. | 1.B Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials. | 1.CDemonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials. | 1.B Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials. |
| 2.APlan and implement comparative and descriptive investigations by making observations, asking well-defined questions, and using appropriate equipment and technology. | 2.A Plan and implement comparative and descriptive investigations by making observations, asking well- defined questions and using appropriate equipment and technology. | 2.A Plan and implement comparative and descriptive investigations by making observations, asking well- defined questions, and selecting and using appropriate equipment and technology. | 2.B Plan and implement investigate procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology. | 2.EPlan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; including graphing calculators, computers and probes, sufficient scientific glassware such as beakers, Erlenmeyer flasks, pipettes, graduated cylinders, volumetric flasks, safety goggles, burettes, electronic balances and an adequate supply of consumable chemicals. | 2.E Design and implement investigative procedures including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness. |
| 2.BDesign and implement experimentalinvestigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology. | 2.B Design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology. | 2.B Design and implement comparative and experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses and selecting and using appropriate equipment and technology. |
| **2.D** Construct tables, using repeated trials and means to organize data and identify patterns. | 2.D Construct tables and graphs, using repeated trials and means to organize data and identify patterns. | 2.D Construct tables and graphs, using repeated trials and means, to organize data and identify patterns. |  |  |  |
| **2.E** Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.  | 2.E Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends. | 2.E Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends. | 2.D Organize, analyze, evaluate, make inferences, and predict trends from data. | 2.HOrganize, analyze, evaluate, make inferences, and predict trends from data. | 2.J Organize and evaluate data and make inferences from data including the use of tables, charts, and graphs. |
|  |  |  | 2.E Communicate valid conclusions. | 2.I Communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphs, journals, summaries, oral reports and technology-based reports. | 2.K Communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports. |
| 3.DRelate the impact of research on scientific thought and society including the history of science and contributions of scientists as related to the content. | 3.D Relate the impact of research on scientific thought and society, including history of science and contributions of scientists as related to the content. | 3.D Relate the impact of research on scientific thought and society including the history of science and contributions of scientists as related to the content. | 3.D Evaluate the impact of research on scientific thought, society, and the environment. | 3.DEvaluate the impact of research on scientific thought, society, and the environment. | 3.D Explain the impacts of the scientific contributions of a variety of historical and contemporary scientists on scientific thought and society. |
|  |  |  | 3.E Describe connections between physics and chemistry and future careers. | 3.EDescribe the connection between chemistry and future careers. | 3.E Research and describe the connections between physics and future careers. |
| 4.AUse appropriate tools to collect, record, and analyze information including: journals/notebooks, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, triple beam balances, microscopes, thermometers, calculators, computers, timing devices, and other equipment as needed to teach the curriculum. | 4.A Use appropriate tools to collect, record, and analyze information including: life science models, hand lens, stereoscopes, microscopes, beakers, Petri dishes, microscope slides, graduated cylinders, test tubes, meter sticks, metric rulers, metric tape measures, timing devices, hot plates, balances, thermometers, calculators, water test kits, computers, temperature and pH probes, collecting nets, insect traps, globes, digital cameras and journals/notebooks and other equipment as needed to teach the curriculum. | 4.AUse appropriate tools to collect, record, and analyze information including: lab journals/notebooks, beakers, meter sticks, graduated cylinders, anemometers, psychrometers, hot plates, test tubes, spring scales, balances, microscopes, thermometers, calculators, computers, spectroscopes, timing devices, and other equipment as needed to teach the curriculum. |  |  |  |
| 4.BUse preventative safety equipment including chemical splash goggles, aprons, and gloves and be prepared to use emergency safety equipment including an eye/face wash, a fire blanket, and a fire extinguisher. | 4.B Use preventative safety equipment including chemical splash goggles, aprons and gloves and be prepared to use emergency safety equipment including an eye/face wash, a fire blanket, and a fire extinguisher. | 4.B Use preventative safety equipment including chemical splash goggles, aprons and gloves, and be prepared to use emergency safety equipment including an eye/face wash, a fire blanket, and a fire extinguisher. |  |  |  |
| ***Strand: Matter and Energy*** |
| 5.AKnow that an element is a pure substance represented by chemical symbols. |  |  | 6.B Relate chemical properties of substances to the arrangement of their atoms or molecules. |  |  |
| ✔5.CDifferentiate between elements and compounds on the most basic level. |  | ☆5.ADescribe the structure of atoms including the masses, electrical charges and locations of protons and neutrons in the nucleus and electrons in the electron cloud. |  | ☆4.DClassify matter as pure substances or mixtures through investigation of their properties. |  |
|  |  | ☆5.DRecognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts. |  |  |  |
|  |  | ☆5.B Identify that protons determine an element’s identity, and valence electrons determine its chemical properties including reactivity. | 6.D Relate the physical and chemical behavior of an element including bonding and classification to its placement on the Periodic Table. | ☆5.BUse the Periodic Table to identify and explain the properties of chemical families including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals. |  |
| ✔6.ACompare metals, nonmetals, and metalloids using physical properties such as luster, conductivity or malleability. |  |  | 6.C Analyze physical and chemical properties of elements and compounds such as, color, density, viscosity, buoyancy, boiling point, freezing point, conductivity, and reactivity. | ☆4.A Differentiate between physical and chemical changes and properties. |  |
| 5.D Identify the formation of a new substance by using the evidence of a possible chemical change such as production of a gas, change in temperature, production of a precipitate, or color change.  |  | ☆5.E Investigate how evidence of chemical reactions indicate that new substances with different properties are formed. | 7.B Recognize that chemical changes can occur when substances react to form different substances and that these interactions are largely determined by the valence electrons. |  |  |
|  |  |  |  | ✔7.DDescribe the nature of metallic bonding and apply the theory to explain metallic properties such as thermal and electrical conductivity, malleability and ductility. |  |
|  |  |  |  | ☆10.EDistinguish between types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions. |  |