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| **Standards**  **HS-PS1 Matter and Its Interactions**  **HS-ETS1 Engineering Design** | | |
| **Performance Expectation(s)**  *The chart below makes one set of connections between the instruction outlined in this article and the NGSS. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities. The materials/lessons/activities outlined in this article are just one step toward reaching the performance expectations listed below.*  **HS-PS1-2.** Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties**.** | | |
| **Dimension** | **Name and NGSS code /Citation** | **Specific connections to Classroom Activity** |
| Science and Engineering practices | **Constructing Explanations and designing solutions**   * Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources …. (HS-PS1-2) | Students create a chemoscan from common household materials ~~found~~ ~~at~~ ~~home~~.  Students explain the type process and predict the outcome of the chemoscan chemical reaction. |
| Disciplinary Core Ideas | **ETS1.B: Developing Possible Solutions**   * When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics~~.~~   **PS1.A: Structure and Properties of Matter**   * The periodic table orders elements horizontally by the number of protons in the atom’s nucleus and places those with similar chemical properties in columns…(HS-PS1-2)   **PS1.B: Chemical Reactions**   * Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules… | Students choose which materials to use from their home and determine its aesthetic appeal, cost, and outcome of reaction.  Students predict the possible outcome of the chemical reaction they have designed and test it.  The students will use their knowledge of the periodic table to determine which elements will react in the manner they wish for their chemoscan design. |
| **Crosscutting Concepts** | **Patterns**   * Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS1-2) | Students use the periodic table and its patterns to determine the nature of the reaction they have chosen for the chemoscan. |
| **Connections to Nature of Science** | Science investigations use diverse methods and do not always use the same set of procedures to obtain data | The students create chemoscans to determine if the chemical reaction they hypothesized met their standards. |
| **Common Core State Standards** | **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-2)  **WHST.9-12.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-PS1-2) | Students write an artist’s statement which answers the questions:  What did I do?  How did I do it?  Why did I do it this way?  What influenced me most?  How does my art relate to the art of my peers?  What do I want others to understand about my art?  What is the chemical equation for the chemoscan reaction?  Am I unwilling to discuss any aspects of my work? If so, why? |

HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. [Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.\* [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.]