**Physical**

**Science**

**Observation for Continued Assessment and End of the Year Evaluation**

This document is designed to assist in monitoring an individual student’s progress throughout the school year. The 2010 Science Virginia Standards of Learning Curriculum Framework establishes the foundation for the knowledge and skills each student should acquire.

Seven spaces are provided by each skill within this document for recording a student’s proficiency level (score of 4, 3, 2, or 1). The Comments section, after each standard, allows the teacher to provide specific information on observations, areas of strength, areas needing additional instruction, and a suggested plan for increasing student performance.

Student work, conversations with the student and observations provide evidence for the evaluation of performance. Evaluations are based on the student’s ability to explain, model, and apply learning.

This document is a fillable Word document. Complete the information on page 1 (below) and then click File, Save As the student's last name first initial and grade level. When entering a student's proficiency score on the appropriate line next to an SOL, click on the line and type the appropriate score number. When adding additional scores throughout the year/course, simply click onto the subsequent line and type the score number. Successive changes require a File, Save to ensure updates are properly recorded.

Student Name:

ID #:

School:

Teacher:

School Year:

**Modified and created by Dr. Dan Mulligan**

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**Scoring Rubric - Proficiency Levels**

* exhibits minimal performance
* shows very limited evidence of conceptual understanding and use of strategies
* responds with inappropriate answer and/or procedure frequently
* very often displays misunderstandings
* completes task appropriately and accurately infrequently
* needs assistance, guidance and modified instruction

Limited Proficiency (1)

* exhibits inconsistent performance and misunderstandings at times
* shows some evidence of conceptual understanding
* has difficulty applying strategies or completing tasks in unfamiliar situations
* responds with appropriate answer or procedure sometimes
* requires teacher guidance frequently
* needs additional time, opportunities
* demonstrates some proficient competencies but is inconsistent

Not Yet Proficient (2)

* exhibits consistent performance
* shows conceptual understanding
* applies strategies in most situations
* responds with appropriate answer or procedure
* completes task accurately; needs minimal assistance
* exhibits fluency and applies learning
* shows some flexibility in thinking
* works in confidence
* recognizes cause and effect relationships; applies models, and explains concepts

Proficient (3)

* consistent performance beyond grade level
* works independently; shows confidence and initiative
* understands advanced concepts
* applies strategies creatively
* analyzes and synthesizes
* justifies and elaborates responses
* makes critical judgments
* makes application and extensions beyond grade level; exceeds Proficient competencies in more challenging situations

Exceeds Expected Proficiency (4)

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| **Physical Science** |
|  | **PS.1 Overall Score** |
|                                                 | a. Make connections between the components of the nature of science and their investigations and the greater body of scientific knowledge and research |
|                                                 | b. Select appropriate equipment (probeware, triple beam balances, thermometers, metric rulers, graduated cylinders, electronic balances, or spring scales) and utlize correct techniques to measure length, mass, density, weight volume, temperature, and force |
|                                                 | c. Design a data table that includes space to organize all components of an investigation in a meaningful way, including levels of the independent variable, measured responses of the dependent variable, number of trials, and mathematical means |
|                                                 | d. Record measurements, using the following metric (SI) units: liter, milliliter (cubic centimeters), meter, centimeter, millimeter, grams, degrees Celsius, and newtons |
|                                                 | e. Recognize metric prefix units and make common metric conversions between the same base metric unit (for example, nanogram to milligram or kilometer to meter)  |
|                                                 | f. Use a variety of graphical methods to display data; create an appropriate graph for a given set of data; and select the proper type of graph for a given set of data, identify and label the axes, and plot the data points  |
|                                                 | g. Gather, evaluate, and summarize information, using multiple and variable resources, and detect bias from a given source |
|                                                 | h. Identify the key components of controlled experiments: hypotheses, independent and dependent variables, constants, controls, and repeated trials |
|                                                 | i. Formulate conclusions that are supported by the gathered data |
|                                                 | j. Apply the methodology of scientific inquiry: begin with a question, design an investigation, gather evidence, formulate an answer to the original question, communicate the investigative process and results, and realize this methodology does not always follow a prescribed sequence |
|                                                 | k. Communicate in written form the following information about investigations: the purpose/problem of the investigation, procedures, materials, data and/or observations, graphs, and an interpretation of the results |
|                                                 | l. Describe how creativity comes into play during various stages of scientific investigations |
|                                                 | m. Use current technologies to model and simulate experimental conditions |
|                                                 | n. Recognize examples of the use of nanotechnology and its applications |
| Comments |

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|  | **PS.2 Overall Score** |
|                                                 | a. Describe the particle theory of matter |
|                                                 | b. Describe how to determine whether a substance is an element, compound, or mixture |
|                                                 | c. Define compounds as inorganic or organic (all organic compounds contain carbon) |
|                                                 | d. Describe what a salt is and explain how salts form |
|                                                 | e. Describe the properties of solids, liquids, gases, and plasma  |
|                                                 | f. Distinguish between physical properties (i.e., shape, density, solubility, odor, melting point, boiling point, and color) and chemical properties (i.e., acidity, basicity, combustibility, and reactivity)  |
|                                                 | g. Find the mass and volume of substances and calculate and compare their densities |
|                                                 | h. Analyze the pH of a solution and classify it as acidic, basic, or neutral  |
|                                                 | i. Determine the identity of an unknown substance by comparing its properties to those of known substances |
|                                                 | j. Design an investigation from a testable question related to physical and chemical properties of matter. The investigation may be a complete experimental design or may focus on systematic observation, description, measurement, and/or data collection and analysis. (Students should be able to use the inquiry skills represented in PS.1 and LS.1 to compose a clear hypothesis, create an organized data table, identify variables and constants, record data correctly, construct appropriate graphs, analyze data, and draw reasonable conclusions.) |
| Comments |

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|  | **PS.3 Overall Score** |
|                                                 | a. Describe the historical development of the concept of the atom and the contributions of Dalton, Thomson, Rutherford, Bohr and other scientists (Schrodinger) |
|                                                 | b. Differentiate among the three basic particles in the atom (proton, neutron, and electron) and their charges, relative masses, and locations  |
|                                                 | c. Compare the Bohr atomic model to the electron cloud model with respect to its ability to represent accurately the three-dimensional structure of the atom |
| Comments |
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|  | **PS.4 Overall Score** |
|  | a. Use the periodic table to obtain the following information about the atom of an element |
|                                                 | 1. symbol
 |
|                                                 | 1. atomic number
 |
|                                                 | 1. atomic mass
 |
|                                                 | 1. state of matter at room temperature
 |
|                                                 | 1. number of outer energy level (valence) electrons
 |
|  | b. Describe the organization of the periodic table in terms of |
|                                                 | 1. atomic number
 |
|                                                 | 1. metals, metalloids, and nonmetals
 |
|                                                 | 1. groups/families vs. periods
 |
|                                                 | c. Recognize that an atom’s identity is related to the number of protons in its nucleus |
|                                                 | d. Categorize a given element as metal, nonmetal, or metalloid |
|                                                 | e. Given a chemical formula of a compound, identify the elements and the number of atoms of each that comprise the compound |
|                                                 | f. Recognize that the number of electrons in the outermost energy level determines an element’s chemical properties or chemical reactivity |
|                                                 | g. Describe the difference between ionic and covalent bonding |
|                                                 | h. Predict what kind of bond (ionic or covalent) will likely form when metals and nonmetals are chemically combined |
| Comments |

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|  | **PS.5 Overall Score** |
|                                                 | a. Compare and contrast physical, chemical, and nuclear changes |
|                                                 | b. Identify the reactants and products in a given chemical equation formula |
|                                                 | c. Design an investigation that illustrates physical and chemical changes |
|                                                 | d. Given chemical formulas, write and balance simple chemical equations |
|                                                 | e. Analyze experimental data to determine whether it supports the Law of Conservation of Mass  |
|                                                 | f. Recognize that some types of chemical reactions require continuous input of energy (endothermic) and others release energy  |
|                                                 | g. Describe, in simple terms, the processes that release nuclear energy (i.e., nuclear fission and nuclear fusion). Create a simple diagram to summarize and compare and contrast these two types of nuclear energy |
|                                                 | h. Evaluate the positive and negative effects of using nuclear energy  |
| Comments |

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|  | **PS.6 Overall Score** |
|                                                 | a. Differentiate between potential and kinetic energy |
|                                                 | b. Use diagrams or concrete examples to compare relative amounts of potential and kinetic energy |
|                                                 | c. Identify and give examples of common forms of energy |
|                                                 | d. Design an investigation or create a diagram to illustrate energy transformations |
| Comments |
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|  | **PS.7 Overall Score** |
|  | a. Distinguish between heat and temperature |
|                                                 | b. Compare and contrast Celsius and Kelvin temperature scales and describe absolute zero |
|                                                 | c. Illustrate and explain the effect of the addition or subtraction of thermal energy on the motion of molecules |
|                                                 | d. Analyze a time/temperature graph of a phase change experiment to determine the temperature at which the phase change occurs (freezing point, melting point, or boiling point) |
|                                                 | e. Compare and contrast methods of thermal energy transfer (conduction, convection, and radiation) and provide and explain common examples  |
|                                                 | f. Explain, in simple terms, how the principle of thermal energy transfer applies to heat engines, thermostats, refrigerators, heat pumps, and geothermal systems  |
|                                                 | g. Design an investigation form a testable question related to thermal energy transfer. The investigation may be a complete experimental design or may focus on systematic observation, description, measurement, and/or data collection and analysis |
| Comments |

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|  | **PS.8 Overall Score** |
|                                                 | a. Determine the relationship between frequency and wavelength |
|                                                 | b. Analyze factors that determine the speed of sound through various materials and interpret graphs and charts that display this information |
|                                                 | c. Identify examples illustrating resonance (e.g., musical instruments, Tacoma Narrows Bridge, crystal stemware) |
|                                                 | d. Model a compression (longitudinal) wave and diagram, label, and describe the basic components: wavelength, compression, rarefaction, and frequency |
|                                                 | e. Describe technological applications of sound waves and generally how each application functions  |
|                                                 | f. Design an investigation from a testable question related to sound. The investigation may be a complete experimental design or may focus on systematic observation, description, measurement, and/or data collection and analysis  |
| Comments |
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|  | **PS.9 Overall Score** |
|                                                 | a. Model a transverse wave and draw and label the basic components. Explain wavelength, amplitude, frequency, crest, and trough |
|                                                 | b. Describe the wave behavior of visible light (refraction, reflection, diffraction, and interference) |
|                                                 | c. Design an investigation to illustrate the behavior of visible light-reflection and refraction. Describe how reflection and refraction occur |
|                                                 | d. Identify the images formed by lenses and mirrors |
|                                                 | e. Compare the various types of electromagnetic waves in terms of wavelength, frequency, and energy |
|                                                 | f. Describe an everyday application of each of the major forms of electromagnetic energy |
| Comments |

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|  | **PS.10 Overall Score** |
|                                                 | a. Make measurements to calculate the speed of a moving object |
|                                                 | b. Apply the concepts of speed, velocity, and acceleration when describing motion |
|                                                 | c. Differentiate between mass and weight |
|                                                 | d. Identify situations that illustrate each Law of Motion |
|                                                 | e. Explain how force, mass, and acceleration are related  |
|                                                 | f. Apply the concept of mechanical advantage to test and explain how a machine makes work easier  |
|                                                 | g. Make measurements to calculate the work done on an object |
|                                                 | h. Make measurements to calculate the power of an object  |
|  | i. Solve basic problems given the following formulas |
|                                                 | 1. Speed = distance/time (s=d/t)
 |
|                                                 | 1. Force = mass x acceleration (F= ma)
 |
|                                                 | 1. Work = force x distance (W=Fd)
 |
|                                                 | 1. Power = work/time (P=W/t)
 |
|                                                 | j. Explain how the concepts of work, force, and motion apply to everyday uses and current technologies |
| Comments |
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|  | **PS.11 Overall Score** |
|                                                 | a. Design an investigation to illustrate the effects of static electricity |
|                                                 | b. Construct and compare series and parallel circuits |
|                                                 | c. Create an electromagnet and explain how it works |
|                                                 | d. Explain the relationship between a magnetic field and an electric current |
|                                                 | e. Construct simple circuits to determine the relationship between voltage, resistance, and current  |
|                                                 | f. Compare and contrast generators and motors and how they function  |
|                                                 | g. Identify situations in everyday life in which motors and generators are used |
|                                                 | h. Provide examples of materials that are good conductors, semiconductors, and insulators  |
|                                                 | i. Identify current applications of semiconductors and their uses (e.g., diodes and transistors) |
| Comments |