

**Louisiana Science Grades 9–12
Grade Level Expectation Mapping**

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Physical Science (Grade 9)	Boardworks High School Chemistry Presentation
Measurement and Symbolic Representation	
1. Measure the physical properties of different forms of matter in metric system units (e.g., length, mass, volume, temperature) (PS-H-A1)	–
2. Gather and organize data in charts, tables, and graphs (PS-H-A1)	–
3. Distinguish among symbols for atoms, ions, molecules, and equations for chemical reactions (PS-H-A2)	Formation of Ions The Periodic Table Reacting Masses
4. Name and write chemical formulas using symbols and subscripts (PS-H-A2)	Naming Compounds
Atomic Structure	
5. Identify the three subatomic particles of an atom by location, charge, and relative mass (PS-H-B1)	Atomic Structure
6. Determine the number of protons, neutrons, and electrons of elements by using the atomic number and atomic mass from the periodic table (PS-H-B1)	Atomic Number and Mass Number
7. Describe the results of loss/gain of electrons on charges of atoms (PS-H-B1) (PS-H-C5)	Formation of Ions Ionic Bonding
8. Evaluate the uses and effects of radioactivity in people's daily lives (PS-H-B2)	Gamma Rays Radioactivity Uses of Radiation
9. Compare nuclear fission to nuclear fusion (PS-H-B2)	Nuclear Fission Nuclear Fusion
10. Identify the number of valence electrons of the first 20 elements based on their positions in the periodic table (PS-H-B3)	Electron Structure and the Periodic Table
The Structure and Properties of Matter	
11. Investigate and classify common materials as elements, compounds, or mixtures (heterogeneous or homogeneous) based on their physical and chemical properties (PS-H-C1)	Compounds Solutions
12. Classify elements as metals or nonmetals based on their positions in the periodic table (PS-H-C2)	Electron Structure and The Periodic Table The Periodic Table
13. Predict how factors such as particle size and temperature influence the rate of dissolving (PS-H-C3)	Solutions Solubility
14. Investigate and compare methods for separating mixtures by using the physical properties of the components (PS-H-C4) (PS-H-C1)	Separating Mixtures
15. Using selected elements from atomic numbers 1 to 20, draw Bohr models (PS-H-C5) (PS-H-B3)	Electron Configuration

16. Name and write the formulas for simple ionic and covalent compounds (PS-H-C5)	Ionic Bonding Ionic Compounds Covalent Bonding Why do atoms form bonds?
17. Name and predict the bond type formed between selected elements based on their locations in the periodic table (PS-H-C5)	Electron Structure and the Periodic Table Why do atoms form bonds?
18. Diagram or construct models of simple hydrocarbons (four or fewer carbons) with single, double, or triple bonds (PS-H-C6)	Hydrocarbons
19. Analyze and interpret a graph that relates temperature and heat energy absorbed during phase changes of water (PS-H-C7)	Changing State
20. Predict the particle motion as a substance changes phases (PS-H-C7) (PS-H-C3)	Changing State Particles in Action
Chemical Reactions	
21. Classify changes in matter as physical or chemical (PS-H-D1)	–
22. Identify evidence of chemical changes (PS-H-D1)	Endothermic Reactions Exothermic Reactions
23. Classify unknowns as acidic, basic, or neutral using indicators (PS-H-D2)	Properties of Acids and Alkalis pH and Indicators
24. Identify balanced equations as neutralization, combination, and decomposition reactions (PS-H-D3)	Neutralization Reacting Masses Redox Reactions Thermal Decomposition
25. Determine the effect of various factors on reaction rate (e.g., temperature, surface area, concentration, agitation) (PS-H-D4)	Concentration Pressure and Reaction Rates Rates of Reaction Surface Area Catalysts and Reaction Rates Temperature and Reaction Rates
26. Illustrate the laws of conservation of matter and energy through balancing simple chemical reactions (PS-H-D5) (PS-H-D3) (PS-H-D7)	Conservation of Mass Reacting Masses
27. Distinguish between endothermic and exothermic reactions (PS-H-D6)	Endothermic Reactions Exothermic Reactions
28. Identify chemical reactions that commonly occur in the home and nature (PS-H-D7)	–

Chemistry (Grades 11-12)	Boardworks High School Chemistry Presentation
Measurement and Symbolic Representation	
1. Convert metric system units involving length, mass, volume, and time using dimensional analysis (i.e., factor-label method) (PS-H-A1)	–
2. Differentiate between accuracy and precision and evaluate percent error (PS-H-A1)	–
3. Determine the significant figures based on precision of measurement for stated quantities (PS-H-A1)	–
4. Use scientific notation to express large and small numbers (PS-H-A1)	–
5. Write and name formulas for ionic and covalent compounds (PS-H-A2)	Naming Compounds
6. Write and name the chemical formula for the products that form from the reaction of selected reactants (PS-H-A2)	Reacting Masses
7. Write a balanced symbolic equation from a word equation (PS-H-A2)	Reacting Masses
Atomic Structure	
8. Analyze the development of the modern atomic theory from a historical perspective (PS-H-B1)	Introducing Atoms
9. Draw accurate valence electron configurations and Lewis dot structures for selected molecules, ionic and covalent compounds, and chemical equations (PS-H-B1)	Electron Configuration Covalent Bonding Ionic Bonding
10. Differentiate among alpha, beta, and gamma emissions (PS-H-B2)	Types of Radiation Gamma Rays
11. Calculate the amount of radioactive substance remaining after a given number of half-lives has passed (PS-H-B2)	Radioactive Dating Half Life
12. Describe the uses of radioactive isotopes and radiation in such areas as plant and animal research, health care, and food preservation (PS-H-B2)	Gamma Rays Uses of Radiation
13. Identify the number of bonds an atom can form given the number of valence electrons (PS-H-B3)	Why do Atoms Form Bonds?
The Structure and Properties of Matter	
14. Identify unknowns as elements, compounds, or mixtures based on physical properties (e.g., density, melting point, boiling point, solubility) (PS-H-C1)	Comparing Bonding Compounds
15. Predict the physical and chemical properties of an element based only on its location in the periodic table (PS-H-C2)	Electron Structure and the Periodic Table
16. Predict the stable ion(s) an element is likely to form when it reacts with other specified elements (PS-H-C2)	The Periodic Table
	Formation of Ions

17. Use the periodic table to compare electronegativities and ionization energies of elements to explain periodic properties, such as atomic size (PS-H-C2)	Electron Structure and The Periodic Table The Periodic Table Patterns of Behavior Electronegativity Ionization Energy
18. Given the concentration of a solution, calculate the predicted change in its boiling and freezing points (PS-H-C3)	Solubility
19. Predict the conductivity of a solution (PS-H-C3)	Ionic Compounds
20. Express concentration in terms of molarity, molality, and normality (PS-H-C3)	What Are Moles?
21. Design and conduct a laboratory investigation in which physical properties are used to separate the substances in a mixture (PS-H-C4)	Separating Mixtures
22. Predict the kind of bond that will form between two elements based on electronic structure and electronegativity of the elements (e.g., ionic, polar, nonpolar) (PS-H-C5)	Covalent Bonding Electronegativity Ionic Bonding Metallic Bonding Why do Atoms Form Bonds?
23. Model chemical bond formation by using Lewis dot diagrams for ionic, polar, and nonpolar compounds (PS-H-C5)	–
24. Describe the influence of intermolecular forces on the physical and chemical properties of covalent compounds (PS-H-C5)	Intermolecular Forces
25. Name selected structural formulas of organic compounds (PS-H-C6)	Functional Groups Giant Covalent Structures Hydrocarbons
26. Differentiate common biological molecules, such as carbohydrates, lipids, proteins, and nucleic acids by using structural formulas (PS-H-C6)	Nucleic Acids Polysaccharides Proteins
27. Investigate and model hybridization in carbon compounds (PS-H-C6)	Hydrocarbons
28. Name, classify, and diagram alkanes, alkenes, and alkynes (PS-H-C6)	Hydrocarbons
29. Predict the properties of a gas based on gas laws (e.g., temperature, pressure, volume) (PS-H-C7)	Ideal Gas Laws
30. Solve problems involving heat flow and temperature changes by using known values of specific heat and latent heat of phase change (PS-H-C7)	Calorimetry Changing State
Chemical Reactions	
31. Describe chemical changes and reactions using diagrams and descriptions of the reactants, products, and energy changes (PS-H-D1)	Endothermic Reaction Exothermic Reaction Reacting Masses

32. Determine the concentration of an unknown acid or base by using data from a titration with a standard solution and an indicator (PS-H-D2)	pH and Indicators Properties of Acids and Alkalis
33. Calculate pH of acids, bases, and salt solutions based on the concentration of hydronium and hydroxide ions (PS-H-D2)	Neutralization Properties of Acids and Alkalis
34. Describe chemical changes by developing word equations, balanced formula equations, and net ionic equations (PS-H-D3)	Reacting Masses
35. Predict products (with phase notations) of simple reactions, including acid/base, oxidation/reduction, and formation of precipitates (PS-H-D3)	Neutralization Redox Reactions Oxidation Numbers
36. Identify the substances gaining and losing electrons in simple oxidation-reduction reactions (PS-H-D3)	Redox Reactions Oxidation Numbers
37. Predict the direction of a shift in equilibrium in a system as a result of stress by using Le Chatelier's principle (PS-H-D4)	Le Chatelier's Principle
38. Relate the law of conservation of matter to the rearrangement of atoms in a balanced chemical equation (PS-H-D5)	Conservation of Mass Reacting Masses
39. Conduct an investigation in which the masses of the reactants and products from a chemical reaction are calculated (PS-H-D5)	Reacting Masses
40. Compute percent composition, empirical formulas, and molecular formulas of selected compounds in chemical reactions (PS-H-D5)	Types of Formulae
41. Apply knowledge of stoichiometry to solve mass/mass, mass/volume, volume/volume, and mole/mole problems (PS-H-D5)	What are Moles? Percentage Composition by Mass
42. Differentiate between activation energy in endothermic reactions and exothermic reactions (PS-H-D6)	Bonds and Activation Energy Endothermic Reactions Exothermic Reactions
43. Graph and compute the energy changes that occur when a substance, such as water, goes from a solid to a liquid state, and then to a gaseous state (PS-H-D6)	Changing State
44. Measure and graph energy changes during chemical reactions observed in the laboratory (PS-H-D6)	Endothermic Reaction Exothermic Reaction
45. Give examples of common chemical reactions, including those found in biological systems (PS-H-D7)	Combustion Exothermic Reactions Endothermic Reactions Fermentation
Forces and Motion	

46. Identify and compare intermolecular forces and their effects on physical and chemical properties (PS-H-E1)	Intermolecular Forces
Interactions of Energy and Matter	
47. Assess environmental issues related to the storage, containment, and disposal of wastes associated with energy production and use (PS-H-G4)	Chain Reactions Climate Change Dangers of Radiation The Impact of Mining Nuclear Fission