School Wide Benchmark Assessment Plan
Chemistry Standards

Test 1 September Test 3 January
Test 2 November Test 4 March

Test	# of STAR Questions	Category	Essential Science Standards
1	6	Atomic and Molecular Structure	**1. The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept:** a. Students know how to relate the position of an element in the periodic table to its atomic number and atomic mass. b. Students know how to use the periodic table to identify metals, semimetals, non-metals, and halogens. c. Students know how to use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electronegativity, and the relative sizes of ions and atoms. d. Students know how to use the periodic table to determine the number of electrons available for bonding. e. Students know the nucleus of the atom is much smaller than the atom yet contains most of its mass.
1	7	Chemical Bonds	**3. Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface. As the basis for understanding this concept:** a. Students know features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics. b. Students know the principal structures that form at the three different kinds of plate boundaries. c. Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes. d. Students know why and how earthquakes occur and the scales used to measure their intensity and magnitude. e. Students know there are two kinds of volcanoes: one kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows producing gentle slopes.
2	10	Conservation of Matter and Stoichiometry	**3. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. As a basis for understanding this concept:** a. Students know how to describe chemical reactions by writing balanced equations. b. Students know the quantity one mole is set by defining one mole of carbon 12 atoms to have a mass of exactly 12 grams. c. Students know one mole equals 6.02 x 1023 particles (atoms or molecules). d. Students know how to determine the molar mass of a molecule from its chemical formula and a table of atomic masses and how to convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure. e. Students know how to calculate the masses of reactants and products in a chemical reaction from the mass of one of the reactants or products and the relevant atomic masses.
2	6	Gasses and Their	**4. The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases.**

		Properties	**As a basis for understanding this concept:** a. Students know the random motion of molecules and their collisions with a surface create the observable pressure on that surface. b. Students know the random motion of molecules explains the diffusion of gases. c. Students know how to apply the gas laws to relations between the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases. d. Students know the values and meanings of standard temperature and pressure (STP). e. Students know how to convert between the Celsius and Kelvin temperature scales. f. Students know there is no temperature lower than 0 Kelvin.
3	**5**	**Acids & Bases**	**5. Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept:** a. Students know the observable properties of acids, bases, and salt solutions. b. Students know acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances. c. Students know strong acids and bases fully dissociate and weak acids and bases partially dissociate. d. Students know how to use the pH scale to characterize acid and base solutions.
3	**3**	**Solutions**	**7. Energy is exchanged or transformed in all chemical reactions and physical changes of matter. As a basis for understanding this concept:** a. Students know how to describe temperature and heat flow in terms of the motion of molecules (or atoms). b. Students know chemical processes can either release (exothermic) or absorb (endothermic) thermal energy. c. Students know energy is released when a material condenses or freezes and is absorbed when a material evaporates or melts. d. Students know how to solve problems involving heat flow and temperature changes, using known values of specific heat and latent heat of phase change.
3	**5**	**Chemical Thermodynamics**	**7. Energy is exchanged or transformed in all chemical reactions and physical changes of matter. As a basis for understanding this concept:** a. Students know how to describe temperature and heat flow in terms of the motion of molecules (or atoms). b. Students know chemical processes can either release (exothermic) or absorb (endothermic) thermal energy. c. Students know energy is released when a material condenses or freezes and is absorbed when a material evaporates or melts. d. Students know how to solve problems involving heat flow and temperature changes, using known values of specific heat and latent heat of phase change.
3	**4**	**Reaction Rates**	**8. Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules. As a basis for understanding this concept:** a. Students know the rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time. b. Students know how reaction rates depend on such factors as concentration, temperature, and pressure. c. Students know the role a catalyst plays in increasing the reaction rate.
4	**4**	**Chemical Equilibrium**	**9. Chemical equilibrium is a dynamic process at the molecular level. As a basis for understanding this concept:** a. Students know how to use LeChatelier's principle to predict the effect of changes in concentration, temperature, and pressure. b. Students know equilibrium is established when forward and reverse reaction rates are equal.
4	**2**	**Organic**	**10. The bonding characteristics of carbon allow the formation of many different organic molecules of varied**

		Chemistry and Biochemistry	**sizes, shapes, and chemical properties and provide the biochemical basis of life. As a basis for understanding this concept:** a. Students know large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits. b. Students know the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules. c. Students know amino acids are the building blocks of proteins**.**
4	**2**	**Nuclear Processes**	**11. Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion. As a basis for understanding this concept:** a. Students know protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons. b. Students know the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions. The change in mass (calculated by E=mc2) is small but significant in nuclear reactions. c. Students know some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions. d. Students know the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay. e. Students know alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.
4	**6**	**Investigation and Experimentation**	**1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:** a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. b. Identify and communicate sources of unavoidable experimental error. c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions. d. Formulate explanations by using logic and evidence. e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions. f. Distinguish between hypothesis and theory as scientific terms. g. Recognize the usefulness and limitations of models and theories as scientific representations of reality. h. Read and interpret topographic and geologic maps. i. Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). j. Recognize the issues of statistical variability and the need for controlled tests. k. Recognize the cumulative nature of scientific evidence. l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science. m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and

			water use decisions in California. n. Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets).