**Student Learning Objectives**
**STAR Test Review**

## Standard 1-Atomic and Molecular Structure

1. Relate the position of an element in the periodic table to its atomic number and atomic mass.
2. Use the periodic table to identify metals, semimetals (metalloids), nonmetals, and halogens.
3. 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.
4. Use the periodic table to determine the number of electrons available for bonding.
5. Know the nucleus of the atom is much smaller than the atom yet contains most of its mass.

## Standard 2- Chemical Bonds

6. Know atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.
7. Know chemical bonds between atoms in molecules such as $H_2$ , $CH_4$ , $NH_3$ , $H_2CCH_2$ , $N_2$ , $Cl_2$ , and many large biological molecules are covalent.
8. Know salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction.
9. Know the atoms and molecules in liquids move in a random pattern relative to one another because the intermolecular forces are too weak to hold the atoms or molecules in a solid form.
10. Know how to draw Lewis dot structures.

## Standard 3- Conservation of Matter and Stoichiometry

11. Describe chemical reactions by writing balanced equations.
12. Know the quantity *one mole* is set by defining one mole of carbon-12 atoms to have a mass of exactly 12 grams.
13. Know one mole equals $6.02 \times 10^{23}$ particles (atoms or molecules).
14. 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.
15. 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.

## Standard 4- Gases and Their Properties

16. Know the random motion of molecules and their collisions with a surface create the observable pressure on that surface.
17. Know the random motion of molecules explains the diffusion of gases
18. 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.
19. Know the values and meanings of standard temperature and pressure (STP)
20. Convert between the Celsius and Kelvin temperature scales.
21. Know there is no temperature lower than 0 Kelvin

## Standard 5- Acids and Bases

22. Know the observable properties of acids, bases, and salt solutions.
23. Know acids are hydrogen-ion donating and bases are hydrogen-ion accepting substances
24. Know strong acids and bases fully dissociate and weak acids and bases partially dissociate
25. Use the pH scale to characterize acid and base solutions

## Standard 6- Solutions

26. Define solute and solvent
27. Describe the dissolving process at the molecular level by using the concept of random molecular motion
28. Know how temperature, pressure, and surface area affect the dissolving process.
29. Calculate the concentration of a solute in terms of grams per liter, molarity, parts per million, and percent composition

## Standard 7- Chemical Thermodynamics

30. Describe the temperature and heat flow in terms of the motion of molecules (or atoms)
31. Know chemical processes can either release (exothermic) or absorb (endothermic) thermal energy
32. Know energy is released when a material condenses of freezes and is absorbed when a material evaporates or melts
33. Solve problems involving heat flow and temperature changes, using know values of specific heat and latent heat of phase change (heat of fusion, heat of vaporization, etc)

## Standard 8- Reaction Rates

34. Know the rate of a reaction is the decrease in concentration of reactants or the increase in the concentration of products with time
35. Know how reaction rates depend on such factors as concentration, temperature, and pressure
36. Know the role a catalyst plays in increasing the reaction rate

## Standard 9- Chemical Equilibrium

37. Use LeChatelier's principle to predict the effect of changes in concentration, temperature, and pressure
38. Know equilibrium is established when forward and reverse reaction rates are equal

## Standard 10- Organic Chemistry and Biochemistry

39. Know large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.
40. 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.
41. Know amino acids are the building blocks of proteins.

## Standard 11- Nuclear Processes

42. Know protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons
43. 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 $E= mc^2$) is small but significant in nuclear reactions.
44. Know some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions.
45. Know the 3 most common forms of radioactive decay (alpha, beta, gamma) and know how the nucleus changes in each type of decay
46. Know alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.