Tennessee Science

Chemistry I

Matter and Its Interactions CHEM1.PS1

1. Obtain, evaluate, and communicate information to compare historical models of the atom (from Democritus to quantum model) and construct explanations to show how scientific knowledge evolves over time based on scientific evidence. CHEM1.PS1.1
2. Use the Periodic Table as a model to predict chemical and physical properties of main group elements (e.g. reactivity, number of subatomic particles, valence electrons, electronegativity, ion charge, ionization energy, and atomic radius) based on locations on the periodic table. CHEM1.PS1.2
3. Model different representations of atoms (e.g. Lewis Dot Structures, Bohr Models, electron configurations). CHEM1.PS1.3
4. Use the periodic table and properties of elements to develop an explanation to predict the types of bonds that are formed between atoms. CHEM1.PS1.4
5. Evaluate the components of a substance to write the chemical name and formula using IUPAC criteria, including covalent compounds, ionic compounds, polyatomic ions, and common acids. CHEM1.PS1.5
6. Construct and use a model to show that atoms, and therefore mass, are conserved during a chemical reaction. Symbolically represent this by balancing chemical equations. CHEM1.PS1.6
7. Perform stoichiometric calculations involving the following relationships: mole-mole; mass-mass; mole-mass; mole-particle; and mass-particle. CHEM1.PS1.7
8. Use models to show a qualitative understanding of the concept of percent yield, limiting reactants, and excess reactants in a chemical reaction. CHEM1.PS1.8
9. Develop an explanation using the reactants in a chemical reaction to identify reaction type (i.e., synthesis, decomposition, combustion, single replacement, double replacement) and predict products. CHEM1.PS1.9
10. Conduct investigations and develop models to characterize the behavior of gases (e.g., pressure, volume, temperature). CHEM1.PS1.10
11. Develop an explanation for the behavior of gases using the Kinetic Molecular Theory and the Combined Gas Law. CHEM1.PS1.11

12 **Use the Ideal Gas Law (PV=nRT) to quantitatively evaluate the relationship among the number of moles, volume, pressure, and temperature for ideal gases.** CHEM1.PS1.12

13 **Create models of solutions to describe solutes and solvents, concentration of solutions, and the process of solvation.** CHEM1.PS1.13

14 **Quantitatively analyze solutions to describe concentration using molarity, percent composition, and ppm.** CHEM1.PS1.14

15 **Demonstrate separation methods such as evaporation, distillation, electrophoresis, and/or chromatography. Construct an argument to justify the use of certain separation methods under different conditions.** CHEM1.PS1.15

16 **Obtain, evaluate, and communicate information to identify acids and bases as a special class of compounds due to their unique properties.** CHEM1.PS1.16

17 **Use models to describe radioactive stability, radioactive decay, fusion, and fission.** CHEM1.PS1.17

18 **Develop and use models to compare alpha, beta, and gamma radiation in terms of mass, charge, and penetrating power. Identify examples of applications of different radiation types in everyday life.** CHEM1.PS1.18

Energy CHEM1.PS3

1 **Construct an explanation of thermal energy as a form of energy, and temperature as a measure of average kinetic energy of a group of particles.** CHEM1.PS3.1

2 **Analyze and interpret data using heating/cooling curves and phase diagrams.** CHEM1.PS3.2

3 **Analyze the energy changes involved in calorimetry by using the law of conservation of energy quantitatively (use of $q=mc\Delta T$) and qualitatively.** CHEM1.PS3.3

4 **Distinguish between endothermic and exothermic reactions by constructing potential energy diagrams and explaining the differences between the two using chemical terms (e.g. activation energy).** CHEM1.PS3.4

5 **Analyze data to explain how energy is absorbed or given off depending on the bonds formed and broken.** CHEM1.PS3.5