

## SCIENCE – CHEMISTRY

- CH.1 The student will investigate and understand that experiments in which variables are measured, analyzed, and evaluated produce observations and verifiable data. Key concepts include
- designated laboratory techniques;
  - safe use of chemicals and equipment;
  - proper response to emergency situations;
  - manipulation of multiple variables, using repeated trials;
  - accurate recording, organization, and analysis of data through repeated trials;
  - mathematical and procedural error analysis;
  - mathematical manipulations including SI units, scientific notation, linear equations, graphing, ratio and proportion, significant digits, and dimensional analysis;
  - use of appropriate technology including computers, graphing calculators, and probeware, for gathering data, communicating results, and using simulations to model concepts;
  - construction and defense of a scientific viewpoint; and
  - the use of current applications to reinforce chemistry concepts.
- CH.2 The student will investigate and understand that the placement of elements on the periodic table is a function of their atomic structure. The periodic table is a tool used for the investigations of
- average atomic mass, mass number, and atomic number;
  - isotopes, half lives, and radioactive decay;
  - mass and charge characteristics of subatomic particles;
  - families or groups;
  - periods;
  - trends including atomic radii, electronegativity, shielding effect, and ionization energy;
  - electron configurations, valence electrons, and oxidation numbers;
  - chemical and physical properties; and
  - historical and quantum models.
- CH.3 The student will investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations. Key concepts include
- nomenclature;
  - balancing chemical equations;
  - writing chemical formulas;
  - bonding types;
  - reaction types; and
  - reaction rates, kinetics, and equilibrium.
- CH.4 The student will investigate and understand that chemical quantities are based on molar relationships. Key concepts include
- Avogadro's principle and molar volume;
  - stoichiometric relationships;
  - solution concentrations; and
  - acid/base theory; strong electrolytes, weak electrolytes, and nonelectrolytes; dissociation and ionization; pH and pOH; and the titration process.
- CH.5 The student will investigate and understand that the phases of matter are explained by kinetic theory and forces of attraction between particles. Key concepts include
- pressure, temperature, and volume;
  - partial pressure and gas laws;
  - vapor pressure;
  - phase changes;
  - molar heats of fusion and vaporization;
  - specific heat capacity; and
  - colligative properties.
- CH.6 The student will investigate and understand how basic chemical properties relate to organic chemistry and biochemistry. Key concepts include
- unique properties of carbon that allow multi-carbon compounds; and
  - uses in pharmaceuticals and genetics, petrochemicals, plastics, and food.