GACE® Science Assessment Test I (024)
Curriculum Crosswalk

	Required Coursework Numbers														
Subarea I. Scientific Inquiry, Processes, Technology, and Society (30%)															
Objective 1: Understands the nature of scientific inquiry and processes, including the collection and analysis of data															
A. Understands methods of scientific inquiry and design															
• Identifying problems based on observations															
• Forming and testing hypotheses															
• Development of theories, models, and laws															
• Experimental design, including independent and dependent variables, controls, and sources of error															
• Process skills including observing, comparing, inferring, categorizing, generalizing, and concluding															
B. Understands the history and nature of scientific knowledge															
• Subject to change															
• Consistent with evidence															
• Based on reproducible evidence															
• Unifying concepts and processes, such as systems, models, constancy and change, equilibrium, form and function															
• Peer review															

	Required Coursework Numbers														
C. Understands the major historical developments of science															
• Accepted principles and models develop over time															
• Major developments in science, such as atomic theory and plate tectonics															
• Contributions of major historical figures such as Darwin and Newton															
D. Understands the processes involved in scientific data collection and manipulation															
• Common units of measurement (metric and English), including unit conversion and prefixes such as milli- and kilo-															
• Laboratory notebook practices															
• Organization, presentation, and communication of data, using appropriate tools															
• Basic data and error analysis, including determining mean, accuracy, precision, and sources of error															
E. Understands how to interpret and draw conclusions from data presented in tables, graphs, maps, and charts															
• Trends in data															
• Relationships between variables															
• Predictions based on data															
• Drawing valid conclusions based on data															

	Required Coursework Numbers														
F. Understands the procedures for correct preparation, storage, use, and disposal of laboratory materials															
• Appropriate and safe use of materials, such as chemicals and lab specimens															
• Safe disposal of materials															
• Appropriate storage															
• Preparations for classroom or field use of materials, such as preparing solutions and staining slides															
G. Understands how to use standard equipment in the laboratory and the field															
• Appropriate and safe use of equipment such as Bunsen burner, glassware, and microscopes															
• Appropriate storage of equipment such as pH probes and dissection equipment															
• Maintenance and calibration of equipment such as microscopes and balances															
• Preparation for classroom or field use, such as prelaboratory setup, classroom demonstrations, and field research															
H. Understands safety and emergency procedures in the laboratory															
• Location and use of standard safety equipment such as eyewash stations and showers															
• Laboratory safety rules for students															
• Appropriate apparel and conduct in the laboratory															

	Required Coursework Numbers														
• Emergency procedures for events such as fires, chemical spills, and injuries															
Objective 2: Understands the relationship of science and technology to society and the environment															
A. Understands that science and technology impact the environment and society															
• Acid rain															
• Air and water pollution															
• Greenhouse gases															
• Ozone layer depletion															
• Waste disposal and recycling															
• Green chemistry															
• Irrigation															
• Reservoirs and levees															
• Depletion of aquifers															
• Loss of biodiversity															
B. Understands major issues associated with energy production and the management of natural resources															
• Renewable and nonrenewable energy resources															
• Conservation, recycling, and sustainability															
• Pros and cons of power generation based on various sources, such as fossil and nuclear fuel, hydropower, wind power, solar power, and geothermal power															

	Required Coursework Numbers														
• Issues associated with the use and extraction of Earth's resources (e.g., mining, land reclamation, and deforestation)															
C. Understands applications of science and technology in daily life															
• Chemical properties of household products															
• Communication (e.g., wireless devices, GPS, satellites)															
• Science principles applied in commonly used consumer products such as batteries, lasers, polarized sunglasses, and fiber optic cables															
• Water purification															
• Common agricultural practices, such as the use of insecticides, herbicides, and genetically modified crops															
• DNA evidence in criminal investigations															
D. Understands the impact of science on public health issues															
• Nutrition, disease, and medicine															
• Biotechnology, such as genetic engineering															
• Medical technologies, such as medical imaging, X rays, and radiation therapy															
Subarea II. Physical Science (70%)															
Objective 1: Understands the organization of matter, the atomic model, and relationships involving energy and matter															
A. Understands the organization of matter															

	Required Coursework Numbers														
• Elements, compounds, and mixtures															
• Molecules, atoms, ions, and subatomic particles															
• Basic properties of solids, liquids, and gases															
B. Understands the basic structure of the atom															
• Atomic models															
• Atomic structure, including nucleus, electrons, protons, and neutrons															
• Atomic number, atomic mass, and isotopes															
• Electron arrangements															
• Radioactive decay processes and half-life															
• Fission and fusion															
C. Understands basic concepts and relationships involving energy and matter															
• Conservation of energy															
• Conservation of matter in chemical systems															
• Kinetic and potential energy															
• Conversions between different forms of energy, such as thermal, chemical, electrical, and mechanical															
• Chemical and physical properties/changes															
• Temperature scales, such as Celsius, Fahrenheit, and Kelvin															
• Conduction, convection, and radiation															

	Required Coursework Numbers														
D. Understands the states of matter and factors that affect phase changes															
• Basic assumptions of the kinetic theory of matter, such as the particles are in constant motion and the average speed of gas particles is related to temperature															
• Ideal gas laws															
• Phase transitions and the energy changes involved, such as heat of vaporization and heat of sublimation															
E. Understands applications of energy and matter relationships															
• Matter cycling (carbon, nitrogen, water)															
• Energy flow in ecosystems															
• Convection currents in the atmosphere, ocean, and mantle															
• Conservation of mass in the rock cycle															
• Chemical and physical changes in rocks															
• Impact of solar radiation on Earth and life															
• Energy transformations in living systems, such as photosynthesis and cellular respiration															
Objective 2: Understands chemistry, including periodic table, compounds, formulas, bonding, reactions, and solutions															
A. Understands how to name simple compounds and write their chemical formulas															
• Interpreting chemical formulas															
• Naming compounds based on formula															

	Required Coursework Numbers														
• Writing formulas based on name															
• Structural formulas, such as electron dot and Lewis structures															
B. Understands types of chemical interactions															
• Covalent bonding															
• Ionic bonding															
• Metallic bonding															
• Intermolecular forces such as hydrogen bonding															
C. Understands the mole concept and its applications															
• Avogadro's number															
• Molar mass															
• Percent composition															
D. Understands the organization of the periodic table and can use it to predict trends in physical and chemical properties															
• Elements arranged in groups and periods															
• Atomic number, atomic mass, and isotopic abundance															
• Symbols of the elements															
• Trends in physical properties based on position of elements on the periodic table															
• Trends in chemical reactivity based on position of elements on the periodic table															

	Required Coursework Numbers														
E. Understands basic concepts involved in chemical reactions															
• Balancing equations of simple chemical reactions															
• Simple stoichiometric calculations based on balanced equations															
• Endothermic and exothermic reactions															
• Factors that affect reaction rates, such as concentration, temperature, pressure, catalysts/enzymes, and activation energy															
• Factors that affect reaction equilibrium, including Le Chatelier's principle															
• Types of reactions, such as combustion, single or double replacement, decomposition, synthesis, and oxidation/reduction															
F. Understands simple acid-base chemistry															
• Properties of acids and bases															
• pH scale															
• Neutralization															
• Acid-base indicators, such as phenolphthalein, pH paper, and litmus paper															
G. Understands different types of solutions															
• Dilute and concentrated															
• Saturated, unsaturated, and supersaturated															
• Solvent and solute															

	Required Coursework Numbers														
• Concentration terms such as molarity															
• Preparation of solutions of varying concentrations															
H. Understands factors affecting the solubility of solids, liquids, and gases and the dissolving process															
• Effect of temperature, pressure, particle size, and agitation on the rate of dissolving															
• Effect of temperature and pressure on solubility, including solubility curves															
• Polar versus nonpolar solvents and solutes															
• Dissociation of ionic compounds such as salts in water (e.g., ionization, electrolytes)															
• Precipitation															
• Freezing point depression															
• Osmotic pressure															
Objective 3: Understands physics, including mechanics, electricity and magnetism, and wave properties															
A. Understands how to describe motion in one and two dimensions															
• Speed and velocity															
• Acceleration															
• Displacement															
• Linear momentum															
• Vector and scalar quantities															

	Required Coursework Numbers														
B. Understands Newton's three laws of motion															
• First law: inertia															
• Second law: F = ma															
• Third law: action-reaction forces															
C. Understands the concepts of mass, weight, and gravity															
• Distinction between mass and weight															
• Gravitational attraction															
• Acceleration due to gravity															
D. Understands how to analyze motion and forces															
• Friction															
• Collisions and conservation of linear momentum															
• Circular motion															
• Center of mass															
• Conservation of energy															
• Work, energy, and power															
• Projectile motion															
• Inclined planes															
• Periodic motion, including pendulums, oscillating springs, planetary orbits, and satellites															
• Basic fluid mechanics, including buoyancy, density, and pressure															
E. Understands simple machines															
• Mechanical advantage															

	Required Coursework Numbers														
• Types of simple machines, such as the wedge, screw, and lever															
• Concept of torque															
F. Understands the electrical nature of common materials															
• Electric charges															
• Electrostatic force (attraction and repulsion, Coulomb's law)															
• Conductivity, conductors, and insulators															
G. Understands basic electrical concepts															
• Direct current (DC) and alternating current (AC)															
• Current, resistance, voltage, and power															
• Ohm's law (V = IR)															
• Basic series and parallel circuits															
• Voltage sources, such as batteries and generators															
H. Understands the basic properties of magnetic fields and forces															
• Magnetic materials															
• Magnetic forces and fields, including magnetic poles, attractive and repulsive forces															
• Electromagnets															
I. Understands the electromagnetic spectrum															
• Nature of light, including wave properties and photons															

	Required Coursework Numbers														
• Visible spectrum and color															
• Electromagnetic spectrum, such as visible, ultraviolet, infrared, microwave, and gamma															
J. Understands the basic characteristics and types of waves															
• Transverse and longitudinal															
• Frequency, amplitude, wavelength, speed, and energy															
K. Understands basic wave phenomena															
• Reflection, refraction, diffraction, and dispersion															
• Absorption and transmission															
• Interference, scattering, and polarization															
• Total internal reflection															
• Doppler effect															
L. Understands basic optics															
• Mirrors															
• Lenses and their applications, such as the human eye, microscope, and telescope															
• Prisms															
M. Understands the basic characteristics and phenomena of sound															
• Pitch/frequency and loudness/intensity															
• Sound wave production, air vibrations, and resonance															
• Application of the Doppler effect to sound															