

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

Page | 1

Test Content Categories	Required Course Numbers										
<b>I. Scientific Methodology, Techniques, and History (11%)</b> <b>A. Methods of Scientific Inquiry and Design</b>											
1. Identifying problems based on observations 2. Forming and testing hypotheses 3. Development of theories, models, and laws 4. Experimental design, including independent and dependent variables, controls, and sources of error 5. Process skills including observing, comparing, inferring, categorizing, generalizing, and concluding 6. Nature of scientific knowledge a. subject to change b. consistent with evidence c. based on reproducible evidence d. includes unifying concepts and processes (e.g., systems, models, constancy and change, equilibrium, form and function)											

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

Page | 2

Test Content Categories	Required Course Numbers										
<b>B. Processes Involved in Scientific Data Collection and Manipulation</b>											
1. Common units of measurement (metric and English) including unit conversion and prefixes such as milli and kilo 2. Scientific notation and significant figures in collected data 3. Organization and presentation of data 4. Basic data and error analysis including determining mean, accuracy, precision, and sources of error											
<b>C. Interpret and Draw Conclusions from Data Presented in Tables, Graphs, Maps, and Charts</b>											
1. Trends in data 2. Relationships between variables 3. Predictions based on data 4. Drawing valid conclusions based on the data											

**Praxis® General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

Page | 3

Test Content Categories	Required Course Numbers										
<b>D. Procedures for Correct Preparation, Storage, Use, and Disposal of Laboratory Materials</b>											
1. Appropriate and safe use of materials (e.g., chemicals, lab specimens) 2. Safe disposal of materials 3. Appropriate storage 4. Preparation for classroom or field use (e.g., how to prepare a solution of given concentration, staining slides, labeling samples)											
<b>E. How to Use Standard Equipment in the Laboratory and the Field</b>											
1. Appropriate and safe use (e.g., Bunsen burner, glassware, GPS, microscope) 2. Appropriate storage (e.g., pH probes stored in appropriate buffer solution, dissection equipment, glassware) 3. Maintenance and calibration (e.g., cleaning microscopes, calibration of balances) 4. Preparation for classroom or field use (e.g., prelaboratory setup, classroom demonstrations, field research)											

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

Page | 4

Test Content Categories	Required Course Numbers										
<b>F. Safety and Emergency Procedures in the Laboratory</b>											
1. Location and use of standard safety equipment (e.g., eyewash, shower) 2. Laboratory safety rules for students 3. Appropriate apparel and conduct in the laboratory (e.g., wearing goggles) 4. Emergency procedures (e.g., fires, chemical spills, handling of injuries)											
<b>G. Major Historical Developments of Science</b>											
1. Accepted principles and models develop over time 2. Major developments in science (e.g., atomic theory, plate tectonics) 3. Contributions of major historical figures (e.g., Darwin, Newton)											

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

Page | 5

Test Content Categories	Required Course Numbers										
<b>II. Physical Science (38%)</b>											
<b>A. Basic Principles</b>											
<b>1. Structure of matter</b>											
<b>a. Elements, compounds, and mixtures</b>											
<b>b. Atoms, molecules, and ions</b>											
<b>c. Basic properties of solids, liquids, and gases</b>											
<b>2. Basic structure of the atom</b>											
a. Atomic models											
b. Atomic structure including nucleus, electrons, protons, and neutrons											
c. Atomic number, atomic mass, isotopes											
d. Electron arrangements (e.g., valence electrons)											
<b>3. Basic characteristics of radioactive materials</b>											
a. Radioisotopes											
b. Radioactive decay processes and half-life											
c. Characteristics of alpha particles, beta particles, and gamma radiation											
d. Fission and fusion											

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

Page | 6

Test Content Categories	Required Course Numbers									
<p>4. Basic concepts and relationships involving energy and matter</p> <ul style="list-style-type: none"> <li>a. Conservation of energy (first law of thermodynamics)</li> <li>b. Entropy changes (second law of thermodynamics)</li> <li>c. Conservation of matter in chemical systems</li> <li>d. Kinetic and potential energy</li> <li>e. Transformations between different forms of energy (thermal, chemical, radiant, nuclear, mechanical, electrical, electromagnetic)</li> <li>f. Differences between chemical and physical properties/changes</li> <li>g. Various temperature scales (Celsius, Fahrenheit, Kelvin)</li> <li>h. Transfer of thermal energy and its basic measurement               <ul style="list-style-type: none"> <li>– conduction, convection, and radiation</li> <li>– specific heat capacity</li> <li>– calorimetry (e.g., predict heat transfer in various systems)</li> </ul> </li> <li>i. Applications of energy and matter relationships               <ul style="list-style-type: none"> <li>– trophic level</li> <li>– matter cycling (carbon, nitrogen, water)</li> <li>– energy flow in ecosystems</li> <li>– convection currents in atmosphere, ocean, and mantle</li> <li>– conservation of mass in the rock cycle</li> <li>– chemical and physical changes in rocks</li> <li>– impact of solar radiation on Earth and life</li> <li>– energy transformations in living systems (e.g., photosynthesis, cellular respiration)</li> </ul> </li> </ul>										

**Praxis<sup>®</sup> General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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<b>B. Chemistry</b>											
<b>1. Periodicity and states of matter</b> <b>a. Periodic table of the elements</b> – 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 (e.g., atomic radius, ionization energy) – trends in chemical reactivity based on position of elements on the periodic table (e.g., metals, nonmetals, noble gases) <b>b. States of matter and factors that affect phase changes</b> – basic assumptions of the kinetic theory of matter (e.g., particles in constant motion, average speed of gas particles related to temperature) – ideal gas laws (e.g., volume is proportional to temperature, pressure is inversely related to volume) – phase transitions and energy changes (e.g., heat of vaporization, heat of sublimation, phase diagrams, heating curves)											

**Praxis<sup>®</sup> General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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Page   8 2. Chemical nomenclature, composition, and bonding a. Name of simple compounds and their chemical formulas – interpreting chemical formulas – naming compounds based on formula – writing formulas based on name – structural formulas (e.g., electron dot, Lewis structures) b. Types of chemical bonding – covalent and ionic c. Mole concept and its applications – Avogadro’s number d. Molar mass and percent composition										
3. Chemical reactions a. Basic concepts involved in chemical reactions – use and balance equations of simple chemical reactions • balance equations • simple stoichiometric calculations based on balanced equations – endothermic and exothermic reactions – factors that affect reaction rates (e.g., concentration, temperature, pressure, catalysts/enzymes, activation energy) – factors that affect reaction equilibrium (e.g., Le Châtelier’s principle) – types of reactions (e.g., combustion, single or double replacement) – simple oxidation-reduction reactions										



**Praxis<sup>®</sup> General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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<b>4. Acid-base chemistry</b> <b>a. Simple acid-base chemistry</b> – chemical and physical properties of acids and bases – pH scale – neutralization – acid-base indicators (e.g., phenolphthalein, pH paper, litmus paper)											
<b>5. Solutions and solubility</b> <b>a. Different types of solutions</b> – dilute and concentrated – saturated, unsaturated, supersaturated – solvent and solute – concentration terms (e.g., molarity, parts per million (ppm)) – preparation of solutions of varying concentrations <b>b. Factors affecting the solubility of substances and the dissolving process</b> – effect of temperature, pressure, particle size, and agitation on the rate of dissolving – effect of temperature and pressure on solubility (e.g., solubility curves) – polar vs. nonpolar solvents and solutes – dissociation of ionic compounds such as salts in water (e.g., ionization, electrolytes) – precipitation – freezing point depression											

**Praxis<sup>®</sup> General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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<b>C. Physics</b>												
<b>1. Mechanics</b>												
<b>a. Description of motion in one and two dimensions</b> – speed, velocity, acceleration – displacement – linear momentum – vector and scalar quantities												
<b>b. Newton’s three laws of motion</b> – First law: inertia – Second law: $F = ma$ (i.e., net force, mass, and acceleration) – Third law: action-reaction forces												
<b>c. Mass, weight, and gravity</b> – distinguish between mass and weight – gravitational attraction (force of attraction between masses at various distances) – acceleration due to gravity												

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

Page | 11

Test Content Categories	Required Course Numbers										
d. Analysis of motion and forces <ul style="list-style-type: none"> <li>– projectile motion</li> <li>– inclined planes</li> <li>– friction</li> <li>– collisions (e.g., elastic, inelastic) and conservation of linear momentum</li> <li>– circular motion (e.g., centripetal acceleration, centripetal force)</li> <li>– center of mass</li> <li>– periodic motion (e.g., pendulums, oscillating springs, planetary orbits, satellites)</li> <li>– conservation of energy</li> <li>– work, energy, and power</li> <li>– basic fluid mechanics (e.g., buoyancy, density, pressure)</li> </ul>											
e. Simple machines <ul style="list-style-type: none"> <li>– mechanical advantage</li> <li>– types of simple machines (e.g., wedge, screw, lever)</li> <li>– concept of torque</li> </ul>											

**Praxis® General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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<p><b>2. Electricity and magnetism</b></p> <p><b>a. Electrical nature of common materials</b></p> <ul style="list-style-type: none"> <li>- electric charges</li> <li>- electrostatic force (attraction and repulsion, Coulomb’s law)</li> <li>- conductivity, conductors, and insulators</li> </ul> <p><b>b. Basic electrical concepts</b></p> <ul style="list-style-type: none"> <li>- DC and AC current</li> <li>- current, resistance, voltage, and power</li> <li>- Ohm’s law</li> <li>- analyze basic series and parallel circuits</li> <li>- voltage sources (e.g., batteries, generators)</li> </ul> <p><b>c. Basic properties of magnetic fields and forces</b></p> <ul style="list-style-type: none"> <li>- magnetic materials</li> <li>- magnetic forces and fields (e.g., magnetic poles, attractive and repulsive forces)</li> <li>- electromagnets</li> </ul>											

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

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<p>3. Optics and waves</p> <p>a. Electromagnetic spectrum</p> <ul style="list-style-type: none"> <li>– nature of light (e.g., wave properties, photons)</li> <li>– visible spectrum and color</li> <li>– electromagnetic spectrum (e.g., ultraviolet, microwave, gamma)</li> </ul> <p>b. Basic characteristics and types of waves</p> <ul style="list-style-type: none"> <li>– transverse and longitudinal</li> <li>– wave characteristics and relationships between them (e.g., frequency, amplitude, wavelength, speed, energy)</li> </ul> <p>c. Basic wave phenomena</p> <ul style="list-style-type: none"> <li>– reflection, refraction, diffraction, and dispersion</li> <li>– absorption and transmission</li> <li>– interference, scattering, and polarization</li> <li>– total internal reflection</li> <li>– Doppler effect (e.g., apparent frequency, moving source or observer, red/blue shift)</li> </ul> <p>d. Basic optics</p> <ul style="list-style-type: none"> <li>– mirrors</li> <li>– lenses and their applications (e.g., the human eye, microscope, telescope)</li> <li>– prisms</li> </ul> <p>e. Sound</p> <ul style="list-style-type: none"> <li>– pitch/frequency and loudness/intensity</li> <li>– sound wave production, air vibrations, and resonance (e.g., tuning forks)</li> <li>– application of the Doppler effect to sound</li> </ul>											

**Praxis® General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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<b>III. Life Science (20%)</b>											
<b>A. Basic Structure and Function of Cells and Their Organelles</b>											
1. Structure and function of cell membranes (e.g., phospholipid bilayer, passive and active transport)											
2. Structure and function of animal and plant cell organelles											
3. Levels of organization (cells, tissues, organs, organ systems). Major features of common animal cell types (e.g., blood cells, muscle, nerve, epithelial, gamete)											
4. Major features of common animal cell types (e.g., blood cells, muscle, nerve, epithelial, gamete)											
5. Prokaryotes (bacteria) and eukaryotes (animals, plants, fungi, protists)											
<b>B. Key Aspects of Cell Reproduction and Division</b>											
1. Cell cycle											
2. Mitosis											
3. Meiosis											
4. Cytokinesis											
<b>C. Basic Biochemistry of Life</b>											
1. Cellular respiration											
2. Photosynthesis											
3. Biological molecules (e.g., DNA, carbohydrates, proteins, lipids, enzymes)											

**Praxis® General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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<b>D. Basic Genetics</b>											
1. Structure (double helix, single stranded, and base pairs) and function of DNA and RNA (replication, transcription, and translation) 2. Chromosomes, genes, alleles 3. Dominant and recessive traits 4. Mendelian inheritance (e.g., genotype, phenotype, use of Punnett squares, pedigrees) 5. Mutations, chromosomal abnormalities, and common genetic disorders											
<b>E. Theory and Key Mechanisms of Evolution</b>											
1. Mechanisms of evolution (e.g., natural selection) 2. Isolation mechanisms and speciation 3. Supporting evidence (e.g., fossil record, comparative genetics, homologous structures)											
<b>F. Hierarchical Classification Scheme</b>											

**Praxis® General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

Page | 16

Test Content Categories	Required Course Numbers									
1. Classification schemes (e.g., domain, class, genus) 2. Characteristics of bacteria, animals, plants, fungi, and protists										
<b>G. Major Structures of Plants and Their Functions</b>										
1. Characteristics of vascular and nonvascular plants 2. Structure and function of roots, leaves, and stems (e.g., stomata, xylem, phloem) 3. Asexual (budding) and sexual reproduction (flowers, fruit, seeds, spores) 4. Growth (e.g., germination, elongation) 5. Uptake and transport of nutrients and water 6. Responses to stimuli (e.g., light, temperature, water, gravity)										
<b>H. Basic Anatomy and Physiology of Animals, including the Human Body</b>										



## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

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<b>1. Response to stimuli and homeostasis</b> <b>2. Exchange with the environment (e.g., respiratory, excretory, and digestive systems)</b> <b>3. Internal transport and exchange (e.g., heart, arteries, veins, capillaries)</b> <b>4. Control systems (e.g., nervous and endocrine systems)</b> <b>5. Movement and support (e.g., skeletal and muscular systems)</b> <b>6. Reproduction and development</b> <b>7. Immune system (e.g., antibodies, autoimmune disorders)</b>												
<b>I. Key Aspects of Ecology</b>												
<b>1. Population dynamics</b> <b>a. growth curves and carrying capacity</b> <b>b. behavior (e.g., territoriality)</b> <b>c. intraspecific relationships (e.g., mating systems, social systems, competition)</b>												
<b>2. Community ecology</b> <b>a. niche</b> <b>b. species diversity</b> <b>c. interspecific relationships (e.g., predator-prey, parasitism)</b>												
<b>3. Ecosystems</b> <b>a. biomes</b> <b>b. stability and disturbances (e.g., glaciation, climate)</b>												

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

Page | 18

Test Content Categories	Required Course Numbers											
change, succession) c. energy flow (e.g., trophic levels, food webs) d. biogeochemical cycles (e.g., water, nitrogen, and carbon cycles, biotic/abiotic interaction)												
<b>IV. Earth and Space Science (20%)</b> <b>A. Physical Geology</b>												
<b>1. Types and basic characteristics of rocks and minerals and their formation processes</b> a. The rock cycle b. Characteristics of rocks and their formation processes (i.e., sedimentary, igneous, and metamorphic rock) c. Characteristics of minerals and their formation processes (e.g., classes of minerals, crystals, hardness)												
<b>2. Processes involved in erosion, weathering, and deposition of Earth's surface materials and soil formation</b> a. Erosion and deposition (e.g., agents of erosion) b. Chemical and physical (mechanical) weathering c. Characteristics of soil (e.g., types, soil profile) d. Porosity and permeability e. Runoff and infiltration												
<b>3. Earth's basic structure and internal processes</b> a. Earth's layers (e.g., lithosphere, mantle, core) b. Shape and size of Earth c. Geographical features (e.g., mountains, plateaus, mid-ocean ridges) d. Earth's magnetic field e. Plate tectonics theory and evidence												

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

Page | 19

Test Content Categories	Required Course Numbers										
<ul style="list-style-type: none"> <li>- folding and faulting (e.g., plate boundaries)</li> <li>- continental drift, seafloor spreading, magnetic reversals</li> <li>- characteristics of volcanoes (e.g., eruptions, lava, gases, hot spots)</li> <li>- characteristics of earthquakes (e.g., epicenters, faults, tsunamis)</li> <li>- seismic waves and triangulation</li> </ul>											
<b>4. The water cycle</b> a. Evaporation and condensation b. Precipitation c. Runoff and infiltration d. Transpiration											
<b>B. Historical Geology</b>											
<b>1. Historical geology</b> a. Principle of uniformitarianism b. Basic principles of relative age dating (e.g., superposition, stratigraphic correlation, fossil succession) c. Absolute (radiometric) dating d. Geologic time scale (e.g., age of Earth, scope of time) e. Fossil record as evidence of the origin and development of life (e.g., fossilization methods, mass extinctions, ice ages, meteor impacts)											
<b>C. Earth's Bodies of Water</b>											

**Praxis® General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

Page | 20

Test Content Categories	Required Course Numbers										
<b>1. Characteristics and processes of Earth’s oceans and other bodies of water</b> a. Distribution and location of Earth’s water b. Seawater composition c. Coastline topography and topography of ocean floor d. Tides, waves, currents e. Estuaries and barrier islands f. Islands, reefs, and atolls g. Polar ice, icebergs, and glaciers h. Lakes, ponds, and wetlands i. Streams, rivers, and river deltas j. Groundwater, water table, wells, and aquifers k. Geysers and springs l. Properties of water that affect Earth systems (e.g., density changes on freezing, high heat capacity, polar solvent, hydrogen bonding)											
<b>D. Meteorology and Climate</b>											
<b>1. Basic structure and composition of Earth’s atmosphere</b> a. Layers (e.g., stratosphere) b. Composition of atmosphere (e.g., percent oxygen and nitrogen) c. Atmospheric pressure and temperature											
<b>2. Basic concepts of meteorology</b> a. Relative humidity b. Dew point c. Wind (e.g., how it is generated and modified) d. Cloud types and formation											

**Praxis<sup>®</sup> General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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e. Types of precipitation (e.g., hail, rain) f. Air masses, fronts, storms, and severe weather (e.g., hurricanes, tornadoes) g. Development and movement of weather patterns <b>3. Major factors that affect climate and seasons</b> a. Effects of latitude, geographical location, and elevation (e.g., mountains and oceans) b. Effects of atmospheric circulation (e.g., trade winds, jet stream) c. Effects of ocean circulation d. Characteristics and locations of climate zones (e.g., Tropics, Arctic) e. Effect of the tilt of Earth's axis on seasons f. Effects of natural phenomena (e.g., volcanic eruptions, solar radiation variations) g. El Niño, La Niña											
<b>E. Astronomy</b>											
<b>1. Major features of the solar system</b> a. Structure of the solar system b. Laws of motion (e.g., gravitation, planetary orbits, satellites) c. Characteristics of the Sun, Moon, and planets d. Characteristics of asteroids, meteoroids, comets, and dwarf/minor planets e. Theories of origin of the solar system											
<b>2. Interactions of the Earth-Moon-Sun system</b> a. Earth's rotation and orbital revolution around the											

**Praxis® General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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Sun b. Effect on seasons c. Phases of the Moon d. Effect on tides e. Solar and lunar eclipses f. Time zones g. Effect of solar wind on Earth											
<b>3. Major features of the universe</b>  a. Galaxies (e.g., definition, relative size, Milky Way) b. Characteristics of stars and their life cycles – life cycle of star, e.g., white dwarf, red giant, supernova, nebulae, black holes – color, temperature, apparent brightness, absolute brightness, luminosity – Hertzsprung-Russell diagrams c. Dark matter d. Theories about the origin of the universe (e.g., Big Bang)											
<b>4. Contributions of space exploration and technology to our understanding of the universe</b>  a. Remote sensing devices (e.g., satellites, space probes, telescopes, spectral analysis) b. Search for water and life on other planets											
<b>V. Science, Technology, and Society (11%)</b> <b>A. Impact of Science and Technology on the Environment and Society</b>											

**Praxis® General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

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1. Air and water pollution (e.g., acid rain, eutrophication, groundwater pollution) 2. Climate change and greenhouse gases 3. Irrigation 4. Reservoirs and levees 5. Depletion of aquifers 6. Ozone layer depletion 7. Loss of biodiversity 8. Space exploration 9. Waste disposal (e.g., landfills) 10. Recycling 11. Environmentally friendly consumer products (e.g., biodegradable materials)											
<b>B. Major Issues associated with Energy Production and the Management of Natural Resources</b>											
1. Renewable and nonrenewable energy resources 2. Conservation and recycling 3. Pros and cons of power generation based on various resources including fossil and nuclear fuel,											

## Praxis® General Science: Content Knowledge (5435) Curriculum Crosswalk

Page | 24

Test Content Categories	Required Course Numbers											
hydropower, wind power, solar power, geothermal power, and alternative energy sources  4. Issues associated with the use and extraction of Earth's resources (e.g., mining, land reclamation, deforestation)												
<b>C. Applications of Science and Technology in Daily Life</b>												
1. Chemical properties of household products 2. Communication (e.g., wireless devices, GPS, satellites) 3. Science principles applied in commonly used consumer products (e.g., batteries, lasers, polarized sunglasses, and fiber optic cables) 4. Water purification 5. Common agricultural practices (e.g., genetically modified crops, use of herbicides and insecticides) 6. DNA evidence in criminal investigations 7. Nanotechnology												
<b>D. Impact of Science on Public Health Issues</b>												
1. Nutrition, disease, and medicine (e.g., vitamins, viruses, vaccines) 2. Biotechnology (e.g., genetic engineering, in vitro fertilization) 3. Medical technologies (e.g., medical imaging, X-rays,												



**Praxis<sup>®</sup> General Science: Content Knowledge (5435)  
Curriculum Crosswalk**

Page | 25

Test Content Categories	Required Course Numbers										
radiation therapy)											