| **Test Content Categories** | **Required Course Numbers** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **I. Earth and Space Sciences (32%)** |  |  |  |  |  |  |  |  |  |  |
| **A. Physical and Historical Geology** |  |  |  |  |  |  |  |  |  |  |
| 1. Knows the basic structure of Earth |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the processes involved in rock and mineral formation |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the processes and effects of weathering, erosion, and deposition, including wind, water, ice, and vegetation |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the concepts of plate tectonics and the processes involved with earthquakes, volcanoes, and mountain building |  |  |  |  |  |  |  |  |  |  |
| 1. Understands how geologic history can be learned by identifying patterns in rock formations and fossils in rock layers that relate to changes over time |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the human impact on land, water, air, and living things, and how to reduce negative human impacts |  |  |  |  |  |  |  |  |  |  |
| **B. Hydrosphere and Atmosphere** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands basic characteristics and processes in the ocean |  |  |  |  |  |  |  |  |  |  |
| 1. Knows the distribution and characteristics of freshwater and salt water on Earth, including rivers, streams, lakes, polar ice, glaciers, and groundwater |  |  |  |  |  |  |  |  |  |  |
| 1. Knows the basic structure and composition of Earth's atmosphere |  |  |  |  |  |  |  |  |  |  |
| 1. Understands basic principles involved in weather conditions, including clouds, precipitation, storms, and tornadoes |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic distribution of climates in different regions of the world and variations due to seasons |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the effects of human use of renewable and nonrenewable natural resources |  |  |  |  |  |  |  |  |  |  |
| **C. Astronomy** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands patterns of motion in the solar system, including Earth’s rotation on its axis, Earth’s revolution around the Sun, the Moon’s revolution around Earth, and the revolution of planets around the Sun |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the processes involved in solar eclipses, lunar eclipses, and phases of the Moon |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the effects of the Moon and the Sun on tides, and how Earth’s tilt results in seasons |  |  |  |  |  |  |  |  |  |  |
| 1. Knows the basic properties of objects in the solar system, including the Sun, planets, asteroids, and comets |  |  |  |  |  |  |  |  |  |  |
| 1. Knows the basic structure of the universe, including galaxies, stars, and black holes |  |  |  |  |  |  |  |  |  |  |
| **II. Life Sciences (34%)** |  |  |  |  |  |  |  |  |  |  |
| **A. Cells and Organization** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the general structure and function of a cell and the structure and function of basic cell organelles |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic mechanisms of cell division |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the processes and purposes of photosynthesis and cellular respiration |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the organization of the human body, including tissues, organs, and systems |  |  |  |  |  |  |  |  |  |  |
| **B. Genetics and Evolution** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands basic patterns of inheritance, including genes, and understands that plants and animals have traits inherited from parents |  |  |  |  |  |  |  |  |  |  |
| 1. Understands that variation of traits exists among individuals within a group of organisms and how variations provide advantages in surviving, finding mates, and reproducing |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic mechanisms of evolutionary theory, including natural selection |  |  |  |  |  |  |  |  |  |  |
| **C. Classification and Characteristics of Organisms** |  |  |  |  |  |  |  |  |  |  |
| 1. Knows that organisms are classified within different groups based on shared characteristics, from the largest and broadest (kingdom) to smaller, more specific groups such as phylum, genus, and species |  |  |  |  |  |  |  |  |  |  |
| 1. Knows the general characteristics of various organisms such as mammals, reptiles, amphibians, birds, insects, plants, and microscopic organisms, including bacteria |  |  |  |  |  |  |  |  |  |  |
| **D. Plants** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic structure and function of plant structures, such as leaves, roots, stems, and flowers |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the fundamentals of plant reproduction and development, including the basic processes of pollination and seed dispersal |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic requirements for plant growth, including air, water, light, and nutrients |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic processes involved in the uptake and transport of nutrients and water |  |  |  |  |  |  |  |  |  |  |
| **E. Animal and Human Anatomy and Physiology** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic structures and functions of the circulatory, respiratory, excretory, and digestive systems |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic structures and functions of the skeletal and muscular systems |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic structures and processes involved in reproduction, development, and growth |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic structures and functions of the immune, nervous, and endocrine systems |  |  |  |  |  |  |  |  |  |  |
| **F. Ecology** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands interspecies and intraspecies relationships such as parasitism, mutualism, competition, and predation |  |  |  |  |  |  |  |  |  |  |
| 1. Knows the general characteristics of biomes such as tundras, coniferous forests, rainforests, grasslands, and deserts |  |  |  |  |  |  |  |  |  |  |
| 1. Understands energy pyramids, food webs, and energy flow and nutrient cycling involving plants, animals, decomposers, and the environment |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the effects of human and natural environmental changes, including climate change, habitat destruction, pollution, and invasive species |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the influence of biotic and abiotic components of an ecosystem such as resource availability, limiting factors, population growth, and carrying capacity on the populations of the ecosystem |  |  |  |  |  |  |  |  |  |  |
| **III. Physical Sciences (34%)** |  |  |  |  |  |  |  |  |  |  |
| **A. Structure and Properties of Matter** |  |  |  |  |  |  |  |  |  |  |
| 1. Knows properties of solids, liquids, and gases |  |  |  |  |  |  |  |  |  |  |
| 1. Understands physical and chemical properties such as mass, density, volume, solubility, and conductivity |  |  |  |  |  |  |  |  |  |  |
| 1. Knows the Celsius temperature scale |  |  |  |  |  |  |  |  |  |  |
| 1. Understands that various materials have different melting points and boiling points |  |  |  |  |  |  |  |  |  |  |
| 1. Distinguishes between elements, atoms, molecules, compounds, and mixtures |  |  |  |  |  |  |  |  |  |  |
| **B. Relationship Between Energy and Matter** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands conservation of energy and matter |  |  |  |  |  |  |  |  |  |  |
| 1. Understands forms of energy such as potential and kinetic energy and how energy can be converted from one form to another |  |  |  |  |  |  |  |  |  |  |
| 1. Knows chemical and physical properties of matter and that the total mass of matter stays the same when undergoing a physical or chemical change |  |  |  |  |  |  |  |  |  |  |
| 1. Knows how heat is transferred by convection, radiation, and conduction, and understands aspects of the greenhouse effect |  |  |  |  |  |  |  |  |  |  |
| 1. Understands phase changes, such as melting, freezing, sublimation, evaporation, and condensation |  |  |  |  |  |  |  |  |  |  |
| **C. Chemical Reactions** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands covalent and ionic bonding |  |  |  |  |  |  |  |  |  |  |
| 1. Understands simple chemical formulas |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the energy changes that take place in chemical reactions |  |  |  |  |  |  |  |  |  |  |
| 1. Understands basic properties of acids and bases and their relationship to the pH scale |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the basic concepts involving neutralization, oxidation, and combustion reactions |  |  |  |  |  |  |  |  |  |  |
| **D. Mechanics** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the relationships between distance, speed, velocity, and acceleration |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the effects of balanced and unbalanced forces, including collisions, friction, and air resistance |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the concepts and effects of gravity, weight, and mass |  |  |  |  |  |  |  |  |  |  |
| 1. Understands the tendency of an object to float or rise in a fluid when submerged (known as buoyancy) |  |  |  |  |  |  |  |  |  |  |
| **E. Electricity, Magnetism, Waves, and Optics** |  |  |  |  |  |  |  |  |  |  |
| 1. Understands basic principles involving magnets, including poles, attraction, and repulsion |  |  |  |  |  |  |  |  |  |  |
| 1. Understands electrostatic attraction and repulsion |  |  |  |  |  |  |  |  |  |  |
| 1. Understands basic principles of electricity involving simple circuits, batteries, and generators |  |  |  |  |  |  |  |  |  |  |
| 1. Understands basic concepts and phenomena involving light, including wave properties such as wavelength, frequency, amplitude, energy, and observations involving reflection, spectra, mirrors, and prisms |  |  |  |  |  |  |  |  |  |  |
| 1. Understands basic models involving sound, such as waves, pitch, loudness, and the Doppler effect |  |  |  |  |  |  |  |  |  |  |
| **Science and Engineering Practice(s)** |  |  |  |  |  |  |  |  |  |  |
| 1. Asking questions (for science) and defining problems (for engineering) |  |  |  |  |  |  |  |  |  |  |
| 1. Developing and using models |  |  |  |  |  |  |  |  |  |  |
| 1. Planning and carrying out investigations |  |  |  |  |  |  |  |  |  |  |
| 1. Analyzing and interpreting data |  |  |  |  |  |  |  |  |  |  |
| 1. Using mathematics and computational thinking |  |  |  |  |  |  |  |  |  |  |
| 1. Constructing explanations (for science) and designing solutions (for engineering) |  |  |  |  |  |  |  |  |  |  |
| 1. Engaging in argument from evidence |  |  |  |  |  |  |  |  |  |  |
| 1. Obtaining, evaluating, and communicating information |  |  |  |  |  |  |  |  |  |  |
| **Tasks of Teaching Science** |  |  |  |  |  |  |  |  |  |  |
| 1. Scientific Instructional Goals, Big Ideas, and Topics |  |  |  |  |  |  |  |  |  |  |
| 1. Scientific Investigations and Demonstrations |  |  |  |  |  |  |  |  |  |  |
| 1. Scientific Resources (texts, curriculum materials, journals, and other print and media-based resources) |  |  |  |  |  |  |  |  |  |  |
| 1. Student Ideas (including common misconceptions, alternate conceptions, and partial conceptions) |  |  |  |  |  |  |  |  |  |  |
| 1. Scientific Language, Discourse, Vocabulary, and Definitions |  |  |  |  |  |  |  |  |  |  |
| 1. Scientific Explanations (includes claim, evidence, and reasoning) |  |  |  |  |  |  |  |  |  |  |
| 1. Scientific Models and Representations (analogies, similes, metaphors, simulations, illustrations, diagrams, data tables, performances, videos, animations, graphs, and examples) |  |  |  |  |  |  |  |  |  |  |