

Reference to achievable
VIRGINIA STANDARDS OF LEARNING

GRADE FIVE

5.5 The student will investigate and understand that organisms are made of cells and have distinguishing characteristics.

- Five kingdoms of living things
- Vascular and nonvascular plants
- Vertebrates and invertebrates

5.6 The student will investigate and understand characteristics of the ocean environment.

- Physical characteristics (depth, salinity, major currents)
- Biological characteristics (ecosystems)
- Public policy decisions related to the ocean environment (assessment of marine organism populations, pollution prevention)

GRADE SIX

6.8 The student will investigate and understand that organisms perform life processes that are essential for the survival and perpetuation of the species.

- Energy transformation (from food or photosynthesis)
- Respiration, movement, waste removal, growth, irritability (response), and reproduction.

6.9 The student will investigate and understand that organisms depend on other organisms and the nonliving components of the environment.

- Producers, consumers, and decomposers
- Food webs and food pyramids
- Cycles (water, carbon dioxide/oxygen, nitrogen)

6.10 The student will investigate and understand public policy decisions relating to the environment.

- Management of renewable resources (water, air, plant life, animal life)
- Management of nonrenewable resources (coal, oil, natural gas, nuclear power)
- Cost/benefit tradeoffs in conservation policies

LIFE SCIENCE

LS.4 the student will investigate and understand that the basic needs of organisms must be met in order to carry out life processes.

- plant needs (light and energy sources, water, gases, nutrients);
- animal needs (food, water, gases, shelter, space); and
- factors that influence life processes

LS.5 The student will investigate and understand classification of organisms.

- differences in number, color, size, shape, and texture of external and internal structures; and
- variation in method of locomotion, obtaining nourishment, and reproduction.

LS.6 The student will investigate and understand the basic physical and chemical processes of photosynthesis and its importance to plant and animal life.

- energy transfer between sunlight and chlorophyll;
- transformation of water and carbon dioxide into sugar, water, and oxygen; and
- photosynthesis as the foundation of food webs

LS.7 The student will investigate and understand that organisms within an ecosystem are dependent on one another and on nonliving components of the environment.

- interactions resulting in a flow of energy and matter throughout the system;
- complex relationships in terrestrial, freshwater, and marine ecosystems; and
- Energy flow in food chains, food webs, and food pyramids

LS.8 The student will investigate and understand that interactions exist among members of a population.

- competition, cooperation, social hierarchy, territorial imperative; and
- influence of behavior on population interactions.

LS.9 The student will investigate and understand interactions among populations in a biological community.

- the relationship among producers, consumers, and decomposers in food chains and food webs;
- the relationship of predators and prey;
- competition and cooperation;
- symbiotic relationships and niches; and
- the role of parasites and their hosts.

LS.10 The student will investigate and understand how organisms adapt to biotic and abiotic factors in a biome.

- differences between ecosystems and biomes;
- characteristics of land, marine, and freshwater biomes; and
- adaptations that enable organisms to survive within a specific biome.

LS.11 The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic and change over time (daily, seasonal, and long term).

- phototropism, hibernation, and dormancy;
- factors that increase or decrease population size; and
- eutrophication, climate change, and catastrophic disturbances.

LS.12 The student will investigate and understand the relationships between ecosystem dynamics and human activity.

- food production and harvest;
- change in habitat size, quality, and structure;
- change in species competition;
- population disturbances and factors that threaten and enhance species survival; and
- environmental issues (water supply, air quality, energy production, and waste management).

EARTH SCIENCE

ES.3 The student will investigate and understand how to read and interpret maps, globes, models, charts, and imagery.

- maps (bathymetric, geologic, topographic, and weather) and star charts;
- imagery (aerial photography and satellite images); * direction and distance measurements on any map or globe; and
- location by latitude and longitude and topographic profiles.

ES.7 The student will investigate and understand the differences between renewable and nonrenewable resources.

- fossil fuels, minerals, rocks, water, and vegetation;
- advantages and disadvantages of various energy sources;
- resources found in Virginia; * use of resources and their effects on standards of living; and environmental costs and benefits

ES.8 The student will investigate and understand geologic processes including plate tectonics.

- how geologic processes are evidenced in the physiographic provinces of Virginia including the Coastal Plain, Piedmont, Blue Ridge, Valley and Ridge, and Appalachian Plateau;
- processes (faulting, folding, volcanism, metamorphism, weathering, erosion, deposition, and sedimentation) and their resulting features; and
- tectonic processes (subduction, rifting and sea floor spreading, and continental collision).

ES.9 The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans.

- processes of soil development; * development of karst topography;
- identification of groundwater zones including water table, zone of saturation, and zone of aeration; identification of other sources of fresh water including aquifers with reference to the hydrologic cycle; and
- dependence on freshwater resources and the affects of human usage on water quality._

ES.10 The student will investigate and understand that many aspects of the history and evolution of the Earth and life can be inferred by studying rocks and fossils.

- traces or remains of ancient, often extinct, life are preserved by various means in many sedimentary rocks;
- superposition, cross-cutting relationships, and radioactive decay are methods of dating bodies of rock;
- absolute and relative dating have different applications but can be used together to determine the age of rocks and structures; and

- rocks and fossils from many different geologic periods and epochs are found in Virginia

ES.11 The student will investigate and understand that oceans are complex, interactive physical, chemical, and biological systems and are subject to long- and short-term variations.

- physical and chemical changes (tides, waves, currents, sea level and ice cap variations, upwelling, and salinity concentrations);
- importance of environmental, geologic, and economic implications;
- systems interactions (energy transfer, weather, and climate); * features of the sea floor (continental margins, trenches, mid-ocean ridges, and abyssal plains) reflect tectonic processes; and
- public policy issues concerning the oceans.

ES.12 The student will investigate and understand the origin and evolution of the atmosphere and the interrelationship of geologic processes, biologic processes, and human activities on its composition and dynamics.

- scientific evidence for atmospheric changes over geologic time;
- current theories related to the effects of early life on the chemical makeup of the atmosphere;
- comparison of the Earth's atmosphere to that of other planets;
- atmospheric regulation mechanisms; and
- potential atmospheric compositional changes due to human, biologic, and geologic activity.

BIOLOGY

BIO.1 The student will plan and conduct investigations in which

- observations of living things are recorded in the lab and in the field;

BIO.3 The student will investigate and understand biochemical principles essential for life.

- water chemistry and its impact on life processes;
- the structure and function of macromolecules;
- the nature of enzymes; and
- the significance of and relationship between photosynthesis and respiration.

BIO.5 The student will investigate and understand life functions of monerans, protists, fungi, plants, and animals, including humans.

- how their structures are alike and different;
- comparison of their metabolic activities;
- analyses of their responses to the environment;
- maintenance of homeostasis;
- human health issues, human anatomy, body systems, and life functions;
- how viruses compare with organisms; and
- observation of local organisms when applicable.

BIO.7 The student will investigate and understand bases for modern classification systems.

- structural similarities in organisms; * fossil record interpretation;
- comparison of developmental stages in different organisms;
- examination of protein similarities and differences among organisms;
- comparison of DNA sequences in organisms;
- systems of classification that are adaptable to new scientific discoveries; and
- examination of local flora and fauna where applicable

BIO.8 The student will investigate and understand how populations change through time.

- examining evidence found in fossil records;
- investigating how variation of traits, reproductive strategies, and environmental pressures impact on the survival of populations;
- recognizing how adaptations lead to natural selection; and
- exploring how new species emerge

BIO.9 The student will investigate and understand dynamic equilibria within populations, communities, and ecosystems.

- interactions within and among populations including carrying capacities, limiting factors, and growth curves;
- nutrient cycling with energy flow through ecosystems;

- succession patterns in ecosystems;
- the effects of natural events and human influences on ecosystems; and
- analysis of local ecosystems.

CHEMISTRY

CH.6 The student will investigate and understand how basic chemical principles relate to other areas of chemistry.

- organic and biochemistry;
- nuclear chemistry; and
- environmental chemistry.