Virginia Science - VAAP

8th Grade

Scientific Investigation SCI-1

1 **The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations which** 8S-SI 1

a observations are made involving fine discrimination between similar objects and organisms; 8S-SI 1A

b precise and approximate measurements are recorded; 8S-SI 1B

c scale models are used to estimate distance, volume, and quantity; 8S-SI 1C

d hypotheses are stated in ways that identify the independent and dependent variables; 8S-SI 1D

e a method is devised to test the validity of predictions and inferences; 8S-SI 1E

f one variable is manipulated over time, using many repeated trials; 8S-SI 1F

g data are collected, recorded, analyzed, and reported using metric measurements and tools; 8S-SI 1G

h data are analyzed and communicated through graphical representation; 8S-SI 1H

i models and simulations are designed and used to illustrate and explain phenomena and systems. 8S-SI 1I

2 **The student will demonstrate an understanding of scientific reasoning, logic, andthe nature of science by planning and conducting investigations in which** 8S-SI 2

a data are organized into tables showing repeated trials and means; 8S-SI 2A

8S-SI 2b. a classification system is developed based on multiple attributes; 8S-SI 2B

c triple beam and electronic balances, thermometers, metric rulers, graduated cylinders, and probeware are used to gather data; 8S-SI 2C

d models and simulations are constructed and used to illustrate and explain; 8S-SI 2D

e sources of experimental error are identified; 8S-SI 2E

f dependent variables, independent variables, and constants are identified; 8S-SI 2F

g variables are controlled to test hypotheses, and trials are repeated; 8S-SI 2G

h data are organized, communicated through graphical representation, interpreted, and used to make predictions; 8S-SI 2H

i patterns are identified in data and are interpreted and evaluated. 8S-SI 2I

3 **The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which** 8S-SI 3

a chemicals and equipment are used safely; 8S-SI 3A

b length, mass, volume, density, temperature, weight, and force are accurately measured; 8S-SI 3B

8S-SI 3c . conversions are made among metric units, applying appropriate prefixes; 8S-SI 3C

d triple beam and electronic balances, thermometers, metric rulers, graduated cylinders, probeware, and spring scales are used to gather data; 8S-SI 3D

e numbers are expressed in scientific notation where appropriate; 8S-SI 3E

f independent and dependent variables, constants, controls, and repeated trials are identified; 8S-SI 3F

g data tables showing the independent and dependent variables, derived quantities, and the number of trials are constructed and interpreted; 8S-SI 3

h data tables for descriptive statistics showing specific measures of central tendency, the range of the data set, and the number of repeated trials are constructed and interpreted; 8S-SI 3H

i frequency distributions, scatter plots, line plots, and histograms are constructed and interpreted; 8S-SI 3O

j valid conclusions are made after analyzing data; 8S-SI 3J

k research methods are used to investigate practical problems and questions; 8S-SI 3K

l experimental results are presented in appropriate written form; 8S-SI 3L

m models and simulations are constructed and used to illustrate and explain phenomena. 8S-SI 3M

Force, Motion, Energy, and Matter SCI-2

1 **The student will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts include** 8S-FME 1

d potential and kinetic energy; 8S-FME 1D

e energy transformations. 8S-FME 1E

2 **The student will investigate and understand that all matter is made up of atoms. Key concepts include** 8S-FME 2

- a atoms consist of particles, including electrons, protons, and neutrons; 8S-FME 2A
- b atoms of a particular element are alike but are different from atoms of other elements; 8S-FME 2B
- c elements may be represented by chemical symbols; 8S-FME 2C
- d two or more atoms interact to form new substances, which are held together by electrical forces (bonds); 8S-FME 2D
- e compounds may be represented by chemical formulas; 8S-FME 2E
- f chemical equations can be used to model chemical changes; 8S-FME 2F
- g a limited number of elements comprise the largest portion of the solid Earth, living matter, the oceans, and the atmosphere. 8S-FME 2G

3 **The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include** 8S-FME 3

- a water as the universal solvent; 8S-FME 3A
- b the properties of water in all three phases. 8S-FME 3B

4 **The student will investigate and understand the properties of air and the structure and dynamics of Earth's atmosphere. Key concepts include** 8S-FME 4

- a air as a mixture of gaseous elements and compounds. 8S-FME 4A

5 **The student will investigate and understand the nature of matter. Key concepts include** 8S-FME 5

- a the particle theory of matter; 8S-FME 5A
- b elements, compounds, mixtures, acids, bases, and salts; 8S-FME 5B
- c solids, liquids, and gases; 8S-FME 5
- d physical properties; 8S-FME 5
- e chemical properties; 8S-FME 5E
- f characteristics of types of matter based on physical and chemical properties. 8S-FME 5F

Life Systems SCI-3

1 **The student will investigate and understand that all living things are composed of cells. Key concepts include** 8S-LS 1

- a cell structure and organelles; 8S-LS 1A
- b similarities and differences between plant and animal cells; 8S-LS 1B
- c development of cell theory; 8S-LS 1C
- d cell division. 8S-LS 1D

2 **The student will investigate and understand that living things show patterns of cellular organization. Key concepts include** 8S-LS 2

- a cells, tissues, organs, and systems; 8S-LS 2A
- b patterns of cell organization and their relationship to life processes in living things. 8S-LS 2B

3 **The student will investigate and understand how organisms can be classified. Key concepts include** 8S-LS 3

- a the distinguishing characteristics of domains of organisms; 8S-LS 3A
- b the distinguishing characteristics of kingdoms of organisms; 8S-LS 3B
- c the distinguishing characteristics of major animal phyla and plant divisions; 8S-LS 3C
- d the characteristics that define a species. 8S-LS 3D

4 **The student will investigate and understand the basic physical and chemical processes of photosynthesis and its importance to plant and animal life. Key concepts include** 8S-LS 4

- a energy transfer between sunlight and chlorophyll; 8S-LS 4A
- b transformation of water and carbon dioxide into sugar and oxygen; 8S-LS 4B
- c photosynthesis as the foundation of virtually all food webs. 8S-LS 4C

5 **The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Key concepts include** 8S-LS 5

- a the structure and role of DNA; 8S-LS 5A
- b the function of genes and chromosomes; 8S-LS 5B
- c genotypes and phenotypes; 8S-LS 5C
- d characteristics that can and cannot be inherited; 8S-LS 5D
- e genetic engineering and its applications; 8S-LS 5E
- f historical contributions and significance of discoveries related to genetics. 8S-LS 5F

6 **The student will investigate and understand that populations of organisms change over time. Key concepts include** 8S-LS 6

- a the relationships of mutation, adaptation, natural selection, and extinction. 8S-LS 6A

Ecosystems SCI-4

1 **The student will investigate and understand the natural processes and human interactions that affect watershed systems. Key concepts include** 8S-ECO 1

a the health of ecosystems and the abiotic factors of a watershed; 8S-ECO 1A

b the location and structure of Virginia's regional watershed systems; 8S-ECO 1B

c divides, tributaries, river systems, and river and stream processes; 8S-ECO 1C

d wetlands; 8S-ECO 1D

e estuaries; 8S-ECO 1E

f major conservation, health, and safety issues associated with watersheds; 8S-ECO 1F

g water monitoring and analysis using field equipment including hand-held technology. 8S-ECO 1G

2 **The student will investigate and understand that organisms within an ecosystem are dependent on one another and on nonliving components of the environment. Key concepts include** 8S-ECO 2

a the carbon, water, and nitrogen cycles; 8S-ECO 2A

b interactions resulting in a flow of energy and matter throughout the system; 8S-ECO 2B

c complex relationships within terrestrial, freshwater, and marine ecosystems; 8S-ECO 2C

d energy flow in food webs and energy pyramids. 8S-ECO 2D

3 **The student will investigate and understand that interactions exist among members of a population. Key concepts include** 8S-ECO 3

a competition, cooperation, social hierarchy, territorial imperative; 8S-ECO 3A

b influence of behavior on a population. 8S-ECO 3B

4 **The student will investigate and understand interactions among populations in a biological community. Key concepts include** 8S-ECO 4

a the relationships among producers, consumers, and decomposers in food webs; 8S-ECO 4A

b the relationship between predators and prey; 8S-ECO 4B

8S-ECO 4c . competition and cooperation; 8S-ECO 4C

d symbiotic relationships; 8S-ECO 4D

e niches. 8S-ECO 4E

5 **The student will investigate and understand how organisms adapt to biotic and abiotic factors in an ecosystem. Key concepts include** 8S-ECO 5

a differences between ecosystems and biomes; 8S-ECO 5A

8S-ECO 5b. characteristics of land, marine, and freshwater ecosystems; 8S-ECO 5B

c adaptations that enable organisms to survive within a specific ecosystem. 8S-ECO 5C

6 **The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic, change over time, and respond to daily, seasonal, and long-term changes in their environment. Key concepts include** 8S-ECO 6

a phototropism, hibernation, and dormancy; 8S-ECO 6A

b factors that increase or decrease population size; 8S-ECO 6B

c eutrophication, climate changes, and catastrophic disturbances. 8S-ECO 6C

7 **The student will investigate and understand the relationships between ecosystem dynamics and human activity. Key concepts include** 8S-ECO 7

a food production and harvest; 8S-ECO 7A

b change in habitat size, quality, or structure; 8S-ECO 7B

8S-ECO 7c. change in species competition; 8S-ECO 7C

8S-ECO 7d. population disturbances and factors that threaten or enhance species survival; 8S-ECO 7D

e environmental issues. 8S-ECO 7E

Earth and Space Systems SCI-5

1 **The student will investigate and understand basic sources of energy, their origins, transformations, and uses. Key concepts include** 8S-ESS 1

b the role of the sun in the formation of most energy sources on Earth; 8S-ESS 1B

c nonrenewable energy sources; 8S-ESS 1C

d renewable energy sources. 8S-ESS 1D

2 **The student will investigate and understand the role of solar energy in driving most natural processes within the atmosphere, the hydrosphere, and on Earth's surface. Key concepts include** 8S-ESS 2

a Earth's energy budget; 8S-ESS 2A

b the role of radiation and convection in the distribution of energy; 8S-ESS 2B

c the motion of the atmosphere and the oceans; 8S-ESS 2C

d cloud formation; 8S-ESS 2D

e the role of thermal energy in weather-related phenomena including thunderstorms and hurricanes. 8S-ESS 2E

3 The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include 8S-ESS 3

- c the action of water in physical and chemical weathering; 8S-ESS 3C
- d the ability of large bodies of water to store thermal energy and moderate climate; 8S-ESS 3D
- e the importance of water for agriculture, power generation, and public health; 8S-ESS 3E
- f the importance of protecting and maintaining water resources. 8S-ESS 3F

4 The student will investigate and understand the properties of air and the structure and dynamics of Earth's atmosphere. Key concepts include 8S-ESS 4

- b pressure, temperature, and humidity; 8S-ESS 4B
- c atmospheric changes with altitude; 8S-ESS 4C
- d natural and human-caused changes to the atmosphere and the importance of protecting and maintaining air quality; 8S-ESS 4D
- e the relationship of atmospheric measures and weather conditions; 8S-ESS 4E
- f basic information from weather maps including fronts, systems, and basic measurements. 8S-ESS 4F

5 The student will investigate and understand the organization of the solar system and the interactions among the various bodies that comprise it. Key concepts include 8S-ESS 5

- a the sun, moon, Earth, other planets and their moons, dwarf planets, meteors, asteroids, and comets; 8S-ESS 5A
- b relative size of and distance between planets; 8S-ESS 5B
- c the role of gravity; 8S-ESS 5C
- d revolution and rotation; 8S-ESS 5D
- e the mechanics of day and night and the phases of the moon; 8S-ESS 5E
- f the unique properties of Earth as a planet; 8S-ESS 5F
- g the relationship of Earth's tilt and the seasons; 8S-ESS 5G
- h the cause of tides; 8S-ESS 5H
- i the history and technology of space exploration. 8S-ESS 5I

6 The student will investigate and understand public policy decisions relating to the environment. Key concepts include 8S-ESS 6

a management of renewable resources; 8S-ESS 6A

b management of nonrenewable resources; 8S-ESS 6B

c the mitigation of land-use and environmental hazards through preventive measures; 8S-ESS 6C

8S-ESS 6d . cost/benefit tradeoffs in conservation policies. 8S-ESS 6D

7 The student will investigate and understand that populations of organisms change over time. Key concepts include 8S-ESS 7

b evidence of evolution of different species in the fossil record; 8S-ESS 7B

c how environmental influences, as well as genetic variation, can lead to diversity of organisms. 8S-ESS 7C