Biology

Subject: Science
Grade: 09
Expectations: 45
Breakouts: 191

(a) Introduction.

1. Biology. Students in Biology focus on patterns, processes, and relationships of living organisms through four main concept biological structures, functions, and processes; mechanisms of genetics; biological evolution; and interdependence within environmental systems. By the end of Grade 12, students are expected to gain sufficient knospbody of changing and increa should know that some questions are outside the realm of science because they deal with phenomena that are n currently scientifically testable.

3. Scientific hypotheses and theories. Students are expected to know that:

a. hypotheses are tentative and testable statements that must be capable of being supported or not suppor observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

b. scientific theories are based on natural and physical phenomena and are capable of being tested by mul independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable exw -29.3b a

6. Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.
7. Statements containing the word "including" refer to content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(b) Knowledge and Skills Statements

(1) Scientific and engineering practices. The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(i) ask questions based on observations or information from text, phenomena, models, or investigations

(ii) define problems based on observations or information from text, phenomena, models, or investigations

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(i) apply scientific practices to plan descriptive investigations

(ii)

(D) use appropriate tools such as microscopes, slides, Petri dishes, laboratory glassware, metric rulers, digital balance pipets, filter paper, micropipettes, gel electrophoresis and polymerase chain reaction (PCR) apparatuses, microcentrifuges, water baths, incubators, thermometers, hot plates, data collection probes, test tube holders, lab notebooks or journals, hand lenses, and models, diagrams, or samples of biological specimens or structures;

(i) use appropriate tools

(E) collect quantitative data using the International System of Units (SI) and qualitative data as evidence;

(i) collect quantitative data using the International System of Units (SI)

(ii) collect qualitative data as evidence

(F) organize quantitative and qualitative data using scatter plots, line graphs, bar graphs, charts, data tables, digital tools, diagrams, scientific drawings, and student-prepared models;

(i) organize quantitative data using scatter plots

(ii) organize quantitative data using line graphs

(iii) organize quantitative data using bar graphs

(iv) organize quantitative data using charts

(v) organize quantitative data using data tables

(vi) organize quantitative data using digital tools

(vii) organize quantitative data using diagrams

(viii) organize quantitative data using scientific drawings

(ix) organize quantitative data using student-prepared models

(x) organize qualitative data using charts

(xi) organize qualitative data using data tables

(xii) organize qualitative data using digital tools

(xiii) organize qualitative data using diagrams

(xiv) organize qualitative data using scientific drawings

(xv) organize qualitative data using student-prepared models

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(i) develop models to represent phenomena, systems, processes, or solutions to engineering problems

(ii) use models to represent phenomena, systems, processes, or solutions to engineering problems

(H) distinguish among scientific hypotheses, theories, and laws.

(i) distinguish among scientific hypotheses, theories, and laws

(2) Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(i) identify advantages of models

(ii)

(D) compare the structures of viruses to cells and explain how viruses spread and cause disease.

(i) compare the structures of viruses to cells

(ii) explain how viruses spread disease

(iii) explain how viruses cause disease

(6) Science concepts

(ii)

(viii) analyze [genetic recombination's] effect o.6 (s)1.s]c enc p .0026 (s)1a p]as(') 0 Tw (0 T9.7(11)Tj 0 /LBody

(ii) investigate how ecological relationships, including parasitism, influence ecosystem stability

(iii) investigate how ecological relationships, including commensalism, influence ecosystem stability

(iv) investigate how ecological relationships, including mutualism, influence ecosystem sticlity