Texas Biology Tutorials offer state standards-aligned targeted instruction, practice, and review designed to help students develop fluency, deepen conceptual understanding, and apply scientific thinking skills. Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By constantly honing their ability to explain and analyze biological scenarios, students build the depth of knowledge and higher-order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible through focused content, guided analysis, multi-modal representations, and personalized feedback as students reason through increasingly challenging problems. The Review It offers a high-impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

Unit 1: Nature of Science

- **WHAT IS SCIENCE?**
  - B.4.B: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and
  - B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - B.2.D: 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. evaluate experimental and engineering designs.
  - B.1.A: 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. ask questions and define problems based on observations or information from text, phenomena, models, or investigations;
  - B.1.B: 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. apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

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- B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
- B.1.H: 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. distinguish among scientific hypotheses, theories, and laws.

- **TYPES OF INVESTIGATIONS**
  - B.2.D: 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. evaluate experimental and engineering designs.
  - B.1.B: 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. apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;
  - B.1.D: 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. use appropriate tools such as microscopes, slides, Petri dishes, laboratory glassware, metric rulers, digital balances, 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;
  - B.1.A: 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. ask questions and define problems based on observations or information from text, phenomena, models, or investigations;
- **USING MODELS**
  - B.1.G: 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. develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and
  - B.2.A: 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. identify advantages and limitations of models such as their size, scale, properties, and materials;

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- B.2.C: 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. use mathematical calculations to assess quantitative relationships in data; and

Unit 2: Measurement and Data

- **TOOLS AND MEASUREMENT**
  - B.2.C: 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. use mathematical calculations to assess quantitative relationships in data; and
  - B.1.D: 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. use appropriate tools such as microscopes, slides, Petri dishes, laboratory glassware, metric rulers, digital balances, 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;
  - B.1.E: 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. collect quantitative data using the International System of Units (SI) and qualitative data as evidence;
  - B.1.D: 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. use appropriate tools such as microscopes, slides, Petri dishes, laboratory glassware, metric rulers, digital balances, 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;
- **DISPLAYING AND INTERPRETING DATA**
  - B.1.E: 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. collect quantitative data using the International System of Units (SI) and qualitative data as evidence;
  - B.1.F: 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

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

- B.2.B: 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. analyze data by identifying significant statistical features, patterns, sources of error, and limitations;
- B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
- B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
- B.2.C: 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. use mathematical calculations to assess quantitative relationships in data; and

Unit 3: Nature of Life

- **FROM ATOMS TO BIOSPHERE**
  - B.12.B: Science concepts--biological structures, functions, and processes. The student knows that multicellular organisms are composed of multiple systems that interact to perform complex functions. explain how the interactions that occur among systems that perform functions of transport, reproduction, and response in plants are facilitated by their structures.
- **CHARACTERISTICS OF LIFE**
  - B.5.B: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity;
  - B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
  - B.5.C: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. investigate homeostasis through the cellular transport of molecules; and
  - B.6.A: Science concepts--biological structures, functions, and processes. The student knows how an organism grows and the importance of cell differentiation. explain the importance of the cell cycle to

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the growth of organisms, including an overview of the stages of the cell cycle and deoxyribonucleic acid (DNA) replication models;

- B.10.A: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. analyze and evaluate how natural selection produces change in populations and not in individuals;
- B.6.B: Science concepts--biological structures, functions, and processes. The student knows how an organism grows and the importance of cell differentiation. explain the process of cell specialization through cell differentiation, including the role of environmental factors; and

Unit 4: Chemistry of Life

- **BIOMOLECULES**
  - B.5.A: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. relate the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids, to the structure and function of a cell;
  - B.7.A: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. identify components of DNA, explain how the nucleotide sequence specifies some traits of an organism, and examine scientific explanations for the origin of DNA;
- **ENZYMES**
  - B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
  - B.11.B: Science concepts--biological structures, functions, and processes. The student knows the significance of matter cycling, energy flow, and enzymes in living organisms. investigate and explain the role of enzymes in facilitating cellular processes.

Unit 5: Cell Structure and Function

- **PROKARYOTIC AND EUKARYOTIC CELLS**
  - B.4.B: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and
  - B.5.C: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. investigate homeostasis through the cellular transport of molecules; and
  - B.5.A: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that

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affect life. relate the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids, to the structure and function of a cell;

- B.5.B: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity;

- **PLANT AND ANIMAL CELLS**
  - B.5.B: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity;
- **PASSIVE TRANSPORT**
  - B.5.C: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. investigate homeostasis through the cellular transport of molecules; and
  - B.5.A: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. relate the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids, to the structure and function of a cell;
- **ACTIVE TRANSPORT**
  - B.5.A: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. relate the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids, to the structure and function of a cell;
  - B.4.A: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;
  - B.2.C: 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. use mathematical calculations to assess quantitative relationships in data; and
  - B.5.C: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. investigate homeostasis through the cellular transport of molecules; and

Unit 6: Cellular Energetics

- **PHOTOSYNTHESIS**

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- B.11.A: Science concepts--biological structures, functions, and processes. The student knows the significance of matter cycling, energy flow, and enzymes in living organisms. explain how matter is conserved and energy is transferred during photosynthesis and cellular respiration using models, including the chemical equations for these processes; and

- **CELLULAR RESPIRATION**

  - B.11.A: Science concepts--biological structures, functions, and processes. The student knows the significance of matter cycling, energy flow, and enzymes in living organisms. explain how matter is conserved and energy is transferred during photosynthesis and cellular respiration using models, including the chemical equations for these processes; and

Unit 7: The Cell Cycle and Mitosis

- **THE CELL CYCLE**

  - B.5.A: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. relate the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids, to the structure and function of a cell;
  - B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
  - B.6.B: Science concepts--biological structures, functions, and processes. The student knows how an organism grows and the importance of cell differentiation. explain the process of cell specialization through cell differentiation, including the role of environmental factors; and
  - B.6.A: Science concepts--biological structures, functions, and processes. The student knows how an organism grows and the importance of cell differentiation. explain the importance of the cell cycle to the growth of organisms, including an overview of the stages of the cell cycle and deoxyribonucleic acid (DNA) replication models;
  - B.6.C: Science concepts--biological structures, functions, and processes. The student knows how an organism grows and the importance of cell differentiation. relate disruptions of the cell cycle to how they lead to the development of diseases such as cancer.

- **MITOSIS**

  - B.6.A: Science concepts--biological structures, functions, and processes. The student knows how an organism grows and the importance of cell differentiation. explain the importance of the cell cycle to the growth of organisms, including an overview of the stages of the cell cycle and deoxyribonucleic acid (DNA) replication models;

Unit 8: Reproduction

- **SEXUAL AND ASEXUAL REPRODUCTION**

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- B.8.A: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids and the principles of inheritance and variation of traits in Mendelian and non-Mendelian genetics. analyze the significance of chromosome reduction, independent assortment, and crossing-over during meiosis in increasing diversity in populations of organisms that reproduce sexually; and
- B.10.B: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success;

- **MEIOSIS**
  - B.8.A: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids and the principles of inheritance and variation of traits in Mendelian and non-Mendelian genetics. analyze the significance of chromosome reduction, independent assortment, and crossing-over during meiosis in increasing diversity in populations of organisms that reproduce sexually; and
  - B.2.C: 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. use mathematical calculations to assess quantitative relationships in data; and
  - B.10.D: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. analyze evolutionary mechanisms other than natural selection, including genetic drift, gene flow, mutation, and genetic recombination, and their effect on the gene pool of a population.
  - B.10.B: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success;

Unit 9: DNA Structure and Function

- **COMPONENTS OF DNA**
  - B.7.A: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. identify components of DNA, explain how the nucleotide sequence specifies some traits of an organism, and examine scientific explanations for the origin of DNA;
  - B.5.A: Science concepts--biological structures, functions, and processes. The student knows that biological structures at multiple levels of organization perform specific functions and processes that affect life. relate the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids, to the structure and function of a cell;
  - B.4.B: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. relate the impact of past

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and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and

- **THE GENETIC CODE**
  - B.7.A: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. identify components of DNA, explain how the nucleotide sequence specifies some traits of an organism, and examine scientific explanations for the origin of DNA;
  - B.4.A: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;
  - B.7.B: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. describe the significance of gene expression and explain the process of protein synthesis using models of DNA and ribonucleic acid (RNA);
- **DNA REPLICATION**
  - B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
  - B.7.A: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. identify components of DNA, explain how the nucleotide sequence specifies some traits of an organism, and examine scientific explanations for the origin of DNA;
  - B.6.A: Science concepts--biological structures, functions, and processes. The student knows how an organism grows and the importance of cell differentiation. explain the importance of the cell cycle to the growth of organisms, including an overview of the stages of the cell cycle and deoxyribonucleic acid (DNA) replication models;

Unit 10: Gene Expression

- **TRANSCRIPTION**
  - B.7.B: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. describe the significance of gene expression and explain the process of protein synthesis using models of DNA and ribonucleic acid (RNA);
- **TRANSLATION**
  - B.7.B: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. describe the significance of gene expression and explain the process of protein synthesis using models of DNA and ribonucleic acid (RNA);
  - B.4.B: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. relate the impact of past

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and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and

- B.2.D: 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. evaluate experimental and engineering designs.
- B.4.A: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;

Unit 11: Mutations

- **GENETIC CHANGES IN DNA**
  - B.7.C: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. identify and illustrate changes in DNA and evaluate the significance of these changes; and
- **GENETIC CHANGES IN CHROMOSOMES**
  - B.8.A: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids and the principles of inheritance and variation of traits in Mendelian and non-Mendelian genetics. analyze the significance of chromosome reduction, independent assortment, and crossing-over during meiosis in increasing diversity in populations of organisms that reproduce sexually; and
  - B.10.D: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. analyze evolutionary mechanisms other than natural selection, including genetic drift, gene flow, mutation, and genetic recombination, and their effect on the gene pool of a population.
  - B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

Unit 12: Heredity

- **MENDELIAN LAWS OF HEREDITY**
  - B.4.B: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and
  - B.2.C: 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. use mathematical calculations to assess quantitative relationships in data; and

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- B.4.A: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;
- B.1.G: 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. develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and
- B.8.B: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids and the principles of inheritance and variation of traits in Mendelian and non-Mendelian genetics. predict possible outcomes of various genetic combinations using monohybrid and dihybrid crosses, including non-Mendelian traits of incomplete dominance, codominance, sex-linked traits, and multiple alleles.

- **MULTIPLE ALLELES AND ALLELES WITHOUT DOMINANCE**
  - B.8.B: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids and the principles of inheritance and variation of traits in Mendelian and non-Mendelian genetics. predict possible outcomes of various genetic combinations using monohybrid and dihybrid crosses, including non-Mendelian traits of incomplete dominance, codominance, sex-linked traits, and multiple alleles.
  - B.2.C: 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. use mathematical calculations to assess quantitative relationships in data; and
  - B.1.G: 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. develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and
  - B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
- **BIOTECHNOLOGY**
  - B.3.C: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.
  - B.7.D: Science concepts--mechanisms of genetics. The student knows the role of nucleic acids in gene expression. discuss the importance of molecular technologies such as polymerase chain reaction

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(PCR), gel electrophoresis, and genetic engineering that are applicable in current research and engineering practices.

- B.4.B: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and

Unit 13: Evolution

- **MULTIPLE LINES OF EVIDENCE**
  - B.9.A: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple lines of evidence. analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental; and
  - B.4.B: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and
- **THE FOSSIL RECORD**
  - B.9.B: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple lines of evidence. examine scientific explanations for varying rates of change such as gradualism, abrupt appearance, and stasis in the fossil record.
  - B.9.A: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple lines of evidence. analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental; and

Unit 14: Mechanisms of Evolution

- **NATURAL SELECTION**
  - B.10.A: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. analyze and evaluate how natural selection produces change in populations and not in individuals;
  - B.10.B: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success;
- **EVOLUTION OF SPECIES**
  - B.10.C: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. analyze and evaluate how

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natural selection may lead to speciation; and

- B.10.D: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple mechanisms. analyze evolutionary mechanisms other than natural selection, including genetic drift, gene flow, mutation, and genetic recombination, and their effect on the gene pool of a population.
- B.9.B: Science concepts--biological evolution. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life that has multiple lines of evidence. examine scientific explanations for varying rates of change such as gradualism, abrupt appearance, and stasis in the fossil record.
- B.4.B: Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and

Unit 15: Homeostasis

- **HOMEOSTASIS AND DYNAMIC EQUILIBRIUM**
  - B.12.A: Science concepts--biological structures, functions, and processes. The student knows that multicellular organisms are composed of multiple systems that interact to perform complex functions. analyze the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals; and
  - B.11.B: Science concepts--biological structures, functions, and processes. The student knows the significance of matter cycling, energy flow, and enzymes in living organisms. investigate and explain the role of enzymes in facilitating cellular processes.
  - B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
- **FEEDBACK MECHANISMS IN ANIMALS**
  - B.12.A: Science concepts--biological structures, functions, and processes. The student knows that multicellular organisms are composed of multiple systems that interact to perform complex functions. analyze the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals; and

Unit 16: Functions of Animal Systems

- **THE IMMUNE AND LYMPHATIC SYSTEMS**
  - B.12.A: Science concepts--biological structures, functions, and processes. The student knows that multicellular organisms are composed of multiple systems that interact to perform complex functions.

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analyze the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals; and

- **THE NERVOUS SYSTEM**
  - B.12.A: Science concepts--biological structures, functions, and processes. The student knows that multicellular organisms are composed of multiple systems that interact to perform complex functions. analyze the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals; and

Unit 17: Functions of Plant Systems

- **PLANT TISSUES**
  - B.12.B: Science concepts--biological structures, functions, and processes. The student knows that multicellular organisms are composed of multiple systems that interact to perform complex functions. explain how the interactions that occur among systems that perform functions of transport, reproduction, and response in plants are facilitated by their structures.
- **PLANT RESPONSES**
  - B.12.B: Science concepts--biological structures, functions, and processes. The student knows that multicellular organisms are composed of multiple systems that interact to perform complex functions. explain how the interactions that occur among systems that perform functions of transport, reproduction, and response in plants are facilitated by their structures.

Unit 18: Cycles in Nature

- **THE CARBON CYCLE**
  - B.13.C: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. explain the significance of the carbon and nitrogen cycles to ecosystem stability and analyze the consequences of disrupting these cycles; and
  - B.13.D: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. explain how environmental change, including change due to human activity, affects biodiversity and analyze how changes in biodiversity impact ecosystem stability.
- **THE NITROGEN AND PHOSPHORUS CYCLES**
  - B.13.C: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. explain the significance of the carbon and nitrogen cycles to ecosystem stability and analyze the consequences of disrupting these cycles; and
  - B.13.D: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. explain how environmental change, including change due to human activity, affects biodiversity and analyze how changes in biodiversity impact ecosystem stability.

Unit 19: Ecology

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- **INTERACTIONS IN ECOSYSTEMS**
  - B.13.A: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. investigate and evaluate how ecological relationships, including predation, parasitism, commensalism, mutualism, and competition, influence ecosystem stability;
  - B.13.C: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. explain the significance of the carbon and nitrogen cycles to ecosystem stability and analyze the consequences of disrupting these cycles; and
  - B.13.B: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. analyze how ecosystem stability is affected by disruptions to the cycling of matter and flow of energy through trophic levels using models;
- **FOOD CHAINS AND WEBS**
  - B.1.G: 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. develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and
  - B.13.B: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. analyze how ecosystem stability is affected by disruptions to the cycling of matter and flow of energy through trophic levels using models;
- **PYRAMIDS OF ENERGY, NUMBERS, AND BIOMASS**
  - B.13.B: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. analyze how ecosystem stability is affected by disruptions to the cycling of matter and flow of energy through trophic levels using models;
  - B.2.C: 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. use mathematical calculations to assess quantitative relationships in data; and
  - B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;
- **NATURAL IMPACT ON ECOSYSTEMS**

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- B.13.D: Science concepts--interdependence within environmental systems. The student knows that interactions at various levels of organization occur within an ecosystem to maintain stability. explain how environmental change, including change due to human activity, affects biodiversity and analyze how changes in biodiversity impact ecosystem stability.
- B.3.B: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
- B.3.A: Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

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