UNIT 1: What is Biology?

1. TIMELINE

2. ESSENTIAL QUESTION/STATEMENT

   HOW IS THE SCIENTIFIC METHOD USED TO SOLVE PROBLEMS?

3. STANDARDS

Alabama Course of Study

1. Select appropriate laboratory glassware, balances, time measuring equipment, and optical instruments to conduct an experiment
   a. Describing the steps of the scientific method
   b. Comparing controls, dependent variables, and independent variables
   c. Identifying safe laboratory procedures when handling certain chemicals and using Bunsen burners and laboratory glassware
   d. Using appropriate SI units for measuring length, volume, and mass

ACT Quality Core

A. Exploring and Defining the Fundamental Unifying Concepts, Organization, and Inquiry Techniques Underlying the Science of Biology

1. Scientific Inquiry

i. Identify and clarify biological research questions and design experiments
ii. Manipulate variables in experiments using appropriate procedures
iii. Collect, organize and analyze data accurately and precisely
iv. Interpret results and draw conclusions, revising hypotheses as necessary and/or formulating additional questions or explanations
v. Write and speak effectively to present and explain scientific results, using appropriate terminology and graphics
vi. Safely use laboratory equipment and techniques when conducting scientific investigations

2. Mathematics and Measurement in Science

vii. Use appropriate SI units for length, mass, time, temperature, quantity, area, volume, and density, and describe the relationships among SI unit prefixes and how SI units are related to analogous English units
viii. Calculate the mean of a set of values

ix. Use graphical models, mathematical models, and simple statistical models to express patterns and relationships determined from sets of scientific data

3. Science in Practice

i. Describe the fundamental assumptions of science
ii. Assess how scientific and technological progress has affected other fields of study, careers, and aspects of everyday life
iii. Recognize and apply criteria that scientists use to evaluate the validity of scientific claims and theories
iv. Explain why scientific investigations must meet certain criteria
v. Explain why all scientific knowledge is subject to change as new evidence

4. Foundations

i. Design and conduct investigations appropriately using essential processes of scientific inquiry
ii. Use mathematics to enhance the scientific inquiry process

4. UNIT VOCABULARY

Biology

Organism

Organization

Reproduction

Species

Growth

Development

Environment

Stimulus

Response

Homeostasis

Energy

Adaptation

Evolution

Scientific methods

Hypothesis

Experiment

Control

Independent variable

Dependent variable

Safety symbol

Data

Theory

Ethics

Technology

Qualitative information

Quantitative information

SI System

Milli

Centi

Deci

Kilo

Hecto

Deka

Unit 2: THE LIFE OF A CELL (Chapters 6, 7, 8, 9)

1. TIMELINE

2. ESSENTIAL QUESTION/STATEMENT

What is the biological importance of the 4 organic compounds of life?

How do organelles help the cell function?

3. STANDARDS

Alabama Course of Study

2. Describe cell processes necessary for achieving homeostasis, including active and passive transport, osmosis, diffusion, exocytosis, and endocytosis

   a. Identifying functions of carbohydrates, lipids, proteins, and nucleic acids in cellular activities

   b. Comparing the reaction of plant and animal cells in isotonic, hypotonic, and hypertonic solutions

   c. Explaining how surface area, cell size, temperature, light, and Ph affect cellular activities

   d. Applying the concept of fluid pressure to biological systems

3. Identify reactants and products associated with photosynthesis and cellular respiration and the purposes of these two processes.

4. Describe similarities and differences of cell organelles, using diagrams and tables.

   a. Identifying scientists who contributed to the cell theory

   b. Distinguishing between prokaryotic and eukaryotic cells

   c. Identifying various technologies used to observe cells

5. Identify cells, tissues, organs, organ systems, organisms, populations, communities, and ecosystems as levels of organization in the biosphere

   a. Recognizing that cells differentiate to perform specific functions

ACT Quality Core

A. Exploring and Defining the Fundamental Unifying Concepts, Organization, and Inquiry Techniques Underlying the Science of Biology

   a. Identify subatomic particles and describe how they are arranged in atoms

   b. Describe the difference between ions and atoms and the importance of ions in biological processes

c. Compare the types of bonding between atoms to form molecules
d. Show how chemical reactions can be represented by chemical formulas
e. Explain the difference between organic and inorganic compounds
f. Explain the fundamental principles of the ph scale and the consequences of having the different concentrations of hydrogen and hydroxide ions
g. Describe the general structure and function (s), including common functional groups of monosaccharides, disaccharides, polysaccharides, carbohydrates, fatty acids, glycerol, glycerides, lipids, amino acids, dipeptides, polypeptides, proteins, and nucleic acids

B. Investigating Life Processes at the Cellular Level and Understanding BOTH How These processes work and how they are maintained and regulated

a. Analyze the similarities and differences among plant vs. animal cells and eukaryotic vs. prokaryotic cells
b. Describe the functions of all major cell organelles, including nucleus, ER, RER, golgi apparatus, ribosome, mitochondria, microtubules, microfilaments, lysosomes, centrioles, and cell membrane

d. Contrast the structure and function of subcellular components of motility

e. Explain how the cell membrane controls movement of substances both into and out of the cell and within the cell

f. Explain how the cell membrane maintains homeostasis

g. Describe and contrast these types of cell transport: osmosis, diffusion, facilitiated diffusion, and active transport

4. VOCABULARY

Element
Atom
Nucleus
Isotope
Compound
Covalent bond
Molecule
Ion
Ionic bond
Metabolism
Mixture

Solution
Ph
Acid
Base
Polar molecule
Hydrogen bond
Diffusion
Dynamic equilibrium
Isomer
Polymer
Carbohydrate
Lipid
Protein
Amino acid
Peptide bond
Enzyme
Nucleic acid
Nucleotide
Cell
Cell theory
Compound light microscope
Electron microscope
Eukaryote
Nucleus
Organelle
Prokaryote
Fluid mosaic model
Phospholipid bilayer
Plasma membrane
Selective permeability
Transport proteins
Cell wall
Chloroplast
Chlorophyll
Chromatin
Cilia
Cytoplasm
Cytoskeleton
Endoplasmic reticulum
Flagella
Golgi apparatus
Lysosome

Microfilament
Microtubule
Mitochondria
Nucleolus
Plastid
Ribosome
Vacuole
ATP
Cellular Respiration

UNIT 3: GENETICS

1.TIMELINE

2. ESSENTIAL QUESTION/STATEMENT

COMPARE THE PROCESSES OF MITOSIS AND MEIOSIS.

HOW IS DNA AND RNA INVOLVED IN THE TRANSMISSION OF GENETIC INFORMATION?

3. STANDARDS

Alabama Course of Study

6. Describe the roles of mitotic and meiotic divisions during reproduction, growth, and repair of cells

7. Apply Mendel's law to determine phenotypic and genotypic probabilities of offspring

8. identify the structure and function of DNA, RNA, and protein

ACT Quality Core

C. Delving into heredity by investigating how genetic structures and processes provide the mechanism for continuity and variety among organisms

A. Describe the basic structure and function of DNA, Mrna,TRNA, amino acids, polypeptides, and proteins

B. describe the experiments of major scientists in determining both the structure of DNA and the central dogma

C. Use MRNA codon charts to determine amino acid sequences of example polypeptides

E. Describe how gene expression is regulated in organisms such that specific proteins are synthesized only when they are needed by the cell

F. describe the basic process of meiosis

G. identify and explain Mendel's law of segregation and law of independent assortment

I. define and provide an example of the following: genotype, phenotype, dominant allele, recessive allele, codominant allele, incompletely dominant alleles, homozygous, heterozygous, and carrier

J. explain sex-linked patterns if inheritance in terms of some genes being absent from the smaller Y chromosome, and thus males (XY) having a different chance of exhibiting certain traits than do females

K. construct and interpret punnett squares and pedigree charts

L. infer parental genotypes and phenotypes from offspring data presented in pedigree charts and from the phenotypic and genotypic ratios of offspring

M. describe the mode of inheritance in commonly inherited disorders

4. Vocabulary

Anaphase

Cell cycle

Centriole

Centromere

Chromatin

Chromosome

Cytokinesis

Interphase

Metaphase

Mitosis

Organ

Organ system

Prophase

Sister chromatid

Spindle

Telophase

Tissue

Cancer

Gene

Allele

Dominant

Fertilization

Gamete

Genetics

Genotype

Heredity

Heterozygous

Homozygous

Hybrid

Law of independent assortment

Law of segregation

Phenotype

Pollination

Recessive

Trait

Zygote

Crossing over

Diploid

Egg

Genetic recombination

Haploid

Homologous chromosome

Meiosis

Nondisjunction

Sexual reproduction

Sperm

DNA replication

Double helix

Nitrogenous base

Codon

Messenger RNA

Ribosomal RNA

Transcription

Transfer RNA

Translation

Chromosomal mutation

Frameshift mutation

Mutagen

Mutation

Point mutation

Carrier

Fetus

Pedigree

Autosome

Codomiant allele

Incomplete dominance

Multiple allele

Polygenic inheritance

Sex chromosome

Sex-linked trait

Karyotype

UNIT 4: ECOLOGY

1. TIMELINE
2. ESSENTIAL QUESTION/STATEMENT

   How can change in one part of an ecosystem affect change in other parts of the ecosystem?

3. STANDARDS

Alabama Course of Study

12. Describe protective adaptations of animals, including mimicry, camouflage, beak type, migration, and hibernation

13. Trace the flow of energy as it decreases through the trophic levels from producers to the quaternary level in food chains, food webs, and energy pyramids

14. Trace biogeochemical cycles through the environment, including water, carbon, oxygen, and nitrogen

15. Identify biomes based on the environmental factors and native organisms

16. Identify density-dependent and density-independent limiting factors that affect populations in an ecosystem

ACT Quality Core

D. Investigating processes that allow populations to change in response to different environmental and genetic pressures

b. Explain the biological definition of evolution

d. Discuss Darwin's principle of survival of the fittest and explain what Darwin meant by natural selection

g. Provide examples of behaviors that have evolved through natural selection

h. Design, perform, and analyze a laboratory simulation of natural selection on a working population

F. Analyzing the ecological processes by which living thins interact with their environments and with each other

a. Define and provide examples of biosphere, biome, ecosystem, community, population, species, habitat, and niche

b. Discuss biotic and abiotic factors that affect land and aquatic biomes

d. Explain how energy flows through ecosystems in one direction

e. Explain how the amount of life any environment can support is limited by the available matter and energy and by the ability of ecosystems to recycle the residue of dead organic materials

g. Diagram the flow of energy using food webs, food chains, and pyramids

h. Describe examples of competition, symbiosis, and predation

i. Explain the concept of carrying capacity

k. Explain the process of ecological succession, and describe the different communities that result

4. VOCABULARY

Abiotic factor

Biological community

Biosphere

Biotic factor

Commensalism

Ecology

Ecosystem

Habitat

Mutualism

Niche

Parasitism

Population

Symbiosis

Autotroph

Biomass

Decomposer

Food chain

Food web

Heterotroph

Trophic level

Climax community

Limiting factor

Primary succession

Secondary succession

Succession

Tolerance

Aphotic zone

Biome

Desert

Estuary

Grassland

Intertidal zone

Photic zone

Plankton

Taiga

Temperate/deciduous forest

Tropical rain forest

Tundra

Carrying capacity

Density-dependent factor

Density-independent factor

Exponential growth

Life-history pattern

Age structure

Birthrate

Death rate

Demography

Doubling time

Acid precipitation

Biodiversity

Edge effect

Endangered species

Exotic species

Extinction

Habitat degradation

Habitat fragmentation

Ozone layer

Threatened species

Captivity

Conservation biology

Habitat corridors

Natural resources

Reintroduction programs

Sustainable use

Analogous structure

Artificial selection

Camouflage

Embryo

Homologous structure

Mimicry

Natural selection

Vestigial structure

Adaptive radiation

Allelic frequency

Convergent evolution

Directional selection

Disruptive selection

Divergent evolution

Gene pool

Genetic drift

Genetic equilibrium

Geographic isolation

Gradualism

Polyploid

Punctuated equilibrium

Reproductive isolation

Speciation

Stabilizing selection

UNIT 5: KINGDOMS AND ORGANIZATION

1. TIMELINE
2. ESSENTIAL QUESTION/STATEMENT

   How can scientists use levels of organization to describe scales of study?
   What characteristics are used to group and classify living things?
   How can the kingdoms of life be compared and contrasted?
   What are some examples of organisms in each kingdom and what characteristics place them in that kingdom?
   How can kingdoms be further divided into subgroups?

3. STANDARDS

Alabama Course of Study

5.Identify cells, tissues, organs, organ systems, organisms, populations, communities, and ecosystems as levels of organization in the biosphere

9. Differentiate between the previous five-kingdom and current six-kingdom classification systems

ACT Quality Core

E. Identifying and Deciphering the distinguishing characteristics of all categories of living things and establishing the genetic, ancestral, and behavioral relationships among them

a. Explain how organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their evolutionary relationships

b. List each of the major levels in the hierarchy of taxa: kingdom, phylum, class, order, family, genus, and species

c. Explain the binomial nomenclature system.

d. Construct and use a dichotomous taxonomic key.

e. Distinguish between and among viruses, bacteria, and protists, and give examples of each

f. Explain classification criteria for fungi, plants, and animals

g. Compare the major division of animals

a. Define and provide examples of biosphere, biome, ecosystem, community, population, species, habitat, and niche

4. VOCABULARY

Binomial nomenclature
Class
Classification
Division
Family
Genus
Kingdom
Order
Phylum
Specific epithet
Taxonomy
Cladistics
Cladogram
Eubacteria
Fungus
Phylogeny
Protest
Bacteriophage
Capsid
Host cell
Lysogenic
Lytic cycle
Prion
Provirus
Retrovirus
Reverse transcriptase
Viroid virus
Binary fission
Chemosynthesis
Conjugation
Endospore
Nitrogen fixation
Obligate aerobe
Obligate anaerobe
Toxin
Alga
Asexual reproduction
Ciliate
Flagellate
Protozoan
Pseudopodia
Spore
Sporozoan

Alternation of generations
Colony
Fragmentation
Gameotophyte
Sporophyte
Thallus
Plasmodium
Budding
Chitin
Haustoria
Hypha
Mycelium
Sporangium
Ascosphore
Ascus
Basidiospore
Basidium
Conidiophore
Conidium
Gametangium
Lichen
Mycorrhiza
Rhizoid
Stolon
Zygospore

Unit 6: Plants

How are the functions of basic plant organs related to their structure?

Alabama Course of Study

3. Identify reactants and products associated with photosynthesis and cellular respiration and the purposes of the two processes.

10. Distinguish between monocots and dicots, angiosperms and gymnosperms, and vascular and nonvascular plants.

ACT Quality Core

E. Identifying and Deciphering the distinguishing characteristics of all categories of living things and establishing the genetic, ancestral, and behavioral relationships among them.

a. Describe the basic mechanisms of plant processes, especially movement of materials and plant reproduction.

b. Explain the functions of unique plant structures, including the cell wall, chloroplasts, and critical parts of the flower and the seed.

Vocabulary

Cuticle

Leaf

Nonvascular plant

Root

Seed

Stem

Vascular plant

Vascular tissue

Cone

Frond

Archegonium

Antheridium

Prothallus

Rhizome

Sorus

Strobilus

Annuals

Biennials

Cotyledon

Deciduous plant

Dicotyledons

Embryo

Fruit

Monocotyledons

Ovule

Perennials

Pollen grains

Apical meristem

Collenchyma

Companion cell

Cork cambium

Epidermis

Guard cell

Meristem

Parenchyma

Phloem

Sclerenchyma

Sieve tube

Stomata

Tracheid

Trichome

Vascular cambium

Vessel element

Xylem

Cortex

Endodermis

Mesophyll

Pericycle

Petiole

Root cap

Sink

Translocation

Transpiration

Auxin

Cytokinin

Ethylene

Gibberellin

Hormone

Nastic movement

Tropism

Megaspore

Micropyle

Microspore

Protonema

Vegetative reproduction

Anther

Day-neutral plant

Long-day plant

Ovary

Petals

Photoperiodism

Pistil

Sepals

Short-day plant

Stamen

Dormancy

Double fertilization

Endosperm

Germination

Hypocotyl

Polar nuclei

Radicle

UNIT 7: Animals

1. TIMELINE

2. ESSENTIAL QUESTION/STATEMENT

How do systems, structures (form and function) and behavior patterns of organisms enable them to survive and interact with their environment?

3. STANDARDS

Alabama Course of Study

11. Classify animals according to type of skeletal structure, method of fertilization and reproduction, body symmetry, body coverings, and locomotion.

12. Describe protective adaptations of animals, including mimicry, camouflage, beak type, migration, and hibernation.

ACT Quality Core

E. Identifying and Deciphering the distinguishing characteristics of all categories of living things and establishing the genetic, ancestral, and behavioral relationships among them

4. VOCABULARY

Ectoderm
Endoderm
Sessile
Anterior
Bilateral symmetry
Dorsal
Endoskeleton
Exoskeleton
Invertebrate
Posterior
Radial symmetry
Symmetry
Ventral
Vertebrate
External fertilization
Filter feeding

Internal fertilization
Appendage