

Topic: Basic Biological Principles

Days: 7

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

Key Learning:

Life's characteristics and the methods used to study life provide a basis for understanding the living world.



Unit Essential Question(s):

How do biologists identify and study living things?

Concept:

Scientific Method 2

3.2.10.A, 3.2.10.C

Concept:

Characteristics of Life 2

3.3.10.A

Concept:

Lab Procedures 3

3.2.10.C, 3.2.10.B

Lesson Essential Question(s):

What steps do scientists use to solve problems? (A)

How do scientists write a hypothesis? (A)

What are the connections between observations and hypotheses? (ET)

What are the key elements of scientific investigation? (A)

Lesson Essential Question(s):

How do living things differ from non-living things? (A)

What common characteristics do all living things share? (A)

Lesson Essential Question(s):

What are the tools used by biologists when performing experiments? (A)

How do scientists make sure experiments are conducted safely? (A)

What procedures are used by biologists to collect data? (A)

Vocabulary:

independent/dependent variable, hypothesis, theory, law, control, experiment, data, observation, inference

Vocabulary:

sexual reproduction, homeostasis, abiotic, biotic, metabolism, Biology, stimulus, response

Vocabulary:

liter, gram, meter, qualitative observation, quantitative observation

Additional Information:

Students will write a hypothesis and design an experiment to test the hypothesis.

Attached Document(s):

Vocab Report for Topic: Basic Biological Principles

Subject(s): Science

Days: 7

Grade(s): 9th, 10th, 11th, 12th

Concept:

Scientific Method 2

- independent/dependent variable -
- hypothesis -
- theory -
- law -
- control -
- experiment -
- data -
- observation -
- inference -

Concept: Characteristics of Life 2

- sexual reproduction -
- homeostasis -
- abiotic -
- biotic -
- metabolism -
- Biology -
- stimulus -
- response -

Concept: Lab Procedures 3

- liter -
- gram -
- meter -
- qualitative observation -
- quantitative observation -

Topic: Biochemistry
 Subject(s): Science

Days: 14
 Grade(s): 9th, 10th, 11th, 12th

Key Learning:

Organisms are built of and run by four basic types of organic molecules.



Unit Essential Question(s):

How are molecules essential to living things?



Concept:

Water 2

S11.B.1.1.1

Concept:

Macromolecules 12

3.1.10.B, S11.B.1.1.1

Concept:

Enzymes



Lesson Essential Question(s):

How does the structure of a water molecule influence its properties? (A)

How does the molecular structure of a water molecule support its biological significance? (A)

Lesson Essential Question(s):

How do the structures of carbohydrates, lipids, proteins, and nucleic acids contribute to their function in organisms? (A)

What are the properties of carbon that contribute to its biological significance? (A)

How are biological indicators used to test various food items for the presence of carbohydrates, lipids, proteins, and nucleic acids? (A)

What are the effects of acids and bases on organic compounds? (A)

Lesson Essential Question(s):

How does enzyme structure affect its function? (A)

What role do enzymes play in living things and what affects their function? (ET)



Vocabulary:

inorganic molecule, polar compound, covalent bond, hydrogen bond, adhesion, cohesion, capillary action

Vocabulary:

acid, base, pH, rehydration synthesis, hydrolysis, saturated, unsaturated, primary, secondary, tertiary, atom, nucleus, electron, proton, neutron, element, isotope, ion, compound, molecule, buffer, monomer, polymer, carbohydrate, lipid, protein, nucleic acid, nucleotide, monosaccharide, amino acid, glycerol, fatty acid, quaternary

Vocabulary:

catalyst, enzyme, active site, denature, substrate, active site

Additional Information:

Construct models of macromolecules that demonstrate the difference between the groups.
 -primary, secondary, tertiary, quaternary structures

Attached Document(s):

Vocab Report for Topic: Biochemistry

Subject(s): Science

Days: 14

Grade(s): 9th, 10th, 11th, 12th

Concept:

Water 2

- inorganic molecule -
- polar compound -
- covalent bond -
- hydrogen bond -
- adhesion -
- cohesion -
- capillary action -

Concept: Macromolecules 12

- acid -
- base -
- pH -
- dehydration synthesis -
- hydrolysis -
- saturated -
- unsaturated -
- primary -
- secondary -
- tertiary -
- atom -
- nucleus -
- electron -
- proton -
- neutron -
- element -
- isotope -
- ion -
- compound -
- molecule -
- buffer -
- monomer -
- polymer -
- carbohydrate -
- lipid -
- protein -
- nucleic acid -
- nucleotide -
- monosaccharide -
- amino acid -
- glycerol -
- fatty acid -
- quaternary -

Concept:

Vocab Report for Topic: Biochemistry

Days: 14

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

Enzymes

- catalyst -
- enzyme -
- active site -
- denature -
- substrate -
- active site -

Topic: Cell Processes

Days: 49

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

Key Learning:

Cells are the basic unit of structure and function for all living things. Cells maintain a biological balance between their internal and external environments. Cells acquire and use energy to carry out their life functions. Cells reproduce and pass on genetic information.



Unit Essential Question(s):

How does cell structure and function relate to the capture, storage, and transfer of energy in systems?



Concept:

Types of Cells, Organelles, and their Functions 16

S11.B.1.1.1, S11.B.1.1.2, 3.1.10.A, 3.1.10.B, 3.1.10.C, 3.1.10.E, 3.2.10.A, 3.2.10.B, 3.2.10.C, 3.3.10.B

Concept:

The Cell's Environment, Homeostasis, and Transport 11

S11.B.1.1.1, S11.B.1.1.2, S11.B.1.1.3, 3.1.10.A, 3.1.10.B, 3.1.10.C, 3.1.10.E, 3.2.10.A, 3.2.10.B, 3.2.10.C, 3.3.10.B

Concept:

Cellular Energy 12

S11.B.1.1.1, S11.B.1.1.2, S11.B.1.1.3, 3.1.10.A, 3.1.10.B, 3.1.10.C, 3.1.10.E, 3.2.10.A, 3.2.10.B, 3.2.10.C, 3.3.10.B



Lesson Essential Question(s):

What are the basic differences and similarities between plant and animal cells? (A)

Why is cell specialization important to multicellular organisms? (ET)

What is the structure and function of essential cell organelles? (A)

Lesson Essential Question(s):

How is the transport of materials through the cell membrane used to maintain homeostasis? (A)

What are the different kinds of cell transport? (A)

How does the structure of the cell membrane relate to its function? (ET)

Lesson Essential Question(s):

How is energy transferred at a molecular level within a cell? How do the structures that handle these molecules carry out their functions? (A)

How are photosynthesis and respiration complementary? (ET)

How are photosynthetic organisms able to trap energy and convert it into a form useful for cellular activities? (A)

What are the processes involved in cellular respiration? (A)



Vocabulary:

cell membrane, nucleus, prokaryote, eukaryote, organelle, cytoplasm, vacuole, lysosome, cytoskeleton, centriole, ribosome, endoplasmic reticulum, golgi apparatus, chloroplast, mitochondria, cell wall

Vocabulary:

homeostasis, osmosis, diffusion, active transport, passive transport, hypotonic solution, isotonic solution, hypertonic solution, endocytosis, exocytosis, lipid bilayer, selectively permeable, facilitative diffusion, osmotic pressure, receptor, marker

Vocabulary:

photosynthesis, cellular respiration, mitochondria, chloroplast, aerobic respiration, anaerobic respiration, fermentation, ATP/ADP, heterotroph, autotroph, pigment, chlorophyll, thylakoid, stroma, NADP, light-dependent reactions, light-independent reactions, electron transport chain, calvin cycle, ATP synthase

Topic: Cell Processes

Days: 49

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

Concept:

Cell Reproduction 10

[S11.B.1.1.1](#), [S11.B.1.1.2](#), [S11.B.1.1.3](#), [S11.B.2.2.2](#), [3.1.10.A](#),
[3.1.10.B](#), [3.1.10.C](#), [3.1.10.E](#), [3.2.10.A](#), [3.2.10.B](#), [3.2.10.C](#),
[3.3.10.B](#), [3.3.10.A](#)

**Lesson Essential Question(s):**

What are the similarities and differences between mitosis and meiosis? (A)

What events occur during each phase of the cell cycle? (A)

What is the role of chromosomes in cell division? (A)

How do cells become specialized for different function? (ET)

How do cancer cells differ from normal cells? (ET)

**Vocabulary:**

mitosis, meiosis, cell cycle, chromosomes, homologous pairs, chromatin, crossing over, chromatid, centromere, binary fission, vegetative propagation, budding, egg, sperm, gametes, zygote, interphase, prophase, metaphase, anaphase, telophase, cytokinesis, cyclin, growth factor, apoptosis, cancer, tumor, diploid, haploid, tetrad

Additional Information:

Apply the principles of homeostasis to an everyday scenario.

Relate cell energy processes to current global energy demands.

Relate cell energy processes to discuss the flow of energy in a living system.

Attached Document(s):

Vocab Report for Topic: Cell Processes

Days: 49

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

Concept:

Types of Cells, Organelles, and their Functions 16

- cell membrane -
- nucleus -
- prokaryote -
- eukaryote -
- organelle -
- cytoplasm -
- vacuole -
- lysosome -
- cytoskeleton -
- centriole -
- ribosome -
- endoplasmic reticulum -
- golgi apparatus -
- chloroplast -
- mitochondria -
- cell wall -

Concept: The Cell's Environment, Homeostasis, and Transport 11

- homeostasis -
- osmosis -
- diffusion -
- active transport -
- passive transport -
- hypotonic solution -
- isotonic solution -
- hypertonic solution -
- endocytosis -
- exocytosis -
- lipid bilayer -
- selectively permeable -
- facilitative diffusion -
- osmotic pressure -
- receptor -
- marker -

Concept: Cellular Energy 12

- photosynthesis -
- cellular respiration -
- mitochondria -
- chloroplast -
- aerobic respiration -
- anaerobic respiration -
- fermentation -

Vocab Report for Topic: Cell Processes

Days: 49

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

ATP/ADP -
heterotroph -
autotroph -
pigment -
chlorophyll -
thylakoid -
stroma -
NADP -
light-dependent reactions -
light-independent reactions -
electron transport chain -
calvin cycle -
ATP synthase -

Concept: Cell Reproduction 10

mitosis -
meiosis -
cell cycle -
chromosomes -
homologous pairs -
chromatin -
crossing over -
chromatid -
centromere -
binary fission -
vegetative propagation -
budding -
egg -
sperm -
gametes -
zygote -
interphase -
prophase -
metaphase -
anaphase -
telophase -
cytokinesis -
cyclin -
growth factor -
apoptosis -
cancer -
tumor -
diploid -
haploid -
tetrad -

Topic: Evolution
 Subject(s): Science

Days: 15
 Grade(s): 9th, 10th, 11th, 12th

Key Learning:

Species change over time.



Unit Essential Question(s):

How have species changed over time?



Concept:

Evidence for Evolution 5

[3.1.10.A](#), [3.1.10.B](#), [3.1.10.E](#), [3.3.10.A](#), [3.3.10.B](#), [3.3.10.D](#),
[S11.B.2.1.1](#)

Concept:

Mechanisms for Evolution 5

[3.1.10.A](#), [3.1.10.B](#), [3.1.10.E](#), [3.3.10.B](#), [3.3.10.D](#), [S11.B.2.1.2](#),
[S11.B.2.1.3](#), [S11.B.2.1.4](#)

Concept:

Changes in Organisms 5

[3.1.10.A](#), [3.1.10.B](#), [3.1.10.E](#), [3.3.10.A](#), [3.3.10.B](#), [S11.B.2.1.1](#),
[S11.B.2.1.2](#), [S11.B.2.1.3](#)



Lesson Essential Question(s):

What evidence suggests that species change over time? (A)

What did Darwin contribute to the Theory of Evolution? (A)

Lesson Essential Question(s):

What are the components of evolution? (A)

What are the components of natural selection? (A)

What are the differences between micro and macro evolution? (A)

What types of natural processes lead to evolutionary changes? (ET)

Lesson Essential Question(s):

How do changes at the molecular level ultimately result in speciation? (A)

What are examples of divergent and convergent evolution? (A)



Vocabulary:

fossils, radioactive dating, geologic time, relative dating

Vocabulary:

natural selection, mutation, geographic isolation, genetic drift, bottleneck effect, gene flow, micro and macro evolution

Vocabulary:

divergent evolution, adaptive radiation, analogous structures, homologous structures, extinction, convergent evolution, isolation, vestigial structures

Additional Information:

Analyze current practices that contribute to the microevolution of populations.

Attached Document(s):

Vocab Report for Topic: Evolution

Subject(s): Science

Days: 15

Grade(s): 9th, 10th, 11th, 12th

Concept:

Evidence for Evolution 5

- fossils -
- radioactive dating -
- geologic time -
- relative dating -

Concept: Mechanisms for Evolution 5

- natural selection -
- mutation -
- geographic isolation -
- genetic drift -
- bottleneck effect -
- gene flow -
- micro and macro evolution -

Concept: Changes in Organisms 5

- divergent evolution -
- adaptive radiation -
- analogous structures -
- homologous structures -
- extinction -
- convergent evolution -
- isolation -
- vestigial structures -

Topic: Interdependence of Life
Subject(s): Science

Days: 10
Grade(s): 9th, 10th, 11th, 12th

Key Learning:

All living things are interdependent with each other and the nonliving environment.



Unit Essential Question(s):

What relationships exist between living things and their environment?



Concept:

Ecosystems Structure and Function 5

3.1.10.A, 3.1.10.B, 3.2.10.C, 4.6.10.B, 4.6.10.C, 4.7.10.A, 4.7.10.B, S11.B.3.1.1, S11.B.3.1.2, S11.B.3.1.3, S11.B.3.1.4, S11.B.3.1.5, S11.B.3.2.1, S11.B.3.2.2, S11.B.3.2.3

Concept:

Population Ecology 5

3.1.10.A, 3.1.10.B, 3.1.10.C, 4.6.10.B, 4.7.10.B, 4.7.10.C, S11.B.3.1.2, S11.B.3.1.3, S11.B.3.1.5, S11.B.3.2.1, S11.B.3.2.2, S11.B.3.2.3



Lesson Essential Question(s):

What are the levels of organization in the biosphere? (A)
What biotic and abiotic components make up ecosystems? (A)
What are the interrelationships between an organism and its environment? (A)
How do matter and energy flow through ecosystems? (A)
How do communities change over time? (ET)
How does biodiversity impact the stability within the ecosystem? (ET)

Lesson Essential Question(s):

What factors cause populations to fluctuate? (A)
What are the general patterns of fluctuation? (A)
How do limiting factors relate to the carrying capacity of a population? (ET)



Vocabulary:

ecosystem, biome, population, community, niche, habitat, species, herbivore, carnivore, omnivore, autotrophy, heterotroph, producer, consumer, decomposer, biotic, abiotic, food web, energy pyramid, succession, Carbon cycle, Nitrogen cycle, Water cycle, Phosphorous cycle

Vocabulary:

S curve, J curve, limiting factor, carrying capacity, exponential growth, immigration, emmigration

Additional Information:

Attached Document(s):

Vocab Report for Topic: Interdependence of Life

Days: 10

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

Concept:

Ecosystems Structure and Function 5

- ecosystem -
- biome -
- population -
- community -
- niche -
- habitat -
- species -
- herbivore -
- carnivore -
- omnivore -
- autotrophy -
- heterotroph -
- producer -
- consumer -
- decomposer -
- biotic -
- abiotic -
- food web -
- energy pyramid -
- succession -
- Carbon cycle -
- Nitrogen cycle -
- Water cycle -
- Phosphorous cycle -

Concept: Population Ecology 5

- S curve -
- J curve -
- limiting factor -
- carrying capacity -
- exponential growth -
- immigration -
- emmigration -

Topic: Organisms and Diversity
Subject(s): Science

Days: 30
Grade(s): 9th, 10th, 11th, 12th

Key Learning:

Classification is used to show the diversity of organisms and the relationships between them.



Unit Essential Question(s):

Why and how are organisms classified?



Concept:

6 Kingdom Classification 20

[3.1.10.A](#), [3.1.10.B](#), [3.1.10.C](#), [3.2.10.B](#), [3.2.10.A](#), [3.3.10.A](#), [3.3.10.B](#), [S11.B.1.1.1](#), [S11.B.1.1.2](#)

Concept:

Biodiversity 10

[3.3.10.B](#), [3.3.10.A](#), [3.2.10.B](#), [3.2.10.A](#), [3.1.10.C](#), [3.1.10.B](#), [3.1.10.A](#), [S11.B.1.1.2](#), [S11.B.1.1.1](#)



Lesson Essential Question(s):

What criteria are used to classify organisms? (A)

How does phylogeny relate to classification? (ET)

What are the key characteristics of each of the six kingdoms? (A)

Lesson Essential Question(s):

What role does biodiversity play in the study of taxonomy? (A)

How do you use classification to show relationships between organisms? (ET)



Vocabulary:

hierarchy of classification, prokaryote, eukaryote, species, taxon, extinction, dichotomous key, phylogeny

Vocabulary:

biodiversity, species, endemic, archaeobacteria, eubacteria, protista, fungi, plantae, animalia

Additional Information:

Construct a dichotomous key that demonstrates the diversity of life.

Attached Document(s):

Vocab Report for Topic: Organisms and Diversity

Subject(s): Science

Days: 30

Grade(s): 9th, 10th, 11th, 12th

Concept:

6 Kingdom Classification 20

- heirarchy of classification -
- prokaryote -
- eukaryote -
- species -
- taxon -
- extinction -
- dichotomous key -
- phylogeny -

Concept: Biodiversity 10

- biodiversity -
- species -
- endemic -
- archeabacteria -
- eubacteria -
- protista -
- fungi -
- plantae -
- animalia -

Topic: Reproduction and Inheritance

Days: 30

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

Key Learning:

Biological traits are passed on to successive generations.

Unit Essential Question(s):

How are traits passed from generation to generation?

Concept:

DNA 5

3.1.10.A, 3.1.10.B, 3.1.10.C, 3.2.10.B, 3.2.10.C, 3.3.10.C, S11.B.1.1.1, S11.B.1.1.2, S11.B.1.1.3, S11.B.2.1.2, S11.B.2.2.1

Concept:

RNA- Protein Synthesis 7

3.1.10.A, 3.1.10.B, 3.1.10.C, 3.1.10.E, 3.2.10.A, 3.2.10.C, 3.3.10.B, 3.3.10.C, S11.B.1.1.1, S11.B.1.1.2, S11.B.1.1.3, S11.B.2.1.2, S11.B.2.2.1

Concept:

Inheritance 13

3.1.10.A, 3.1.10.B, 3.1.10.C, 3.1.10.E, 3.2.10.A, 3.2.10.B, 3.2.10.C, 3.3.10.B, 3.3.10.C, S11.B.1.1.1, S11.B.1.1.2, S11.B.1.1.3, S11.B.2.1.2, S11.B.2.1.3, S11.B.2.2.3, S11.B.3.3.3



Lesson Essential Question(s):

What is the chemical structure of DNA? (A)

How does the structure of DNA code for traits? (A)

How is DNA replicated? (A)

How is DNA technology applied and used in our society today? (ET)

Lesson Essential Question(s):

What is the chemical structure of RNA? (A)

How does the structure of RNA molecules facilitate the production of a protein? (A)

What is the connection between an individual's DNA and their physical make-up? (ET)

Lesson Essential Question(s):

How are inherited traits passed on from parent to offspring? (A)

How do Mendel's Laws apply to patterns of inheritance? (ET)

How can probability be used to predict traits? (ET)



Vocabulary:

DNA, genetic code, nucleotide, replication, nitrogenous bases, phosphate group, 5-carbon sugar, double helix, allele, gene, chromosome, recombinant DNA, purine, pyrimidine, base pairing, DNA polymerase

Vocabulary:

RNA, mRNA, tRNA, rRNA, anticodon, transcription, translation, ribosome, codon, genetic code, RNA polymerase, introns, exons, promoters

Vocabulary:

allele, gene, heredity, monohybrid, dihybrid, genotype, phenotype, homozygous, heterozygous, dominant, recessive, probability, Punnett square, incomplete dominance, multiple alleles, pleiotropic, sex-linked, segregation, codominance, polygenic, carrier, independent assortment, pedigree, hybrid

Topic: Reproduction and Inheritance

Days: 30

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

Concept:

Mutations 5

[3.1.10.A](#), [3.1.10.B](#), [3.1.10.C](#), [3.1.10.E](#), [3.2.10.A](#), [3.2.10.B](#),
[3.2.10.C](#), [3.3.10.B](#), [3.3.10.C](#), [S11.B.1.1.1](#), [S11.B.1.1.2](#), [S11.B.](#)
[1.1.3](#), [S11.B.2.1.2](#), [S11.B.2.2.1](#), [S11.B.2.2.3](#)



Lesson Essential Question(s):

What are the different types of mutations? (A)

What are the effects of different types of mutations? (A)



Vocabulary:

frameshift, point, deletion, addition,
substitution, chromosomal errors, mutagen,
carcinogen, nondisjunction, inversion,
translocation, gene mutation

Additional Information:

Students will read an article on Biotechnology and write a twenty-five word abstract describing the technique presented.

Attached Document(s):

Vocab Report for Topic: Reproduction and Inheritance

Days: 30

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

Concept:

DNA 5

- DNA -
- genetic code -
- nucleotide -
- replication -
- nitrogenous bases -
- phosphate group -
- 5-carbon sugar -
- double helix -
- allele -
- gene -
- chromosome -
- recombinant DNA -
- purine -
- pyrimidine -
- base pairing -
- DNA polymerase -

Concept: RNA- Protein Synthesis 7

- RNA -
- mRNA -
- tRNA -
- rRNA -
- anticodon -
- transcription -
- translation -
- ribosome -
- codon -
- genetic code -
- RNA polymerase -
- introns -
- exons -
- promoters -

Concept: Inheritance 13

- allele -
- gene -
- heredity -
- monohybrid -
- dihybrid -
- genotype -
- phenotype -
- homozygous -
- heterozygous -

Vocab Report for Topic: Reproduction and Inheritance

Days: 30

Subject(s): Science

Grade(s): 9th, 10th, 11th, 12th

dominant -
recessive -
probability -
Punnett square -
incomplete dominance -
multiple alleles -
pleiotropic -
sex-linked -
segregation -
codominance -
polygenic -
carrier -
independent assortment -
pedigree -
hybrid -

Concept: Mutations 5

frameshift -
point -
deletion -
addition -
substitution -
chromosomal errors -
mutagen -
carcinogen -
nondisjunction -
inversion -
translocation -
gene mutation -