

Unit 1 Science of Life Study Guide

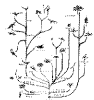


Keystone Concepts



- 1) Apply scientific thinking processes, tools, and technologies in the study of the theory of evolution.
 - a. Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.
- 2) Describe ecological levels of organization in the biosphere.
 - a. Describe the levels of ecological organization (i.e., organisms, population, community, ecosystem, biome, and biosphere).
 - b. Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.

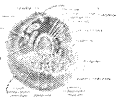
BIG Ideas in Biology:



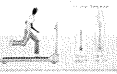
1. Organisms share common characteristics of life.



2. Life emerges due to the chemical organization of matter into cells.



3. Cells are the basic unit of structure and function for all organisms.



4. Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.



5. Eukaryotic cells can differentiate and organize making it possible for multicellularity.



6. Organisms obtain and use energy to carry out their life processes



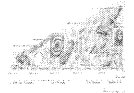
7. New cells arise from the division of pre-existing cells.



8. Hereditary information in genes is transmitted across generations via DNA.



9. DNA segments contain information for the production of proteins necessary for growth and function of cells.



10. Evolution is the result of many random processes selecting for the survival and reproduction of a population.



11. Organisms on Earth interact and depend in a variety of ways on other living and nonliving things in their environments.

Vocabulary

Biology	Law	milli-
Systems	Observation	Liter
Models	Qualitative	Meters
Patterns	Quantitative	Grams
Scales	Inferences	Length
Change	Hypothesis	Mass
Cell	Control	Temperature
Heredity	Independent Variable	Area
Gene	Dependent Variable	Density
Evolution	Experimentation	Water Displacement
Natural selection	Laboratory	Volume
Reproduction		Weight
Homeostasis	Kilo-	Data
Differentiation	Hecto-	
Ecology	Deca-	
Scientific method	deci-	
Theory	centi-	

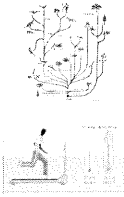
Unit 2: Char Life & Tools Study Guide



Keystone Concepts

- 1) Explain the characteristics common to all organisms.
 - a. Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.
- 2) Describe relationships between structure and function at biological levels of organization.
 - a. Describe and interpret relationship between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms)
- 3) Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.
 - a. Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).

BIG Ideas in Biology:



1. Organisms share common characteristics of life
4. Through a variety of mechanisms organisms seek to maintain a biological balance between their internal and external environments.

Five Characteristics of Life:

- 1) All living organisms are made up of one or more cells
- 2) All living organisms must be able to reproduce successfully
- 3) All living organisms must be able to grow and develop
- 4) All living organisms must obtain and use energy
- 5) All living organisms must adapt and respond to their environment

Key Elements to Creating a Graph

- 1) Identify the Variables
- 2) Determine the variable range
- 3) Determine the scale of the graph
- 4) Number and label each axis
- 5) Plot the points
- 6) Draw the graph
- 7) Give the graph a title

Vocabulary

cell	asexual	photosynthesis
unicellular	sexual	adaptation
multicellular	internal	stimulus
tissue	external	response
organ	binary fission	compound light microscope
systems	budding	stereoscope
organism	fertilization	TEM
species	growth	SEM
population	development	limit of resolution
community	metamorphosis	power of magnification
ecosystem	heterotrophy	chromatography
biome	metabolism	staining
biosphere	cellular respiration	centrifugation
reproduction	autotroph	

Unit 3: Web of Life Study Guide

Keystone Concepts

Evolution:

- 1) Explain the mechanisms of evolution
- 2) Explain how natural selection can impact allele frequencies of a population
- 3) Describe the factors that can contribute to the development of new species (e.g. isolation mechanisms, genetic drift, founder effect, migration)
- 4) Explain how genetic mutations may result in genotypic and phenotypic variations within a population
- 5) Analyze the sources of evidence for biological evolution
- 6) Interpret evidence supporting the theory of evolution (i.e. fossil, anatomical, physiological, embryological, biochemical, and universal genetic code)

Ecology:

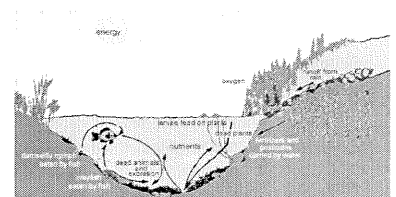
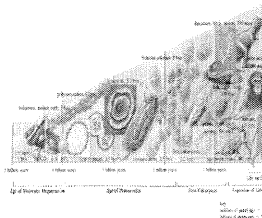
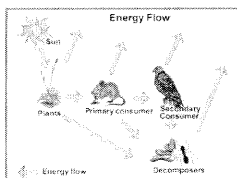
- 7) Describe ecological levels of organization in the biosphere
- 8) Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems
- 9) Describe interaction and relationships in an ecosystem
- 10) Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids)
- 11) Describe biotic interactions in an ecosystem (e.g. competition, predation, symbiosis)
- 12) Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle)
- 13) Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires)
- 14) Describe the effects of limiting factors on population dynamic and potential species extinction

Energy Flow:

- 15) Identify and describe the cell structures involved in processing energy
- 16) Describe the fundamental roles of plastids and mitochondria in energy transformations
- 17) Identify and describe how organisms obtain and transform energy for their life processes.
- 18) Compare the basic transformation of energy during photosynthesis and cellular respiration
- 19) Describe the role of ATP in biochemical reactions
- 20) Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments
- 21) Explain how organisms maintain homeostasis (e.g. thermoregulation, water regulation, oxygen regulation)

BIG Ideas in Biology:

6. Organisms obtain and use energy to carry out their life processes
10. Evolution is the result of many random processes selecting for the survival and reproduction of a population.
11. Organisms on Earth interact and depend in a variety of ways on other living and nonliving things in their environments



Vocabulary

Domains	Endosymbiotic Theory	Trophic Levels
Archaeobacteria	Mutation	Producer
Eubacteria	Darwin	Consumer
Eukarya	Natural selection	Decomposer
Kingdoms	Human Evolution	Energy Flow
Animals	Adaptations/Taxonomy	Water cycle
Plants	Fossils	Carbon cycle
Fungi	Comparative Embryology	Nitrogen cycle
Protists	Comparative Biochemistry	Phosphate cycle
Aristotle	Biogeography	Niche
Linnaeus	Speciation	Food Web
Phylum	Homologous structures	Food Chain
Class	Analogous structures	Energy Pyramid
Order	Vestigial structures	Extinct
Family	Divergent Evolution	Threatened
Genus	Convergent Evolution	Endangered
Species	Phylogenetic Trees	Parasitism
Binomial Nomenclature	Geologic Timeline	Symbiosis
Taxonomy	Morphology	Mutualism
Taxa/Taxon	Mass Extinction	Commensalism
Biodiversity	Punctuated Evolution	Herbivore
Hybrid	Gradual Evolution	Omnivore
Eukaryotic	Biotic/Abiotic	Carnivore
Prokaryotic	Hetero/Autotrophic	Biomes

Vocabulary

Unit 4: BioChem Study Guide

Keystone Concepts

- 1) Describe how the unique properties of water support life on Earth.
 - a. Describe the unique properties of water and how these properties support life on Earth. (e.g., freezing point, high specific heat, cohesion)

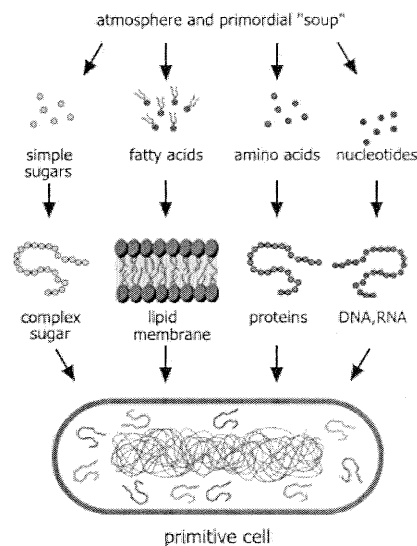
- 2) Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).
 - a. Explain how carbon is uniquely suited to form biological macromolecules.
 - b. Describe how biological macromolecules form from monomers
 - c. Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms

- 3) Explain how enzymes regulate biochemical reactions within a cell.
 - a. Describe the role of an enzyme as a catalyst in a specific biochemical reaction.
 - b. Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.

- 4) Identify and describe how organisms obtain and transform energy for their life processes.
 - a. Describe the role of ATP in biochemical reactions

BIG Ideas in Biology

2. Life emerges due to the chemical organization of matter into cells



Vocabulary

Inorganic		Catalyst
Molecule	Adhesion	Primary structure
Compound	Cohesion	Secondary structure
Hydrogen	Surface Tension	Tertiary structure
Oxygen	Meniscus	Quaternary structure
Carbon	Water Striders	Substrate
Nitrogen	Suspension	Active site
Sulfur	High Specific Heat	Denaturation
Chemical Bond	Organic	Coenzymes
Exothermic	Macromolecule	Triglycerides
Endothermic	Biomolecule	Fatty acids
Polarity	Monosaccharide	Hydrolysis
Solute	Disaccharide	Saturated fat
Solvent	Polysaccharide	Unsaturated fat
Solution	Isomer	Waxes
Inorganic	Carbon chain / ring	Phospholipids
Acid	Dehydration synthesis	Steroids
Base	Hydrolysis	Emulsification
Neutral	Cellulose	DNA
Hydroxide	Starch	RNA
Hydronium	Amino acids	ATP
pH Scale	Peptide bonds	Nucleotides
pH paper	Enzyme	

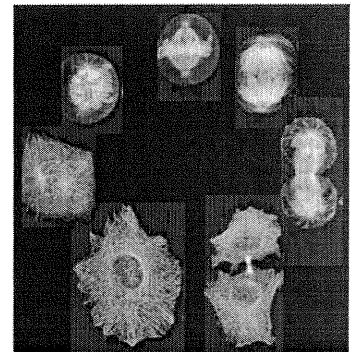
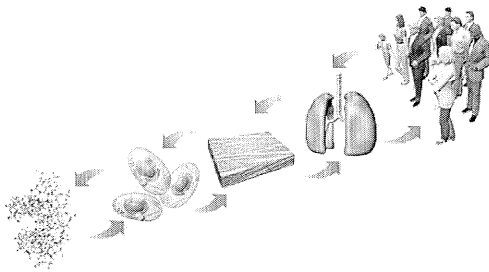
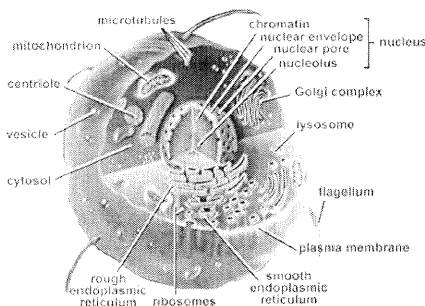
Unit 5 Cells Study Guide

Keystone Concepts

- 1) Describe and interpret relationships between structure and function at various levels of biological organizations (i.e. organelles, cells, tissues, organs, organ systems, and multicellular organisms)
- 2) Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).
- 3) Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations
- 4) Describe the role of ATP in biochemical reactions
- 5) Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell
- 6) Describe how membrane-bound cellular organelles facilitate the transport of materials within a cell

BIG Ideas in Biology

3. **Cells** are the basic unit of structure and function for all organisms
5. Eukaryotic cells can **differentiate** and organize making it possible for multicellularity.
7. New **cells** arise from the division of pre-existing cells.



Vocabulary

Cell membrane

Cell theory

Rough ER

Cytoplasm

History of cells

Golgi apparatus

Genetic material

Organelles

Vesicles

Chromosome

Eukaryote

Ribosomes

Bacteria

Unicellular

Vacuoles

Capsid

Multicellular

Chloroplast

Capsule

Autotrophic

Plastids

Shapes of bacteria

Heterotrophic

Mitochondria

Conjugation

Cell wall

Cristae

Binary fission

Cytoskeleton

Lysosome

Virus

Microtubules

Cell respiration

Vaccines

Microfilaments

Photosynthesis

Protest

DNA

Intracellular

Fungi

Nuclear membrane

Extracellular

Plant

Nuclear pore

Animal

Nucleolus

Prokaryote

Smooth ER

Unit 6 Cell Transport Study Guide

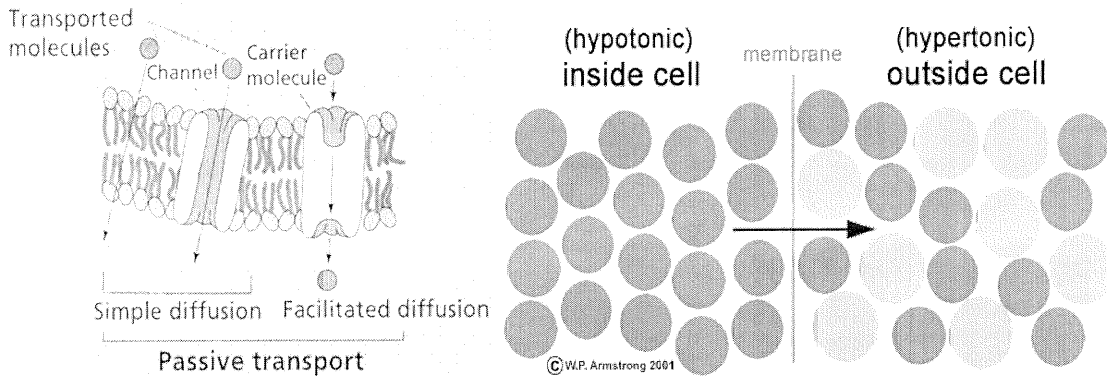
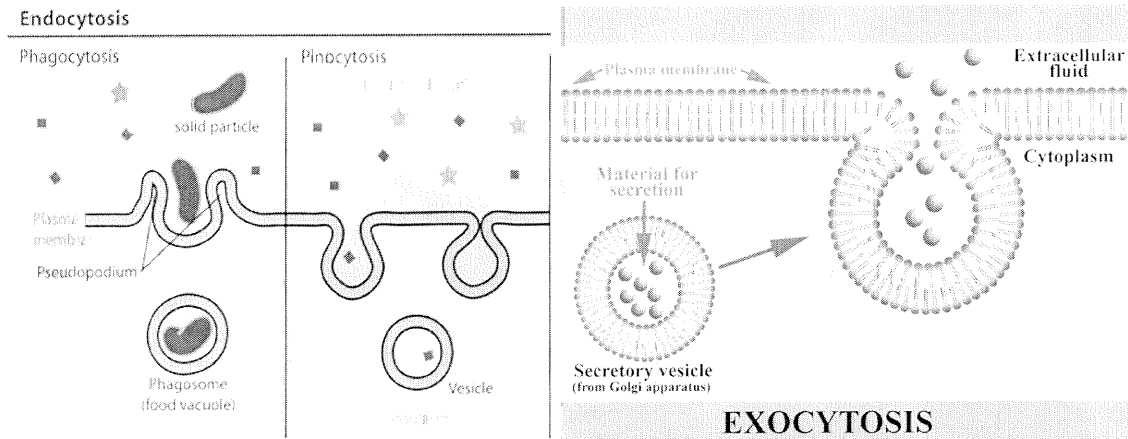


Keystone Concepts:

- 1) Describe how the structure of the plasma membrane allows it to function as a regulatory structure an/or protective barrier for a cell
- 2) Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport – diffusion, osmosis, facilitated diffusion; and active transport – pumps, endocytosis, exocytosis).

Big Ideas in Biology:

- #4) Evolution is the result of many random processes selecting for the survival and reproduction of a population



Vocabulary

Brownian movement

Dynamic equilibrium

Diffusion

Osmosis

Concentration
gradient

Solute

Selectively
permeable

Phospholipid

Fluid mosaic model

Singer and Nelson

Cholesterol

Polar

Nonpolar

Hydrophobic

Hydrophilic

Hypertonic

Hypotonic

Isotonic

Plasmolysis

Cytolysis

Facilitated diffusion

Channel protein

Carrier protein

Active transport

Passive transport

Endocytosis

Exocytosis

Phagocytosis

Pinocytosis

Protists

Unit 7 Protein Synthesis Study Guide



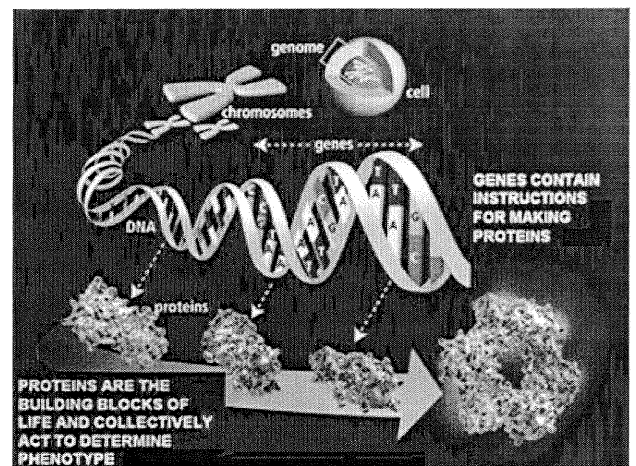
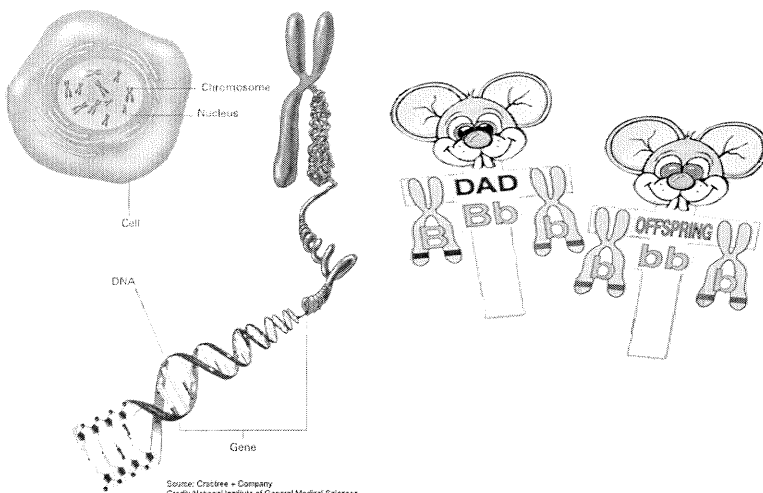
Keystone Concepts



- 1) Describe how the process of DNA replication results in the transmission and/or conservation of genetic information
- 2) Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance
- 3) Describe processes that can alter composition or number of chromosomes
- 4) Describe how the processes of transcription and translation are similar in all organisms
- 5) Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins
- 6) Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype
- 7) Describe how genetic mutations may result in genotypic and phenotypic variations within a population

BIG Ideas in Biology:

8. Hereditary information in genes is transmitted across generations via DNA.
9. DNA segments contain information for the production of proteins necessary for growth and function of cells.



Vocabulary

DNA	Ribose	Covalent Bond
RNA	Deoxyribose	Genome
Nucleic Acids	mRNA	Gene
Adenine	tRNA	The Central Dogma
Thymine	rRNA	Cancer
Guanine	Amino Acid	Genetic Engineering
Cytosine	Polypeptide	Selective Breeding
Uracil	Peptide bond	Graft
Base-Pairing Rule	Protein	Gene Splicing
Double Helix	Protein Modification	Restriction Enzymes
Rosalind Franklin	Codon (Start & Stop)	Plasmid
Watson and Crick	Anticodon	Reproductive Cloning
X-Ray Crystallography	Ribosome	Therapeutic Cloning
Helicase	Nuclear Pore	Recombinant DNA
DNA Polymerase	Mutation	Genetically Modified Organisms (GMOs)
RNA Polymerase	Silent	Gene Therapy
Semi-Conservative Replication	Nonsense	DNA Fingerprinting
Transcription	Missense	Gel Electrophoresis
Translation	Frame-Shift	Forensics
	Hydrogen Bond	

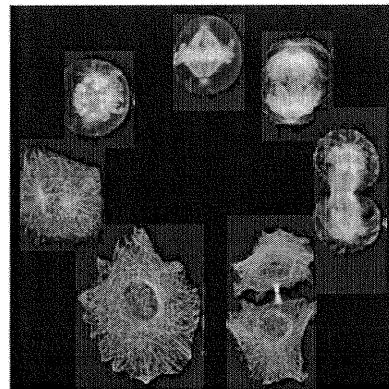
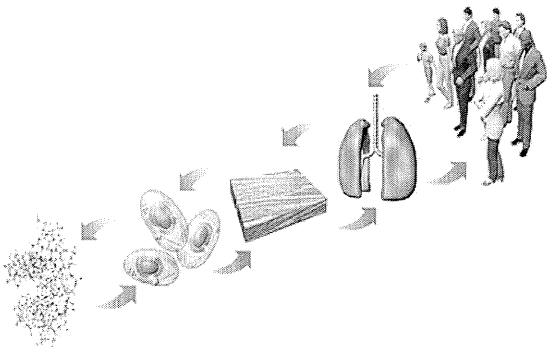
Unit 8 Cell Division & Reproduction Study Guide

Keystone Concepts

1. Describe the events that occur during the cell cycle: interphase, nuclear division (mitosis or meiosis), cytokinesis
2. Compare the processes and outcomes of mitotic and meiotic nuclear divisions
3. Describe the processes that can alter composition or number of chromosomes (i.e., crossing over, nondisjunction, duplication, translocation, deletion, insertion, and inversion.)

BIG Ideas in Biology:

5. Eukaryotic cells can differentiate and organize making it possible for multicellularity.
7. New cells arise from the division of pre-existing cells.



Vocabulary

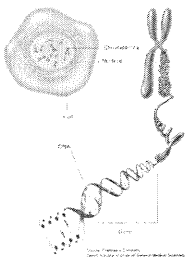
Mitosis	Anaphase	Asexual reproduction
Meiosis	Telophase	Differentiation
Sister Chromatid	Cytokinesis	Zygote
Chromosome	Centrioles	Stem cells
Centromere	Cell plate	Sexual reproduction
Histones	Cleavage furrow	Fertilization
Chromatin	Spindle fibers	Somatic cells
Autosome	Tetrad	Haploid
Sex Chromosome	Genetic recombination	Egg
Diploid (2n)	Crossing over	Sperm
Haploid (n)	Gametes	Pollen
Binary Fission	Sex cells	Cancer
Cell Cycle	Spermatogenesis	
Interphase	Oogenesis	
Prophase		
Metaphase		

Unit 9 Genetics Study Guide

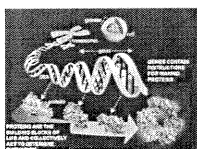
Keystone Concepts

- 1) Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.
- 2) Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, co-dominance, sex-linked, polygenic, and multiple alleles).
- 3) Describe processes that can alter composition or number of chromosomes (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion).
- 4) Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (gene therapy).

BIG Ideas in Biology:



8. Hereditary information in genes is transmitted across generations via DNA.



9. DNA segments contain information for the production of proteins necessary for growth and function of cells.

Vocabulary

Genetics	Heterozygous	Pedigrees
Heredity	Punnett Square	Genetic disorders
Gene	Probability	Nondisjunction
Traits	Generations	Duplication
Gene pool	Incomplete Dominance	Translocation
Alleles	Codominance	Deletion
Mendel	Multiple alleles	Insertion
Law of Dominance	Polygenic	Inversion
Dominant	Sex chromosomes	Genetic screening
Recessive	Autosomes	Genetic counseling
Law of Segregation	Sex-influenced	Amniocentesis
Law of Independent Assortment	Sex-linked	
Genetic recombination	Sex-limited	
Genotype	Lethal Gene	
Phenotype	Carrier	
Homozygous	Karyotypes	