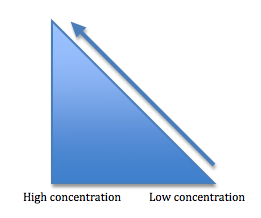
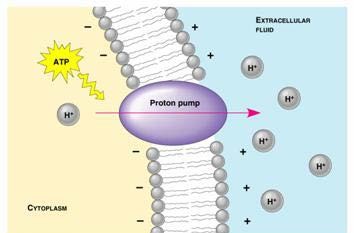
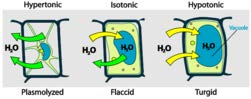
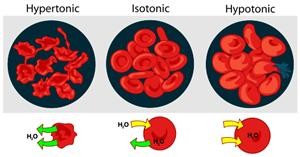
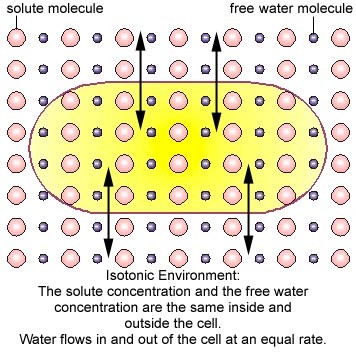
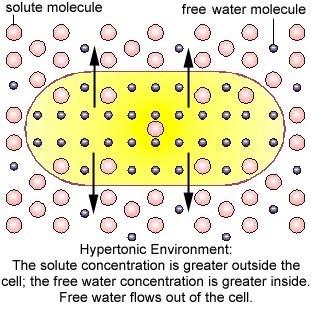
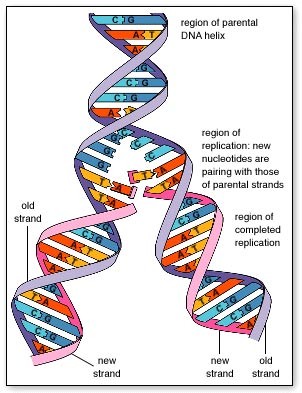
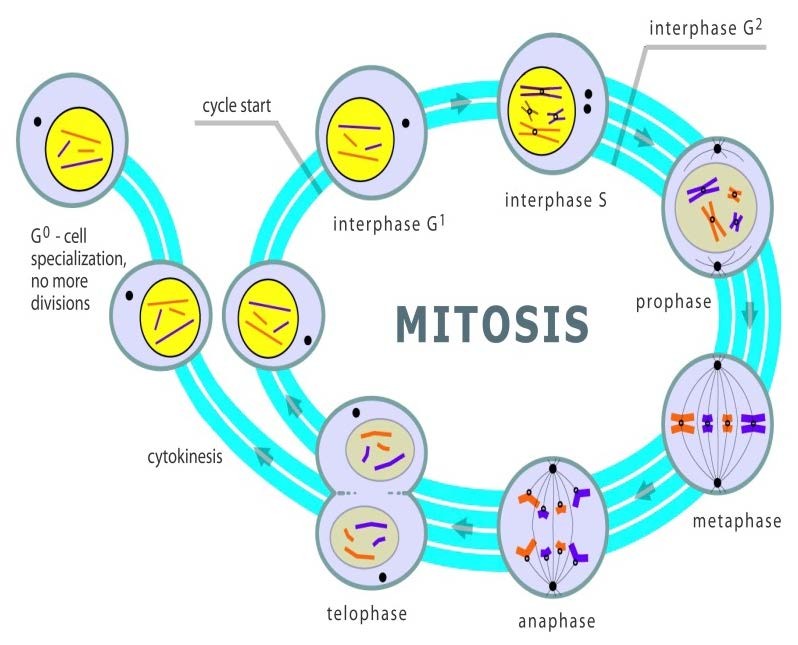
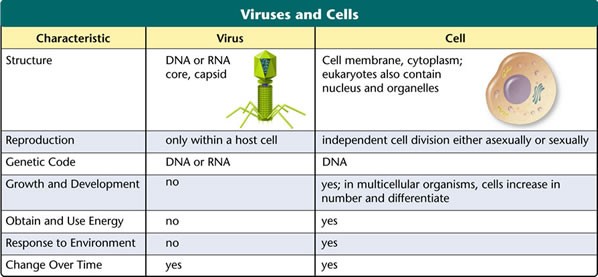


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| **B.4.A** compare and contrast prokaryotic and eukaryotic cells | | | | |
| Prokaryotic Cells: | Eukaryotic Cells: Animal Plant Plant  Chloroplast  site of photosynthesis | | | |
| **Prokaryotic Cells**  -do not have a nucleus – DNA **Eukaryotic Cells**  floats freely in cell -both have DNA as their -have a nucleus  -do not have membrane-bound genetic material -have membrane-bound organelles -both have a cell membrane organelles  -much smaller than eukaryotes -both have ribosomes -much larger than  -divide by binary fission prokaryotes  -bacteria -undergo mitosis | | | | |
| **B.4.B** investigate and explain cellular processes, including homeostasis, energy conversions (covered 9B), transport of molecules, and synthesis of new molecules (covered 6C) | | | |  |
| **Diffusion**: movement of molecules  from a high to low concentration; energy is NOT required | | Simple Diffusion-Passive transport  Simple diffusion through plasma membrane.jpg | Facilitated Diffusion-Active transport  07_15facilitateddiffusionb.jpg |



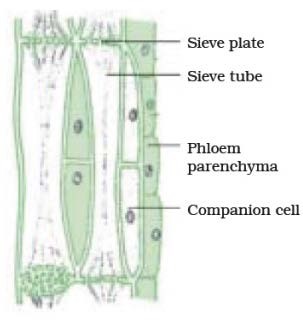
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| **Osmosis**: type of diffusion; movement  of water molecules from a high to low concentration through a semi- permeable membrane  http://t3.gstatic.com/images?q=tbn:ANd9GcQWFx2NWxu6Po-Qlh0PHKe-jfXbtNDgHDakVhAcGwmbZrbGkZ2T5A:library.thinkquest.org/C004535/media/cell_membrane.gif | **Hypertonic** (cell shrinks/shrivels) | **Isotonic** (cell stays the same) | | **Hypotonic** (cell swells/enlarges)  hypotonic-solution-7554_0.jpg |
|  | | | |
| **Active transport**: movement of  molecules from a low to high concentration; requires energy (ATP) |  | |  | |
| **Bulk transport**: movement of large  quantities of molecules at once | Endocytosis: molecules ENTER the cell  endoexo.jpg | | Exocytosis: molecules EXIT the cell  endoexo.jpg | |

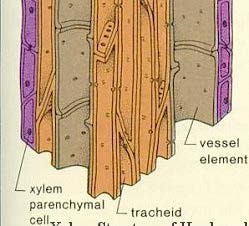
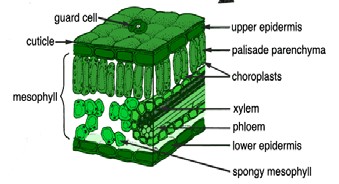
**Cell Cycle**



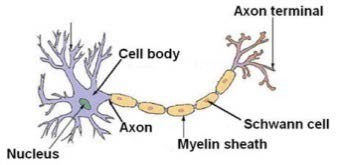
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|  | **Cell Cycle** |  |

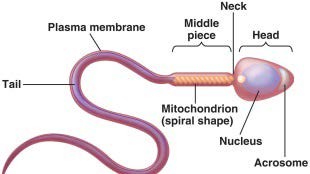
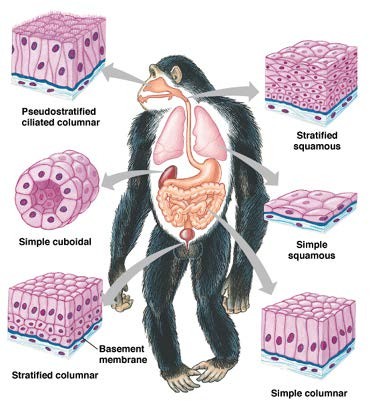
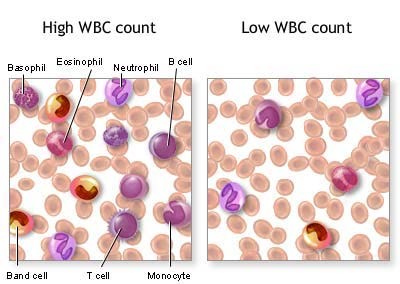
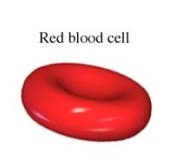
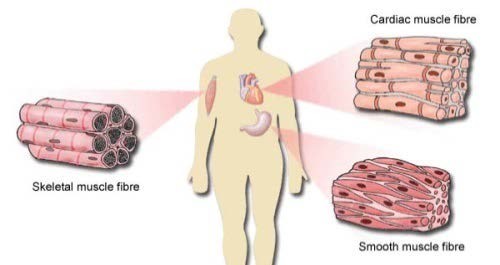
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| **B.4.C** compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and  influenza | | | | | |
| Examples of Viral Diseases and Infections:   * HIV/AIDS * Influenza (flu) * Common cold   These diseases can NOT be treated  with antibiotics. Antibiotics kill bacteria only, not viruses. | | | | |  |
| **B.5.A** describe the stages of the cell cycle, including deoxyribonucleic acid (DNA) replication and mitosis, and the importance of the cell cycle to the growth of organisms | | | | | |
|  | **Phase** | **Events within cell** |  | Replication Steps  The double helix is unwound.  The hydrogen bonds between the nitrogen bonds are broken to separate the two strands of DNA.  Each original strand is used as a template to build a new strand. Complementary base pairing occurs (A pairs with T and C pairs with G).  Two molecules of DNA are produced (half original and half new). This is known as semi-conservative replication | |
|  | G1 | Intensive cellular synthesis (make more organelles) |
|  | S | DNA replication occurs, Each chromosome has become two chromatids. |
|  | G2 | Intensive cellular synthesis. Mitochondria and chloroplasts divide. Energy stores increase. Mitotic spindle begins to form. |
|  | Mitosis | Nuclear division occurs in four phases (prophase,metaphase, anaphase telophase) |
|  | C | Equal distribution of organelles and cytoplasm into each daughter cells |
|  | | | |





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| **B.5.B** examine specialized cells, including roots, stems, and leaves of plants; and animal cells such as blood, muscle, and epithelium | | | |
| Cell | Tissue | Function | Location |
| Parenchyma | Parenchyma (ground) | Many functions  Leaf: photosynthesis; allows for gas exchange  Root: storage of sugars; transport water | Throughout plant (roots, stems, and leaves) |
| Tracheid | Xylem (vascular) | Serve as conducting cell to transport water  throughout plant | Throughout plant (roots, stems, and leaves) |
| Sieve tube member/element | Phloem (vascular) | Serve as conducting cell to transport sugars  throughout plant | Throughout plant (roots, stems, and leaves) |
| Companion cell | Aid in conducting sugars throughout plant; found  along side sieve tube member | Throughout plant (roots, stems, and leaves) |
| Root hairs | n/ahttp://click4biology.info/c4b/9/images/9.2/roothair.jpg | Increase surface area for absorption of water | Roots |
| Guard cells | n/a | Regulate the opening and closing of pores in the leaf called stoma(ta) | Leaf |
| Pollen | n/a | Produce sperm | Flower (in angiosperms); cone (in  gymnosperms) |
| Ovule | n/a | Produce egg | Flower (in angiosperms); cone (in  gymnosperms) |





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| --- | --- | --- |
| Function | Picture | Structure |
| **Nerve cells**: Carry messages to other parts  of the body |  | **Nerve cells** (or neurons) are very long so that they can carry messages to  different parts of the body. They have many branches at the end so that they can connect with many other nerve cells. |
| **Muscle cells:** They are classified as  skeletal, cardiac, or smooth muscles. Their function is to produce force and cause motion. Muscle cells contain many mitochondria for ATP (energy).  . |  | **Skeletal =** striated; voluntary; found in muscles of arms and legs  **Smooth** = not striated; involuntary; found lining the digestive tract  **Cardiac** = striated; involuntary; found in the heart |
| The main function of **red blood cell**s is to  carry oxygen from the  lungs to the parts of the body where it is needed. |  | They are shaped to give them a large surface area so they can absorb oxygen more easily. The cytoplasm contains a protein called ‘hemoglobin’,  which carries oxygen |
| **White blood cells** fight pathogens and help  stop infections. |  | White blood cells are capable of ‘eating’ bacteria and breaking them down. A high white blood cell count indicates that your body is fighting a  pathogen. |
| **Epithelial cells** comprise tissues that line  organs. |  | Epithelial tissue is comprised of multiple layers. This is often used for protection (i.e. the skin). |
| **Spermatozoon** carry genetic information to  an egg. |  | They have a tail which they use for swimming. They have mitochondrion to release the energy they need for swimming. The head of the sperm  contains special chemicals that help it to penetrate an egg. |

* + 1. describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation

Environmental factors can alter the way our genes are expressed, making even identical twins different. The development and maintenance of an organism is orchestrated by a set of chemical reactions that switch parts of the genome off and on at strategic times and locations.

## Internal Conditions that Affect Cell Differentiation:

Proteins and hormones that are made within the organism. Certain protein within cells transmit information and trigger (start or activate) hormones (enzymes) that carry forward the information for cell growth/differentiation.

## External Conditions that Affect Cell Differentiation:

The release of these hormones is affected by environmental factors, such as temperature changes and pollution , --- affect gene expressions.

* + 1. recognize that disruptions of the cell cycle lead to diseases such as cancer

# Cancer is

* + - * Uncontrolled mitosis
      * Uncontrolled cell division
      * A result of failed checkpoints, allowing the cell to continue to divide without regulation
    1. identify components of DNA, and describe how information for specifying the traits of an organism is carried in the DNA

Nucleotide: monomer of DNA Sugar (deoxyribose) Nitrogenous base

Adenine (A) Thymine (T) Cytosine (C)

Guanine (G) Phosphate group

Structure of DNA Two strands

Backbone is of alternating sugar and phosphate molecules

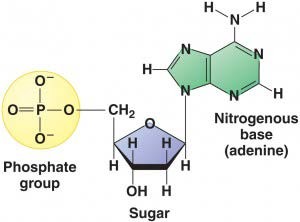
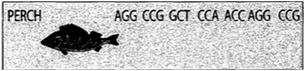
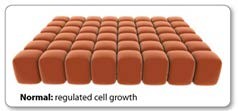
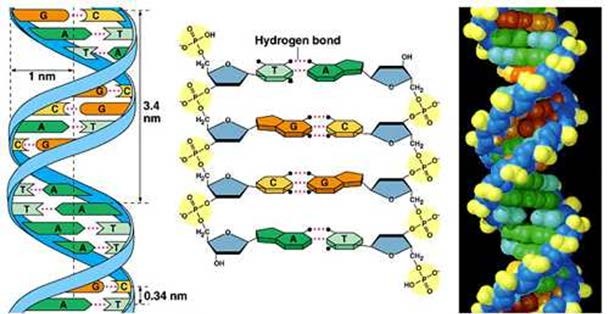
Interior consists of base-pairs of nitrogen bases (complementary base pairing)

A always pairs with T C always pairs with G

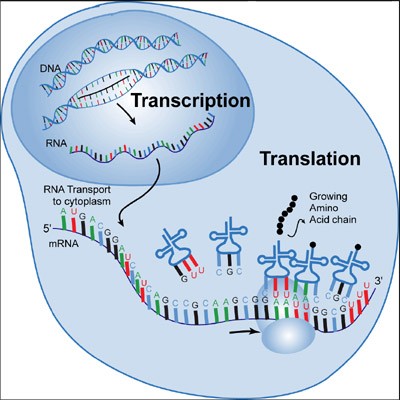
Hydrogen bonds hold the nitrogen bases together

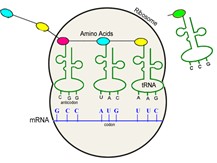
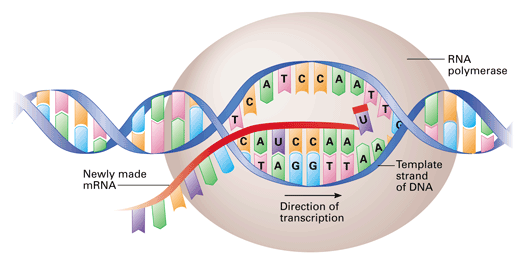
Two strands twist to form a double helix

* + 1. recognize that components that make up the genetic code are common to all organisms ALL living organisms contain A, T, C, and G in their DNA.



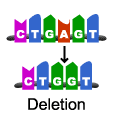
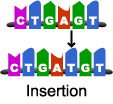
ALL living organisms use that DNA to make proteins from the same twenty amino acids.

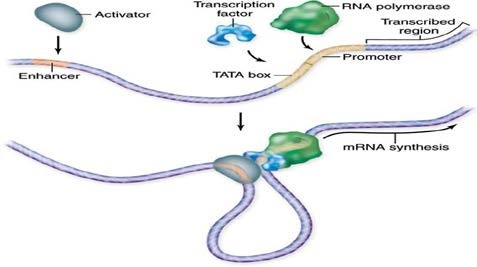
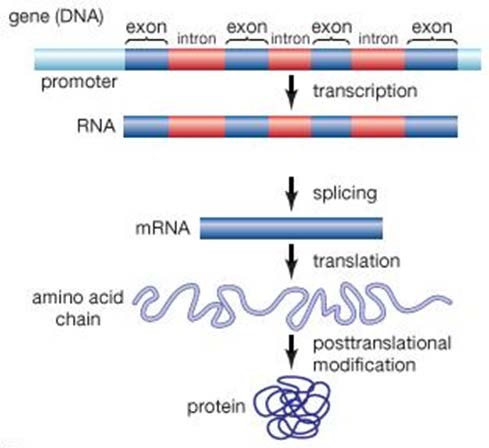
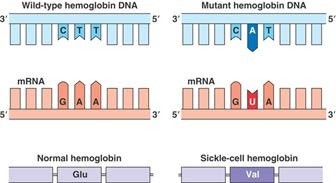
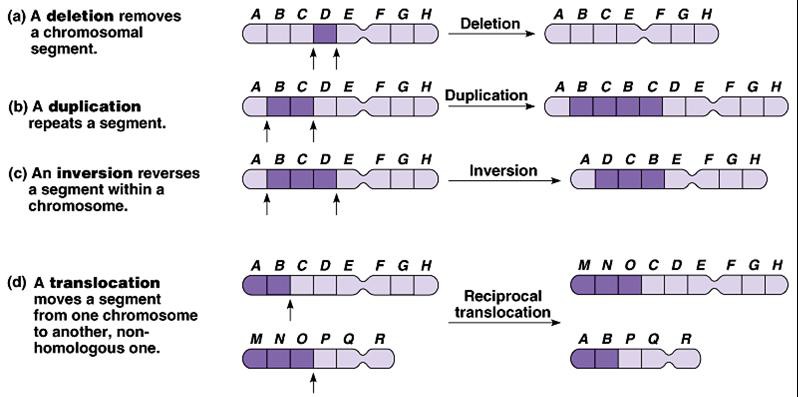




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| **B.6.C** explain the purpose and process of transcription and translation using models of DNA and RNA | |
| http://www.ict-science-to-society.org/pathogenomics/images/central_dogma.gif | |
| **Transcription**   * The use of DNA to make RNA * Occurs in the nucleus of the cell * RNA base-pairs with the template strand of DNA * Remember: \*RNA has uracil (U) instead of thymine (T)   • |  |
| **Translation**   * The use of RNA to make proteins * Occurs in the cytoplasm of the cell * Requires the use of three types of RNA * Messenger RNA (mRNA): copy of DNA’s message to code proteins; contains codons (three base sequences) * Transfer RNA (tRNA): carries amino acids to the ribosomes; contains anti-codons (three base sequences that pair up with mRNA) * Ribosomial RNA (rRNA): makes up structure of ribosome   Anti-codon on tRNA pairs with mRNA codon to bring proper amino acid into the ribosome. Amino acids are connected until a stop codon is reached. |  |

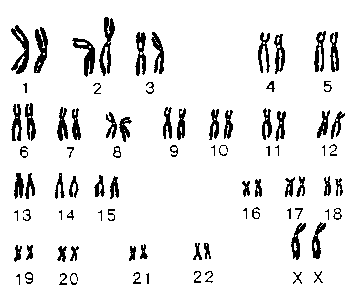
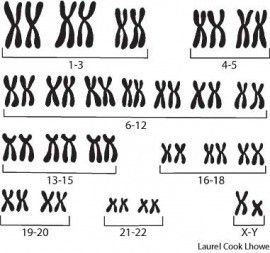
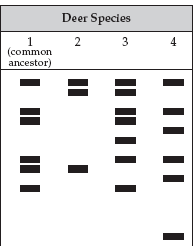
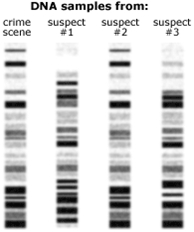




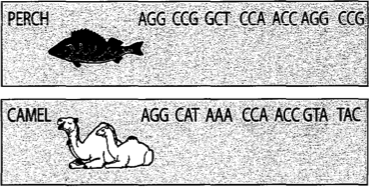


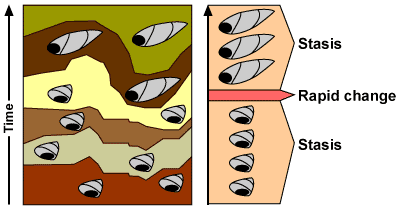
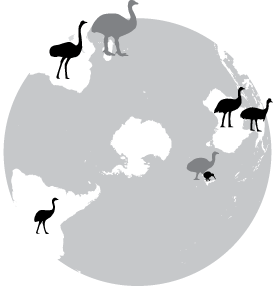
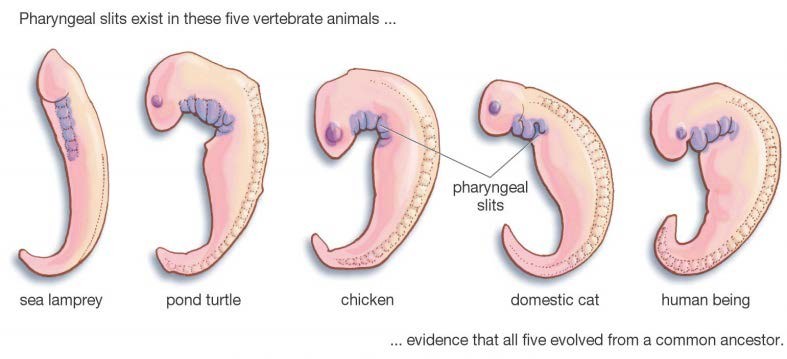
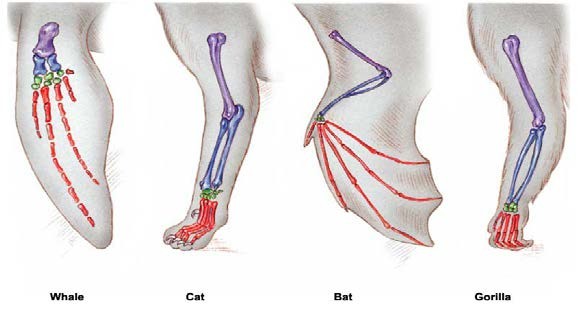
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| **B.6.D** Recognize that gene expression is a regulated process. | | |
| Steps of transcription  **Transcription factors** bind to the **DNA**.  **RNA polymerase** binds to the **promoter** region of DNA. RNA polymerase uses DNA as a template to make **RNA**.  \*\*\* Note: When transcription factors are NOT bound to the DNA, RNA will not be produced. \*\*\*  **Exons**: genes that will be **expressed**; they **remain** in the mRNA sequence  **Introns**: not needed by a cell and are **removed**  http://upload.wikimedia.org/wikipedia/commons/1/12/DNA_exons_introns.gif |  | |
| **B.6.E** identify and illustrate changes in DNA and evaluate the significance of these changes | | |
| Chromosomal mutation  Deletion: chromosomal segment is removed (genetic information is permanently lost) Duplication: chromosomal segment is repeated  Inversion: segment within a chromosome is reversed Translocation: moves a segment from one chromosome to another  Non-disjunction: chromosome fails to separate properly during meiosis  **Mutation in nucleotide sequence**  Point mutation: single nucleotide is changed (a.k.a substitution) Frameshift mutation: nucleotides are either deleted or inserted **Point Mutation Frameshift Mutations**  missense | |  |

|  |  |  |
| --- | --- | --- |
| **B.6.F** predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses and non‐Mendelian inheritance | | |
| **Mendelian Genetics Definitions**  Gene – section of DNA that codes for proteins  Alleles - different forms of a gene; either dominant or recessive Chromosome - structure made up of DNA and proteins Genotype - genetic makeup of an organism (ex. AA, Aa, aa)  Phenotype - visible expression of genetic makeup; physical traits (ex. blue eyes)  Homologous chromosomes – pair of chromosomes that contain genes for the same traits; one from mom and one from dad  Homozygous - possesses identical alleles for a given gene on homologous chromosomes (ex. AA or aa); also known as true-breeding  Heterozygote - possesses different alleles for a given gene on homologous chromosomes (ex. Aa); also known as hybrids  Sex chromosomes - determine the sex of an individual; in humans, X and Y chromosomes; XY for males, XX for females  Autosome - chromosome that is not a sex chromosome P generation- individuals for initial cross  F1 generation - offspring from initial cross  F2 generation - offspring that results from cross of F1 individuals  Dominant allele - masks recessive allele; expressed in homozygous dominant and heterozygous conditions; represented by capital letters (i.e. A, B, H, L)  Recessive allele - not expressed in heterozygous condition; expressed only when individual is homozygous for the allele; represented by lowercase letters (i.e. a, b, h)  Monohybrid cross – only one trait is involved (ex. Bb x Bb) Dihybrid cross – two or more traits are involved (ex. BbSs x BbSs) **Non-Mendelian Genetics**  Incomplete dominance - no allele completely dominates another; results in a phenotype intermediate to that of parents  Ex. A red flower (RR) crossed with a white flower (WW) produces pink flowers (RW). Codominance - both alleles are expressed  Ex. A red cow (RR) crossed with a white cow (WW) produces a white AND white cow (RW).  Ex. A person with Type AB blood has a genotype of IAIB. Multiple alleles – more than two alleles exist for a trait  Ex. Human blood types have three possible alleles (IA, IB, and i). | |  |
| **Pedigree**  Square = male Circle = female Shaded = affected  Non-shaded = normal Half-shaded = carrier  Possible genotypes for x-linked recessive diseases (example: colorblindness) Males  XEY: normal XeY: colorblind  Females  XEXE: normal  XEXe: carrier (normal phenotype, but can pass recessive allele to offspring) XeXe: colorblind | http://www.macalester.edu/academics/psychology/whathap/ubnrp/visionwebsite04/pictures/pedigree.gif | |

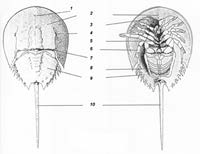


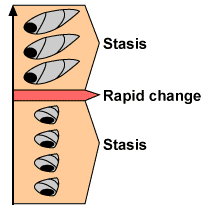
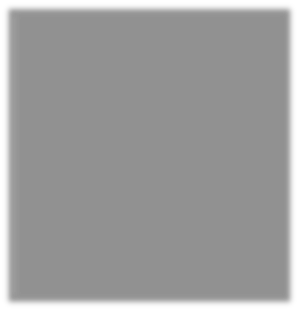
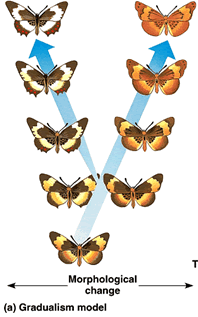
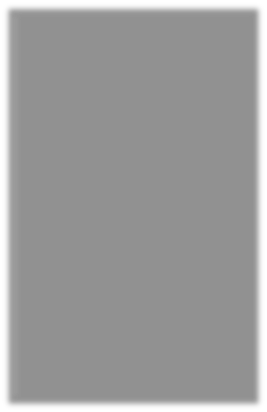
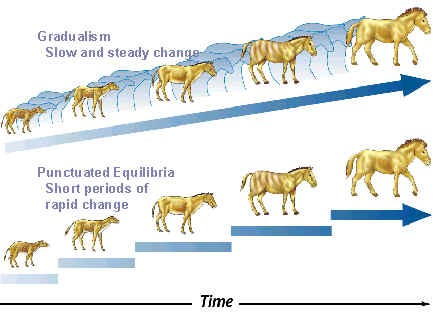
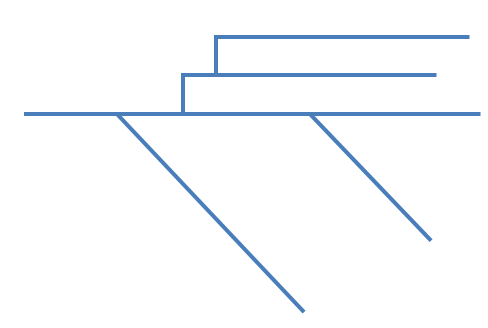
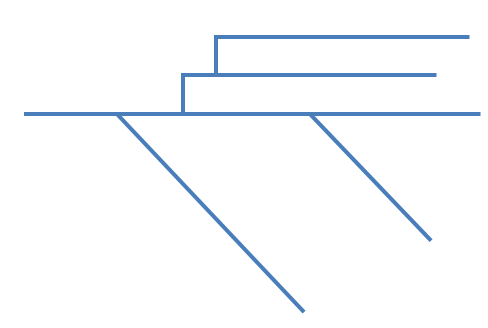
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| **B.6.G** recognize the significance of meiosis to sexual reproduction | | |
| **Meiosis**  Creates four genetically unique daughter cells due to crossing over (exchange of DNA between homologous chromosomes)  Reduction in chromosome number from diploid to haploid  Diploid: two sets of chromosomes (one from mom, one from dad) Haploid: one set of chromosomes  Results in sex cells or gametes | | mediagr.gif |
| **B.6.H** describe how techniques such as DNA fingerprinting, genetic modifications, and chromosomal analysis are used to study the genomes of organisms | | |
| **Gel electrophoresis**  DNA is cut into smaller pieces using restriction enzymes An electrical current is applied  DNA is separated by size. Shorter fragments move farther down the gel than longer fragments. | Suspect #2 matches the crime scene sample.  Deer species #3 is most closely related to deer species #1 because  they have five DNA bands in common. | |
| **Karyotype**  **Normal male Normal female** | http://bookbing.org/wp-content/uploads/karyotype-down-syndrome-300x225.jpg  **Down’s Syndome Female (extra #21 chromosome)** | |



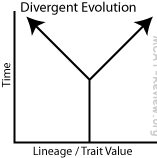
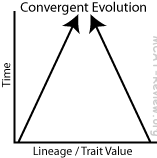
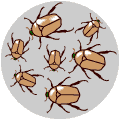


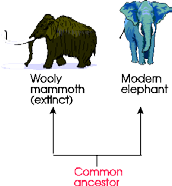
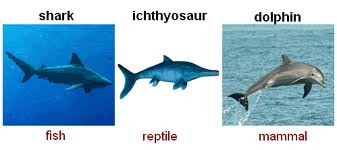
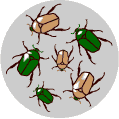
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| **B.7.A** analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and  developmental | |
| **Fossil Record**  Bottom layers contain the oldest fossils Upper layers contain the youngest fossils | |
| **Biogeography** = study of distribution of species in space and time  Isolation of populations may lead to speciation  For example, all ratites (flightless birds) shared a common ancestor on the supercontinent of Pangea. When Pangea separated, populations became isolated and gave rise to different species (i.e. ostrich, emu, kiwi). | |
| **Homologies** = similarity of the structure, physiology, or development of different species based upon their  descent from a common ancestor **Anatomical**: similar bone structure **Molecular:** DNA and protein sequences  **Developmental**: embryology FG16_12 |  |



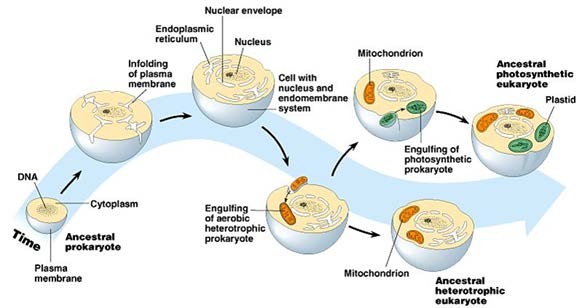
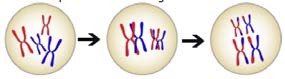


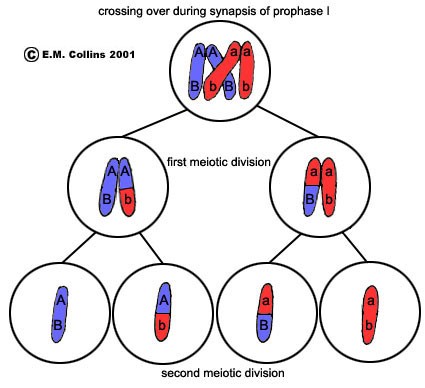
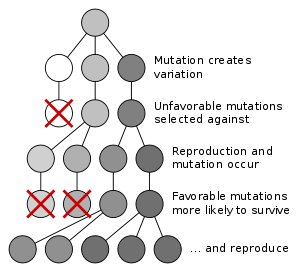
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| **B.7.B** analyze and evaluate scientific explanations concerning any data of sudden appearance, stasis, and sequential nature of groups in the fossil record | | |
| **Stasis**  Populations remain unchanged for long periods of time Examples: *Ginkgo biloba* and Horseshoe crab | | |
| **Gradualism**  Slow and steady change over time Transitional fossils are present | **Punctuated equilibrium**  Populations change quickly and then stay the same. | |
| **B.7.C** analyze and evaluate how natural selection produces change in populations, not individuals | | |
| Lamarckian Evolution  Larmack believed that individuals could change to develop adaptations for the environment.  For example, short-necked giraffes would grow longer necks within their lifetime to reach tall leaves. Rejected in scientific community  **Darwinian Evolution**  The organisms that are best adapted for an environment survive and reproduce, passing on successful traits to the next generation.  For example, short-necked giraffes died because they could not reach food. Genes coding for short- necked giraffes became reduced in the giraffe population. Long-necked giraffes survived and  passed on their genes to the next generation. Accepted in scientific community | | http://webapps.fundp.ac.be/umdb/wiki-bioscope/images/f/f6/Compar.gif |



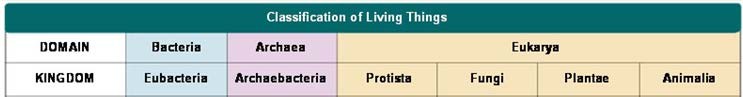
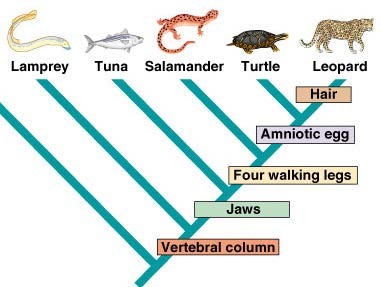


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| **B.7.D** analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite  supply of environmental resources, result in differential reproductive success | |  |
| Steps of natural selection: There is genetic variation in traits. For example, some beetles are green and some are brown. These differences on based on DNA.   1. **There is differential reproduction**.   Since the environment can't support unlimited population growth, not all individuals get to reproduce to their full potential. In this example, green beetles tend to get eaten by birds and survive to reproduce less often than brown beetles do.   1. **There is heredity.**   The surviving brown beetles have brown baby beetles because this trait has a genetic basis.  **End result:**  The more advantageous trait, brown coloration, which allows the beetle to have more offspring, becomes more common in the population. If this process continues, eventually, all individuals in the population will be brown. | Heredity of the traits of the beetles who survive |
| **B.7.E** analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species | | |
| **Speciation** – formation of new species; results when there is a limit of gene flow between populations where it previously existed  **Reproductive barriers include**  **Geographic isolation** (populations are physically separated)  **Temporal isolation** (populations are breeding at different times of the day or year) Behavioral isolation (populations use different mating calls or rituals)  **Convergent evolution** – the evolution of similar adaptations because of similar habitats  For example, sharks and dolphins have similar tail and fin structure. However, they are not closely related. They look similar because they live in similar habitats.  **Divergent evolution** - the process of two or more related species becoming more and more dissimilar  For example, the kit fox and red fox once had a common ancestor. The red fox lives in mixed farmlands and forests, while the kit fox lives on the plains and in the deserts. This geographic isolation resulted in the development of different adaptations and the divergence into two species.  **Coevolution** – the concurrent evolution of two species completely dependent on each other  For example, if a plant is pollinated by one type of insect. If the insect population evolves, the plant population must evolve to maintain its existence.  Adaptation – an inherited characteristic that allows for an organism’s increased chance of survival | | |

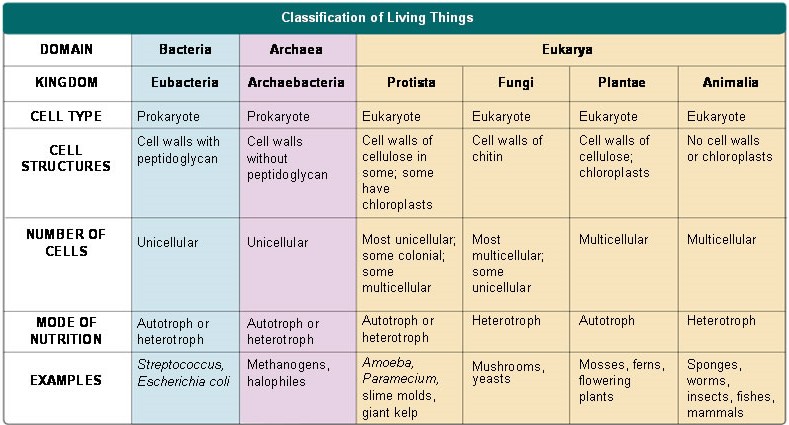




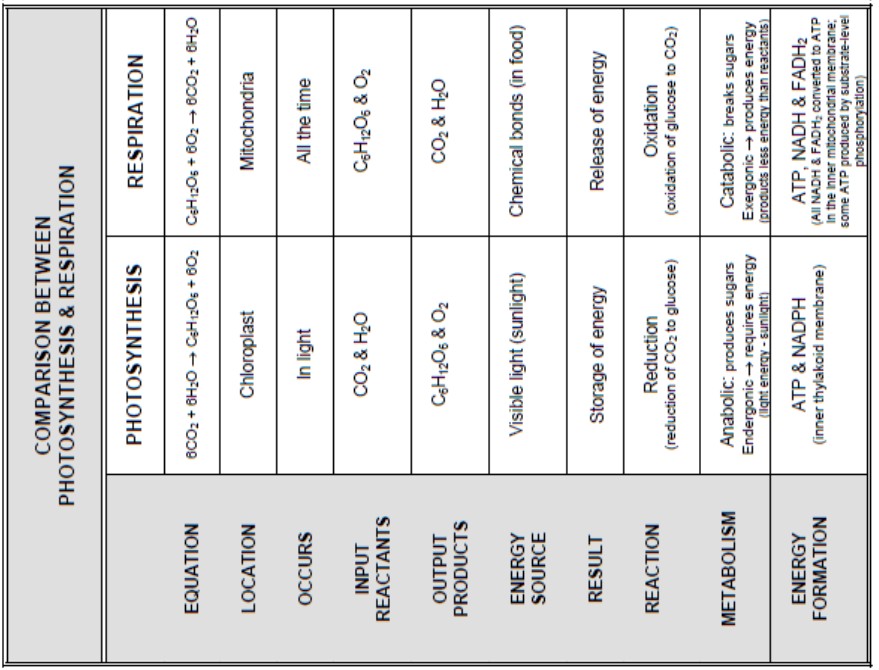
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| **B.7.F** analyze and evaluate the effects of other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination | |
| **Genetic drift** – random changes in allele frequencies  **Gene flow** – individuals can migrate into new populations and interbreed, which incorporates their genes into the new population  **Mutation** – change in DNA creates genetic variation within a  population; may lead to a favorable adaptation  **Recombination** (gene shuffling) – creates genetic variation within a  population  ***Mutation Recombination*** | ***Genetic Drift***  http://evolution.berkeley.edu/evosite/evo101/images/beetles_mech3.gif  ***Gene Flow***  http://evolution.berkeley.edu/evosite/evo101/images/geneflow_beetles.gif |
| **B.7.G** analyze and evaluate scientific explanations concerning the complexity of the cell | |
| **Evolution of eukaryotes**   * origin of mitochondria * engulfed aerobic bacteria, but did not digest them * mutually beneficial relationship natural selection * origin of chloroplasts * engulfed photosynthetic bacteria, but did not digest them * mutually beneficial relationship natural selection! | |



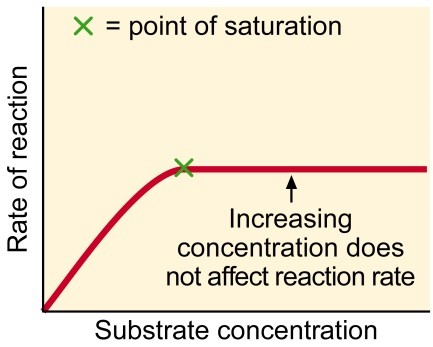
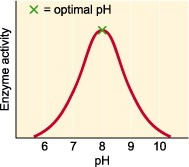
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| **B.8.A** define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community | |
| **Taxonomy is the classification of organisms in a hierarchical system**.  Organisms are assigned a scientific name using binomial nomenclature.  **Scientific name = Genus + species**  The genus of a scientific name is always capitalized. The species is lower-cased. The whole name is written in italics. Scientific names are standardized and universal. Common names vary by region and may lead to confusion. A scientific name is unique to each species. **Ex. *Homo sapiens*, *Zea mays***  There are a number of **goals to biological classification**   * to examine the relationships between various organisms, * to construct evolutionary trees to explore the origins of life on Earth * to provide consistent ways to name and categorize organisms.   For example, the bird called a robin in Great Britain is a different bird from the bird called a robin in North America. To avoid confusion, biologists need a way to name organisms that does not depend on language or location. | |
| **B.8.B** categorize organisms using a hierarchical classification system based on similarities and differences shared among groups | |
| **Hierarchical classification**  Most broad category is a domain Most specific category is a species  You can remember the order from Kingdom to Species by using the following mnemonics: “King Philip Came Over for Great  Spaghetti” or “Kids Put Candy on Father’s Green Shirt.”  If Species A, B, and C all belong to the same family; and species A and B belong to the same genus. Species A and B are the most closely related. | http://science.kennesaw.edu/~jdirnber/Bio2108/Lecture/LecPhylogeny/25-07-HierarchicalClass-AL.jpg |
| Phylogenetic Trees or Cladograms  **Cladograms** are primarily based on similarities between  DNA and protein sequences.  Species to the far left are the most ancestral.  The closer together organisms appear on the cladogram, the more similarities they share.  Organisms possess are characteristic if they are to the  right of the labeled trait. For example, the turtle has a vertebral column, jaws, four walking legs, and an amniotic egg. However, it does have hair. |



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| **Dichotomous keys** help to classify organisms based on their characteristics. How to use a dichotomous key:  Always start at #1 on the dichotomous key, regardless of the organism chosen.  Read options ‘a’ and ‘b’ for #1. Determine which description matches the organism in question. Follow the directions after the matching description.  Continue until description matching the organism reveals the name of organism. | http://crescentok.com/staff/jaskew/ISR/botzo/keycone.jpg  What tree is this?  1a. leaves broad.......................go to 2  1b. leaves needle-like...............go to 3  2a. margin smooth.....................persimmon  2b. margin toothed.....................elm 3a. cone woody and elongated...pine  3b. cone soft and round..............ceda |
| **B.8.C** compare characteristics of taxonomic groups, including archaea, bacteria, protists, fungi, plants, and animals | |
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| Autotroph – capable of producing its own food  Heterotroph – NOT capable of producing its own food; must obtain food from another source | |



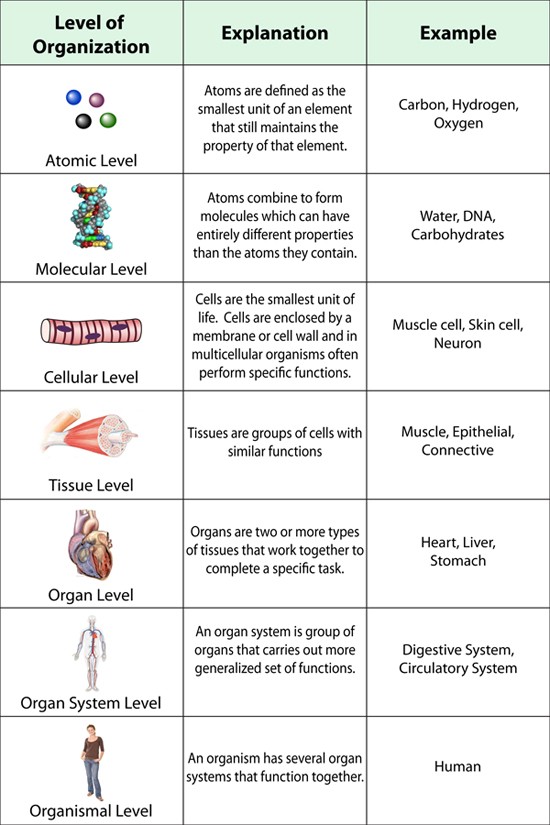
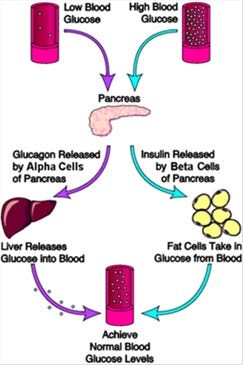
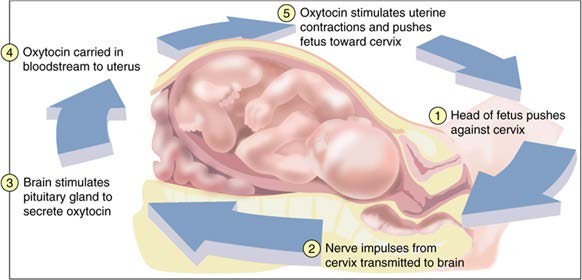
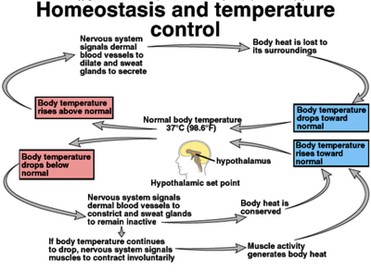
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| **B.9.A** compare the structures and functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids | | | | |
|  | Carbohydrates | Proteins | Lipids | Nucleic Acids |
| Atoms | Carbon, hydrogen, oxygen | C, H, O, nitrogen, sometimes sulfur | C, H, O | C, H, O, nitrogen, phosphorous |
| Mono-mer | Monosaccharide | Amino acid | No monomer | Nucleotide |
| Function | Short-term energy storage; structural support; component of cell walls | Transport molecules, act as enzymes (speed up rate of chemical reactions) | Long-term energy storage; main component of cell membrane | Store genetic information; act as instructions to make proteins |
| Example | Sugars, glucose, sucrose, cellulose, deoxyribose, ribose | Hemoglobin | Phospholipids, oils, fats | DNA, RNA |
| Picture/Diagram |  |  |  |  |
| **B.9.B** compare the reactants and products of photosynthesis and cellular respiration in terms of energy and matter and **B.4.B** | | | | |
| http://www.ck12.org/ck12/images?id=311849 | | | | |



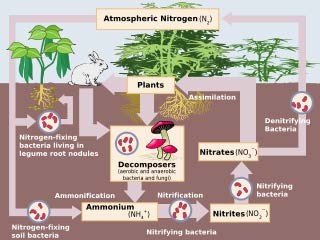
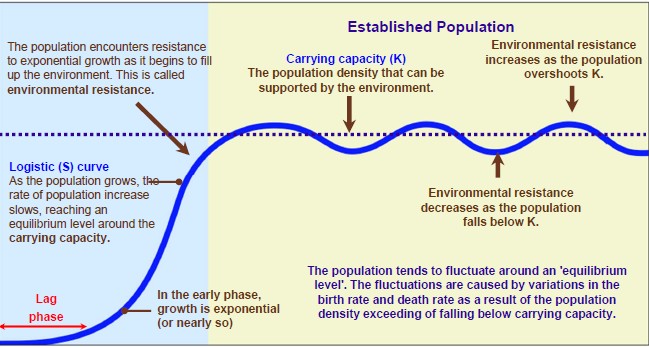
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| **B.9.C** identify and investigate the role of enzymes | | |
| Enzymes speed up the rate of chemical reactions.  Description: http://upload.wikimedia.org/wikipedia/commons/thumb/f/fe/Carbonic_anhydrase_reaction_in_tissue.svg/504px-Carbonic_anhydrase_reaction_in_tissue.svg.png | Enzymes are proteins that react with substrates to create products. | |
| Enzymes are affected by temperature, pH, and substrate concentration on enzymes. | Description: Graph of enzyme activity verses temperature | |
| **B.9.D** analyze and evaluate the evidence regarding formation of simple organic molecules and their organization into long complex molecules having information such as the DNA  molecule for self‐replicating life | | |
| Prebiotic Experiments  In the 1950s, **Stanley Miller** and Harold Urey designed experiments to recreate the conditions of primitive  Earth.  They aimed to create the biological molecules that were the Prebiotic Experiments  In the 1950s, **Stanley Miller and Harold Urey** designed experiments to recreate the conditions of primitive  Earth.  They aimed to create the biological molecules that were the forerunners to the development of the first living organisms.  At the time of the experiments, Earth’s early atmosphere was thought to be made up of methane, water vapor, ammonia, and hydrogen gas.  The experiment produced amino acids, so it seemed that the building blocks of life are relatively easy to create.  Many types of organic molecules have even been detected in deep space.(forerunners to the development of the first living organisms) | |  |



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| **B.10.A** describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals | | | |
| An animal’s organ systems interact to perform many functions. | | | |
|  | Regulation | The endocrine system makes certain hormones. Blood in the circulatory system carries them to the skeletal system to control the amount of calcium released from  bones. |  |
| Nutrient Absorption | Food is broken down in the stomach mechanically by the muscular system (churns food) and chemically by water, acid, and enzymes in the digestive system;  nutrients are then absorbed by blood in the circulatory system |
| Reproduction | Certain hormones produced in the endocrine system control ovulation in a female’s reproductive system |
| Defense | Mucus in the lungs traps a virus in the respiratory system. T-cells in the immune system destroy virus- infected cells. Nerves in the nervous system sense pain from a fire on the skin |
| **B.10.B** describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants | | | |
|  | Function | Example of interactions |  |
| Transport | The root system uptakes water.  Xylem vessels transport water to the leaves in the shoot system. Phloem vessels transport sugars and nutrients throughout the plant. |
| Reproduction | The reproductive organs in a flower are the pistil (female) and the stamen (male). A seed is a mature, pollinated ovule (fertilized egg).  Hormones in a plant’s root system help trigger the growth of a seed in the shoot system. |
| Response | When one side of a plant does not receive enough light, a hormone that causes growth is produced in the shoot system’s leaves. It is transported to the darker side. As the dark side grows, the plant bends toward the light. |
| **Response**  **Phototropism**: plant movement in response to light **Gravitropism**: plant movement in response to gravity **Thigmotropism:** plant movement in response to touch  . | | | |

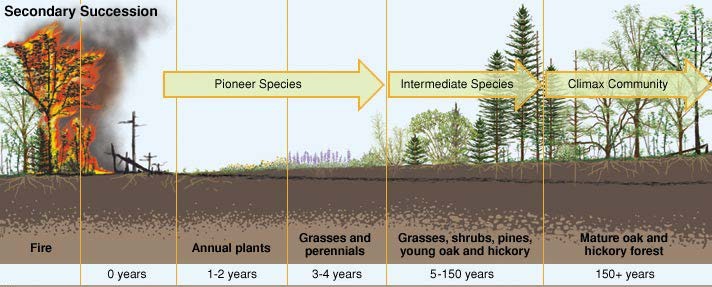


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| **B.10.C** analyze the levels of organization in biological  systems and relate the levels to each other and to the whole system | **B.11.A** describe the role of internal feedback mechanisms in the maintenance of homeostasis | | |
|  | In **negative feedback** the body responds to an extreme condition by reversing the current direction of change.  Example: Maintaining stable blood glucose levels  Low blood sugar… pancreas releases glucagon… liver releases glucose into blood… normal blood sugar obtained  High blood sugar… pancreas releases insulin… fat cells take glucose from  blood… normal blood sugar obtained  Example: Maintaining stable body temperature  High body temperature… blood vessels dilate and sweat glands secrete sweat… body temperature returns to normal  Low body temperature… blood vessels constrict and muscles contract… body temperature returns to normal | |  |
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| In **positive feedback** the body responds to an extreme condition by promoting the current direction of change. Example: Giving birth  Oxytocin is continuously secreted to stimulate uterine contractions. | |  | |

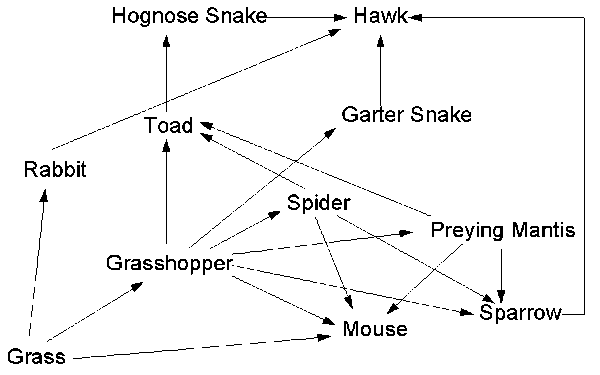
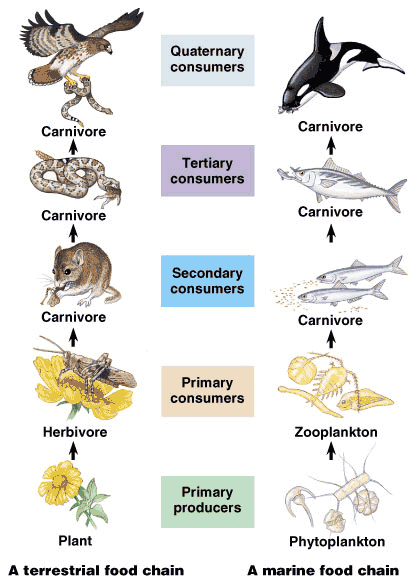


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| Beneficial Roles of Bacteria | Harmful Roles of Bacteria |
| Decompose organic material | Spoil food |
| Change nitrogen from one form to another in the nitrogen cycle | Produce harmful or damaging toxins |
| Have role in making drugs(like penicillin), foods(like yogurt and cheese), and vitamins | Cause of shortage of oxygen in lakes where blooms occur |
| Help absorb nutrients in the human digestive system | Cause diseases |

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| **B.11.B** investigate and analyze how organisms, populations, and communities respond to external factors |
| **Limits to Growth**  **Limiting Factor**: any factor that limits the size of a population  **Density dependent** factors exert a greater effect on population growth at higher population densities.  Examples: predation, disease, natural disasters, food shortage, competition,.  **Density Independent Factors** : The effect of density independent factors on a  population’s growth is NOT dependent on that population’s density: Examples: Physical (or abiotic) factors: temperature, precipitation,  humidity, Catastrophic events |
| **B.11.C** summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems |
| Microorganisms:  Tiny organisms (like bacteria or protists) that can only be seen in a microscope. They play a critical role in the maintenance and disruption of the health of both individual organisms and entire ecosystems.  Example: The bacteria E. coli is critical for the digestive process in many warm- blooded organisms. Outside of the intestines, E. coli can sicken or kill certain organisms  http://bioh.wikispaces.com/file/view/36-15-CarbonCycle-L.gif/31445429/36-15-CarbonCycle-L.gif |

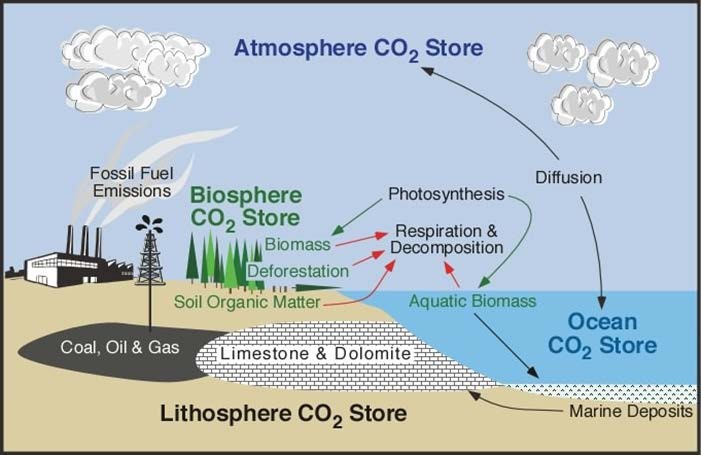


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| **B.11.D** describe how events and processes that occur during ecological succession can change populations and species diversity |
| Ecological succession: the sequence of predictable changes in a community over time; usually follows a disturbance (i.e. wildfire, hurricane, tornado)  **Primary succession**: no soil exists  **Secondary succession**: soil remains after disturbance  Stage of succession influences the animals that will be found there. For example, woodpeckers will not be present in an ecosystem until it has trees present |
| http://media.web.britannica.com/eb-media/97/95197-036-7F9B8F09.jpg |
| **B.12.A** interpret relationships, including predation, parasitism, commensalism, mutualism, and competition among organisms |
| **Symbiotic relationships**  **Mutualism** (+/+): both organisms benefit  Ex. Hummingbird and Flower: Hummingbird gets nectar (+) and the flower get pollinated (+)  Ex. Oxpecker bird removes and eats ticks from a rhino. The oxpecker bird get food (+) and the rhino is rid of harmful ticks (+).  **Commensalism** (+/o): one organism benefits, the other is neither helped nor harmed  Ex. Hermit crabs live in shells made and then abandoned by snails. Hermit crabs get a place to live (+), but this relationship neither helps nor harms the snails (o). Ex. Cattle egrets eat insects that are stirred up by cattle walking in a field. The egret gets food (+), while the cattle are neither helped nor harmed (o).  **Parasitism** (+/-): the parasite is benefited, while the host is harmed (NOT immediately killed)  Ex. A flea feeds on a mouse’s blood. The flea gets food (+), while the mouse is harmed (-).  Ex. A tapeworm attaches to the intestinal wall of a dog. The tapeworm gets food (+), while the dog is harmed (-)..  **Community interactions**  **Predation**: predator kills and consumes prey  Ex. A lion attacking and killing a zebra.  **Competition**: organisms compete for the same limited resource (i.e. food, water, habitat space, mates)  Ex. A hyena and lion fighting over a zebra carcass.  Ex. Two male hippos fighting to establish mating rights in an area |
| **B.12.B** compare variations and adaptations of organisms in different ecosystems |
| Within a population, individuals differ from one another. Many of these differences are genetically based. Environmental factors can also lead to individual differences because they influence how genes are expressed. **Genetic variation** is the difference in the genotypes within a population. Ex: Humans have different eye and hair color, skin color, shape of faces,  certain health disorders, etc. Genetic variation helps species survive because if all organisms within a population were genetically identical, then all of them would be equally vulnerable to a change in the environment or disease. The entire population could die off due to a predator, a new competitor, or the arrival of a new disease which would put the species in danger.  What are adaptations? An **adaptation** is a heritable trait that helps an organism survive in its environment. It may be a physical trait such as a beak size or shape or a behavioral trait  such as how to protect itself or find food.  **Some adaptations are specific to certain ecosystems**. Ex: some insects camouflage themselves to fit in the environment. Ex: chameleon  **Some organisms in different ecosystems have similar adaptations.** Ex: animals that graze grasslands such as zebras, buffalos, and llamas. They all have flat teeth for grinding  grass, a long and complex digestive system to break down grass, and sturdy hooves for walking and running.  •**Deciduous forest**- This biome has a wide range of temperatures and precipitation. The organisms that adapted to survive the seasonal weather changes.  To survive the winters, these animals often do not move much and some may hibernate or sleep. Other animals migrate to other places until warm weather returns to the forest.  •**Desert-** In this biome, plants and animals have adaptations that help them conserve water. Ex: Leaves of a cacti, needles, waxy covering and shallow roots spread so it can soak up  as much rain and dew before it evaporates.  Many animals are nocturnal animals and move only during the night because it is so hot in the desert. They also may have physical adaptations to keep cool. Ex: the long ears of rabbits and foxes. |

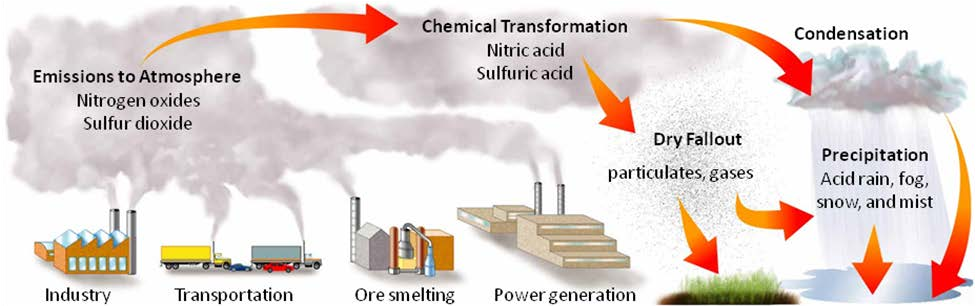
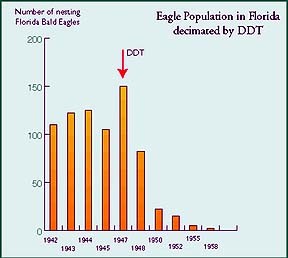
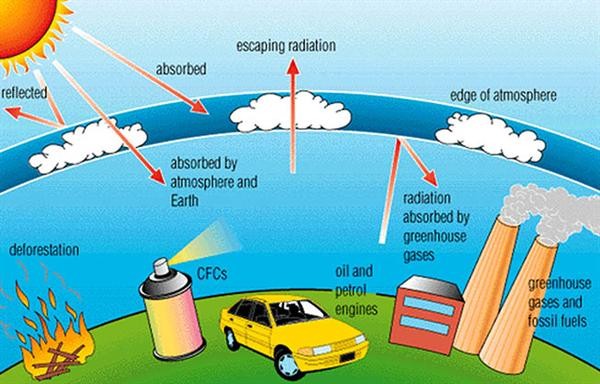


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| **B.12.C** analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids | |
| **Trophic level**: a single step in a food chain or food web  **Producer**: photosynthetic organisms (ex. grass) **Primary consumer**: eats the producer (ex. grasshopper) **Secondary consumer**: eats the primary consumer (ex. mouse)  **Tertiary consumer**: eats the secondary consumer (ex.  snake)  **Quaternary consumer**: eats the tertiary consumer (ex.  hawk)  Arrows show transfer of **ENERGY**. All energy originates with the sun. |  |
| **Types of consumers (heterotrophs)**  **Herbivore**: eats plants only (ex. cow)  **Carnivore**: eats animals only (ex. lion)  **Ominvore**: eats both plants and animals (ex. bear, humans)  **Decomposer**: externally digest dead organic matter (ex. bacteria, fungi)  **Detritivore**: internally digest dead organic matter (ex. earthworm, vulture) | |
| **Ecological Pyramids**  **Energy Pyramid**: Shows the relative amount of energy  available at each trophic level. Organisms use about 10 percent of this energy for life processes. The rest is lost as heat.  **Biomass pyramid**: Represents the amount of living  organic matter at each trophic level. Typically, the greatest biomass is at the base of the pyramid. **Pyramid of Numbers**: Shows the relative number of individual organisms at each trophic level. | http://myweb.rollins.edu/jsiry/06%20Ecological%20Pyramids.jpg |

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| **Continue: B.12.C** analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids | | |
| **Biomagnificatio**n = concentrations of a harmful substance  increase in organisms at higher trophic levels in a food chain or food web |  | |
| **B.12.D** recognize that long‐term survival of species is dependent on changing resource bases that are limited | | |
| Organisms compete for limited resources, such as, food, water, habitat space, and mates. | | |
| **Density-dependent** limiting factors limit the population size when the population is large and dense.  Competition for resources – competition increases as the population size increases Predation – as the prey pop increases, the predator population increases and vice versa Disease and parasites – spread easier in large populations | | |
| **Density-independent** limiting factors limit all population sizes (large or small)  Extreme weather – drought, flood, freezing Human activities – pollution, habitat destruction | | |
| **Population Growth Curve**  Exponential phase: population shows rapid increase in growth due to unlimited resources  Plateau phase: population has reached its carrying capacity (i.e. the maximum population that the habitat can support)  Carrying capacity for the rabbit population on the right is approximately 65 rabbits  http://www.biologyjunction.com/images/graph_rabbits.gif | |  |



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| **B.12.E** describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles | |
| The carbon cycle is a process that moves carbon between the atmosphere, the Earth’s surface, and living things. Carbon is recycled through respiration, photosynthesis, fuel combustion, decomposition; carbon can be atmospheric or dissolved, or can be found in organic compounds within the body.  **How does the carbon cycle works?**   * In the atmosphere, carbon exists mostly as carbon dioxide. Carbon dioxide leaves the atmosphere when it dissolves in water or is taken up by plants for photosynthesis. * It is released in the atmosphere during cellular respiration, geologic processes such as volcanic eruptions, and when fossil fuels or forests are burned.   **What are some consequences of disruptions of the carbon cycle?**   * Over the past 100 years, the levels of carbon dioxide in Earth’s atmosphere have increased. Human activities such as the burning fossil fuels and forests are releasing carbon dioxide into the atmosphere at alarming rates and it is being released faster than it can be removed by natural processes. * Increasing levels of carbon dioxide is a major contributing factor to the global climate change. Scientists say that increasing carbon dioxide which is a greenhouse gas that helps keep heat from leaving the atmosphere. The higher carbon dioxide levels are causing rising temperatures and climate change. * The Greenhouse effect also affects the oceans. When CO2 or carbon dioxide dissolves in water, carbonic acid forms which causes the water to become more acidic (acidification). This negatively affects marine organisms that have a low tolerance for changing pH levels   **Nitrogen Cycle** – producers take in nitrogen compounds in soil and pass to consumers that consume the producers; decomposers (bacteria) break down nitrogen compounds and  release nitrogen gas to air or usable nitrogen so the soil. The nitrogen cycle involves the exchange of nitrogen between living things and their environment.   * Nitrogen gas is removed from the atmosphere by a process called **nitrogen fixation**.   Nitrogen fixation is the process by which bacteria change nitrogen gas into a form that plants can use.   * Certain **bacteria** in the soil and water are able to fix nitrogen. Some of these bacteria live in the roots of certain plants. Lightning also fixes nitrogen.   **What are some consequences of disruptions to the nitrogen cycle?**  One problem  To increase plant growth, farmers and gardeners mix nitrogen containing fertilizer into the soil. The fertilizer runoff can affect the balance of nitrogen in bodies of water. In a process called eutrophication, nitrogen dissolves in the body of water and stimulates the growth of plants and algae.  When plants and algae die, the bacterial populations that feed on dead matter boom. These bacteria consume so much oxygen from water that fish and other aquatic animals cannot survive.  Another problem  Acid precipitation can also disrupt the nitrogen cycle. Acid precipitation can lead to the death of plants and animals by altering the pH levels of soil and water. It can also cause harmful metals from pipes to enter drinking water. | |
| Carbon Cycle Nitrogen Cycle: |  |
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| **B.12.F** describe how environmental change can impact ecosystem stability. | |
| **Greenhouse effect**  Increased levels of carbon dioxide and greenhouse gases traps radiation from the sun. This results in increased temperatures worldwide, known as global warming. |  |
| **Pollution**  Bald eagles were once endangered because of the dangerous pesticide DDT. DDT would become concentrated in the eagles because of their high level in the food chain. Females would lay eggs with extremely thin shells, which led to the failed development of the chicks.  The graph shows the decline of the eagle population in Florida after the introduction of DDT. |  |
| **Acid precipitation**  Acid rain accumulates in stream, rivers and lakes. Many organisms can only survive in a specific pH range. When their habitat becomes too acidic they will die. |  |