

BIOLOGY EOC REFERENCE SHEET - Part 2

Develop an understanding of the evolution and diversity of life.

- **Classification of Organisms according to Evolutionary Relationships, Historical Development and Changing Nature of Classification Systems, Eukaryotic vs. Prokaryotic Organisms, Eukaryotic Kingdoms, Dichotomous Keys**
- **Processes by which Organisms or Representative Groups accomplish Essential Life Functions**
- **Adaptations affecting Survival and Reproduction, Structural Adaptations in Plants and Animals, Disease-Causing Viruses and Microorganisms, Co-Evolution**
- **Interactive Role of Internal / External Factors in Health and Disease, Genetics, Immune Response, Nutrition, Parasites, Toxins**
- **Patterns of Animal Behavior as Adaptations to the Environment, Innate / Learned Behavior**

CLASSIFICATION:

- process in understanding how organisms are related and how they are different
- **taxonomy** – branch of biology that studies grouping and naming of organisms
- history of classification systems
 - 4th Century B.C., **Aristotle** proposed two groups (plants and animals) and used common names for identification, based on “blood” and “bloodless”
 - early 1700s, **Carolus Linnaeus** developed a system based on physical characteristics
 - two kingdoms (plants and animals)
 - developed “genus” and “species”
 - designed system of naming called **binomial nomenclature** (“two names”), which gave each organism two names, a genus, and a species, Genus always capitalized, both should be underlined or italicized
- **Six kingdoms: Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, and Animalia**
- A **dichotomous key** is a tool used to identify organisms by using pairs of contrasting characteristics
- basis of current classification: phylogen. DNA / biochemical analysis, embryolog. morpholog. Phylogenetic trees

LEVELS OF CLASSIFICATION:

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

CLASSIFICATION OF HUMANS:

Kingdom *Animalia* (multicellular organisms that eat food)
 Phylum *Chordata* (dorsal hollow nerve cord, notochord, pharyngeal slits)
 Class *Mammalia* (hair, mammary glands, endothermy, four-chambered heart)
 Order *Primates* (nails, clavicle, orbits encircled with bone, enlarged cerebrum, opposable digits)
 Family *Hominidae* (bipedal – walk erect on two feet, advanced tool use)
 Genus *Homo* (“human” like)
 Species *Homo sapiens*

COMPARISON OF EUKARYOTE TO PROKARYOTE:

Prokaryote – has nuclear material in the center of the cell, but is not enclosed by a nuclear membrane; no membrane bound organelles; examples: bacteria and blue-green algae

Eukaryote – contain a clearly defined nucleus enclosed by a nuclear membrane and membrane bound organelles; examples: plants, animals, fungi, and protists

COMPARISON OF KINGDOM CHARACTERISTICS

| Domain: BACTERIA | | Domain: ARCHAEA | | Domain: EUKARYA | |
|--------------------------|---------------------------------------|--------------------|----------------------------|----------------------------|-------------------------|
| EUBACTERIA | ARCHAEA | PROTISTA | FUNGI | PLANTAE | ANIMALIA |
| Bacteria | Ancient bacteria | Protists | Eukaryote | Eukaryote | Eukaryote |
| Prokaryote | Unicellular | Eukaryote | Multicellular | Multicellular | Multicellular |
| Unicellular, colonial | Prokaryote | Unicellular | Aerobic | Aerobic | Aerobic |
| Aerobic / anaerobic | Less widespread | Multicellular | Decomposer | Producer | Consumer |
| Decomposer | Protective cell wall | Aerobic | Lack chlorophyll | Photosynthesis | Cellular respiration |
| Heterotrophic | Methanogens - use | Pathogenic / | Pathogenic | Cell wall (cellulose) | Invertebrates |
| Photosynthetic (some) | H ₂ and CO ₂ to | parasitic | Saprophytic / parasitic | Vascular system, seeds | Vertebrates |
| Chemosynthetic (some) | produce methane | Animal-like | Medicinal, food source | Poisonous | Symmetry |
| Pathogenic | (CH ₄) & energy | (protozoa) | Heterotrophic | Medicinal, food source | |
| Medicinal | Extreme Environments | Plant-like (algae) | Sexual / asexual | Alternation of generations | <i>Ex: Homo sapiens</i> |
| Classified by shape | - Thermophiles - heat | Medicinal, food | Alternation of generations | Roots, stems, leaves | |
| Binary fission | - Halophiles - salt | source | Often symbiotic with algae | Pollination(fertilization) | |
| Vaccines, antibiotics | <i>Ex. methanococcus</i> | Mobile | <i>Ex: mushroom</i> | Germination | |
| <i>Ex: streptococcus</i> | | <i>Ex: amoeba</i> | | <i>Ex: oak</i> | |

Note: Current classification systems reveal six kingdoms, where Monerans are divided into **Archaeobacteria (ancient bacteria, anaerobic nature)** and **Eubacteria (true bacteria, aerobic nature)**.

VIRUSES:

Note: **Viruses** are not considered living organisms!

- composed of a nucleic acid surrounded by a protein coat
- use living cells to replicate viral nucleic acid
- infects a living cell when the virus injects its nucleic acid into the host cell; the viral nucleic acid replicates and makes more viruses
- two processes to infect host cells: the lytic cycle and the lysogenic cycle
- **lytic:** virus attached to host cell injects its nucleic acid into host; nucleic acid is immediately replicated; host bursts; releases virus
- **lysogenic:** host infected but does not immediately die; viral DNA is replicated along with host DNA; virus becomes dormant; spontaneously enters lytic cycle and cell bursts – may be years later
- viruses can infect animals, plants, and bacteria
- viruses do not respond to drug treatment
- immunity must be acquired naturally or from vaccinations

DICHOTOMOUS KEYS:

- device used to aid in identifying a biological specimen
- offers two alternatives at each juncture, each choice determining the next step; breaks down subgroups by their evolutionary relationships
- can be used for field identification of species, as found in field guides by focusing on practical characteristics



| Dichotomous Key to Representative Birds | |
|---|---------------------|
| 1. a. The beak is relatively long and slender..... | <i>Certhidea</i> |
| b. The beak is relatively stout and heavy..... | go to 2 |
| 2. a. The bottom surface of the lower beak is flat and straight | <i>Geospiza</i> |
| b. The bottom surface of the lower beak is curved | go to 3 |
| 3. a. The lower edge of the upper beak has a distinct bend | <i>Camarhynchus</i> |
| b. The lower edge of the upper beak is mostly flat | <i>Platyspiza</i> |

Bird X is most likely:

Retrieved from: <http://www.ekcsk12.org/faculty/jbuckley/leclass/practicemidterm6.htm>

PLANTS

Spore-Producing Plants

- Nonvascular, produce spores
- Remain small– absorb water by osmosis
- Sperm swim to fertilize eggs
- Live in moist environments
- Reproduce sexually
- Alternation of Generations (You see the gametophyte generation)
- Mosses and liverworts

Vascular Plants

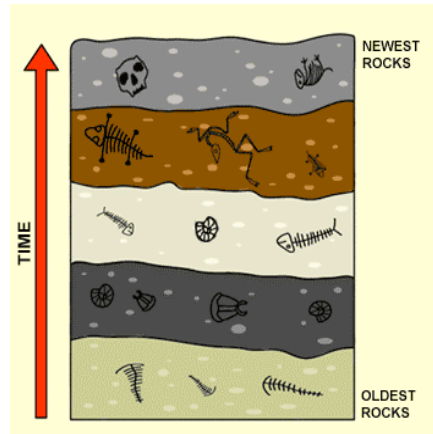
- Two types of vascular tissue
- Xylem* – transports water and minerals (UP)
- Phloem* – transports sugars (DOWN)
- Produce spores
- Club mosses, horsetails, ferns
- Require water for reproduction
- Alternation of Generations (you see the sporophyte generation)
- Seed Producing Vascular Plants**
- Vascular, Produce seeds
- Seed = embryo protected by a seed coat
- Two groups based on reproduction
- Gymnosperms* – cone-bearing
- Angiosperms* – flowering
 - monocots (corn) and dicots (flowers)
- Roots – anchor, absorb water, store food
- Stems – support, transport
- Leaves – photosynthesis, produces food
- Adaptations – seed, pollen, fruit, flowers
- Pollination – fertilization, germination

EVIDENCE FOR EVOLUTION - CHANGE IN SPECIES

- Evolution** - change in the genetic makeup of a population of organisms over time
- Species** - group of organisms that share similar characteristics and can interbreed to produce fertile offspring.
- Adaptation** - any physical or behavioral trait that improves an organism's chances for survival
- Speciation** - evolution of a new species from an existing species. New species arise when populations are separated, environmental conditions in area influence traits required for survival

FOSSIL EVIDENCE FOR EVOLUTION

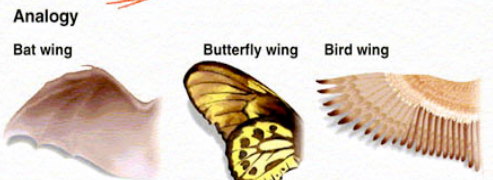
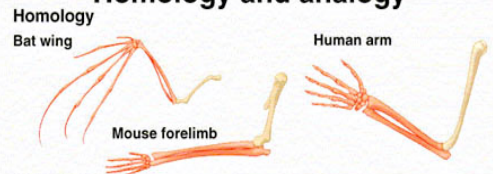
Fossils - are actual remains or evidence of organisms that lived in the past. Fossils also provide clues about when different species lived. Ex. a fossil's location in a rock layer tells how long ago it lived



COMPARATIVE ANATOMY

- Homologous structures:** body parts of different organisms that have similar structures but not necessarily similar function. May indicate common ancestry = divergent evolution
Ex. forelimb of vertebrates
- Analogous Structures:** body parts that have similar function but not a similar structure. They do not indicate shared ancestry. Convergent evolution occurs when unrelated species undergo natural selection
Ex. bat wings, butterfly wings, bird wings
- Vestigial Structures:** body parts that do not seem to play a role in the body functions of the organism. Ex. appendix in humans
- Comparative Embryology:** study of embryos to reveal structural similarities

Homology and analogy



BIOGEOGRAPHY

- Biogeography** - is the study of the distribution of a species geographically. Biogeography relies on data about living organisms as well as fossils to identify where different species have lived at different times in Earth's history.
- Continental Drift Hypothesis** - continents were once joined in a single large landmass called Pangaea, that broke apart, and over millions of years, the continents moved to current location. Fossil records show that the continental drift changed the distribution of Earth's organisms.

| MAJOR SYSTEMS AND ORGANS | | |
|--------------------------|---|--|
| SYSTEM | FUNCTION | BASIC ORGANS, AND STRUCTURAL PARTS |
| Circulatory | Transports nutrients, fluids, gases | Heart, veins, arteries |
| Digestive | Breaks down food into essential nutrients | Mouth, esophagus, stomach, intestines |
| Endocrine | Controls body functions through hormones | Glands which secrete hormones |
| Excretory | Removes cellular wastes from the blood | Bladder, kidneys, urethra |
| Immune | Protects the body against invading organisms | White blood cells |
| Integumentary | Protects the body by forming the body's outer layer | Skin, hair, nails |
| Muscular | Moves the body with the help of the skeletal system | Muscles |
| Skeletal | Supports the body internally | Bones, cartilage, ligaments, tendons |
| Nervous | Coordinates sensory input with motor output | Brain, spinal cord, sense organs |
| Reproductive | Provides a means of producing offspring | Testes (male), ovaries and uterus (female) |
| Respiratory | Controls the exchange of gases | Nose, pharynx, larynx, trachea, bronchi, lungs |

REPRODUCTION, GROWTH, DEVELOPMENT:

Reproduction – production of offspring by an organism; a characteristic of all living things (can be sexual or asexual); exists for the continuation of the species, not the individual

Growth – increase in the amount of living material and formation of new structures in an organism; a characteristic of all living things; ex: getting bigger, growing muscle, longer bones, etc.

Development – all the changes that take place during the life of an organism; a characteristic of all living things; ex: infancy, youth, puberty, adulthood, and death

DISEASE CAUSING MICROORGANISMS:

- **Microorganisms** are living organisms, usually unicellular bacteria, than can only be seen with a microscope.
- Benefits of microorganisms: help us to digest food, encourage normal development of the immune system, and fight off bad organisms
- **Microbes** (or **pathogens**) include viruses, bacteria, fungi, and parasites, which cause disease when our immune system can't fight them
- Microorganisms can be identified based on their size, shape, color, ability to form colonies, etc.
- Process of growing the organism is called a culture, and can be used to test sensitivity of organisms to various antibiotics, which will help a doctor determine which drug to use in treating an infection.
- An infectious disease in humans occurs when balance is disturbed by: exposure to an organism, normal microorganisms in the body become pathogenic, or the human immune system does not act fast enough or strong enough.
- Most common areas on the body for microorganisms: skin, mouth,

ANTIBIOTIC RESISTANCE:

- some bacteria are resistant to antibiotics because they have enzymes that can destroy the antibiotics or because of genetic mutation that allow them to grow despite the antibiotics
 - increasing numbers of microorganisms have become resistant to antibiotics are violent and untreatable, now called "superbugs"
 - overuse of antibiotics has led to the development of resistant bacteria
- How can you prevent the spread of antibiotic resistance?**
- avoid antibiotics unless they are clearly needed
 - do not take antibiotics without the advice of a doctor
 - take the full course of prescription
 - do not save antibiotics for later
 - do not demand antibiotics from the doctor

DEFENSES AGAINST INFECTION:

First Line of Immune Defense:

- **Physical Barriers** - skin, mucous membranes (linings of the mouth, nose, eyelids), airways, stomach acid, pancreatic enzymes, bile, intestinal secretions, urinary secretions

Second Line of Immune Defense:

- **Blood** – increasing the number of certain types of white blood cells that engulf and destroy invading microorganisms
- **Inflammation** – release of substances from damaged tissue isolates area to attack and kill invaders and dispose of dead and damaged tissue, and to begin repair; blood supply increases which brings more white blood cells to swollen area
- **Fever** – body temperature increases to enhance defense ability (controlled by hypothalamus in brain); causes shivers, chills, body aches; normal body temperature is 98.6°F, a fever is considered higher than 100°F.

Third Line of Immune Defense:

- **Immune Response** – immune system responds by producing substances that attack invaders (ex: killer T cells, phagocytes) and the immune system produces antibodies that attach to and immobilize the invader to kill it; antibodies will "remember" the infectious organism so it will kill it upon next exposure; immune system is present all over the body and tightly bound to blood and lymph systems; tissues and cells that provide antibodies include red bone marrow, thymus, spleen, circulating lymphatic system, and white blood cells.
 - There are two types of immunity:
 - **Natural Immunity** – created by body's natural physical barriers or in the form of antibodies passed from mother to child
 - **Acquired Immunity** – created by exposure to a specific microorganism, which is "remembered" by the body's immune system
- Immunization** – body's ability to fight off certain organisms is stimulated or enhanced

1. Active Immunization – contain either noninfectious fragments or whole pieces of bacteria or viruses that have been weakened so they will not cause infection but will instead cause the production of antibodies (vaccination)

2. Passive Immunization – antibodies against a specific infectious organism are given directly to the person (vaccine may not be available)

External Defenses:

- **Antibiotics** – organic substances synthesized by microorganisms or at a lab used to treat infectious diseases or to prevent them; each antibiotic is specific to a certain bacteria; can be administered by mouth, vein, or muscle
- **Hygiene** – keeping a clean environment that limits exposure to infected bodily fluids, decomposing material, or infected people will prevent the spread of infection

ANIMAL BEHAVIORAL ADAPTATIONS:

- Behavior** – animal’s response to a stimulus
- Innate behavior** – instinct; influenced by genes
Ex: bird defending its nest
- Learned behavior** – changed by experience
Ex: training a pet to respond to a specific name
- Social behavior** – interactions between members of the same species
Ex: mating and caring for offspring
- Territorial behavior** – organisms defend an area to keep out other organisms (ex: animal marking trees)
- Reflex** – automatic, neuromuscular action (ex: knee jerk)
- Taxis** – response to a directional stimulus; organism is motile

ADAPTIVE RESPONSES:

- **Mimicry** – structural adaptation that allows one species to resemble another species; may provide protection from predators
- **Camouflage** – structural adaptation that enables species to blend with their surroundings; allows a species to avoid detection
- **Migration** – instinctive seasonal movements of animals from place to place
 - **Emigration** – movement of individuals from a population; leaving the population
 - **Immigration** – movement of individuals into a population
- **Hibernation** – state of reduced metabolism occurring in animals that sleep during parts of cold winter months; an animal’s temperature drops, oxygen consumption decreases, and breathing rate declines
- **Estivation** – state of reduced metabolism that occurs in animals living in conditions of intense heat
- **Mating / Reproduction** – production of offspring for the survival of the species; can be seasonally scheduled

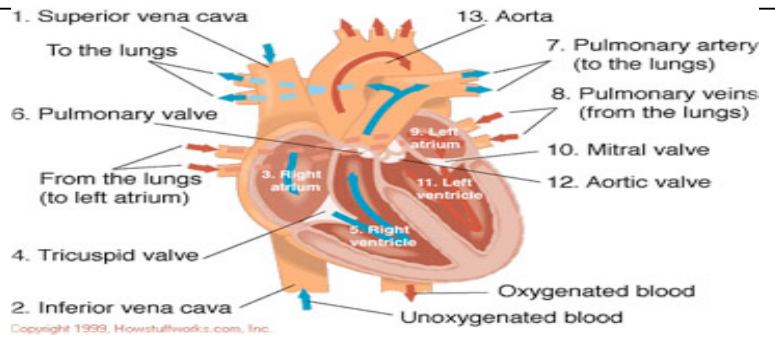
FACTORS AFFECTING BLOOD FLOW

Blood Pressure (BP); is the amount of force blood exerts outwardly on the wall of a vessel. Arterial blood pressure is directly proportional to the amount of blood found in an artery. More blood in an artery = higher pressure; less blood in an artery (blood loss) = lower pressure. Other factors affecting BP include smoking, alcohol intake, salty diet, lack of exercise, hypertension or other diseases

Blood Volume: The amount of blood that is pumped throughout cardiovascular system per minute. It is determined by fluid intake and fluid loss. If blood volume increases (fluid intake) BP increases; if blood volume decreases (fluid loss), BP decreases. Too much salt in diet increases blood volume.

Resistance: Difficulty or ease in which blood flows through blood vessels. The tendency of vascular system to oppose blood flow; inversely proportional to flow. If resistance increases, flow decreases; if resistance decreases, flow increases. Major determinant of resistance is the diameter of the arterioles. The **diameter** or length of vessels and **viscosity** (thickness) of the blood directly impact resistance. Diseases that cause plaque (fatty deposits) to build up in vessels make them narrower and slow blood flow. Sometimes the plaque build up may lead to blood clots that may block blood flow to the heart.

Exercise - helps to regulate blood flow



- **Interrelationships among Organisms / Populations / Communities / Ecosystems, Techniques of Field Ecology, Abiotic / Biotic Factors, Carrying Capacity**
- **Flow of Energy and Cycling of Matter in the Ecosystem, Relationship of Carbon Cycle to Photosynthesis and Respiration, Trophic Levels, Direction and Efficiency of Energy Transfer**
- **Human Population and its Impact on Local Ecosystems and Global Environments, Historic and Potential Changes in Population, Factors associated with Population Change, Climate Change, Resource Use, Sustainable Practices**

ENERGY FLOW IN AN ECOSYSTEM

SUN >>>> GRASS >>>> MICE >>>> HAWK

Sunlight is the main energy source for living things. Energy flows through an ecosystem from the sun to organisms within the ecosystem in one direction. Two main groups of organisms in the ecosystem are the producers and consumers.

Producers – autotrophs, use sun’s energy to make their own food, plants (grass)

Consumers – heterotrophs, cannot make their own food, eat other living things to get their energy (mice- primary consumers; and hawk- secondary consumer)

STRUCTURE OF AN ECOSYSTEM

Organism >>>> Species >>>> Population >>>> Community >>>> Ecosystem >>>> Environment

Species – group of organisms that can interbreed

Community – groups of interacting populations

Habitat – place where an organism lives

Population – units of single species

Ecosystem – groups of interacting communities

Niche – organism’s role within its habitat

GROUPS OF ORGANISMS

| Consumer | Energy Source | Example |
|------------|---------------------------|------------------|
| Herbivore | Eat plants | Deer |
| Carnivore | Eat other animals | Lion |
| Omnivore | Eat plants and animals | Human |
| Decomposer | Break down dead organisms | Bacteria & Fungi |

EXAMPLES OF INFECTIOUS ORGANISMS:

- **Bacteria** – microscopic, single celled
 - Streptococcus pyogenes* (strep throat)
 - Escherichia coli* (urinary tract or intestinal infection)
- **Viruses** – cannot reproduce on its own (invades a host cell)
 - Varicella zoster* (chicken pox)
 - Rhinovirus* (common cold)
- **Fungi** – yeasts, molds, mushrooms
 - Candida albicans* (yeast infection)
 - Tinea pedis* (athlete’s foot)
- **Parasites** – organism such as a worm or single celled animal (**protozoan**) that survive by living inside another organism (host)
 - Enterobius vermicularis* (pinworm)
 - Plasmodium falciparum* (malaria)

SYMBIOTIC RELATIONSHIPS:

Symbiosis – permanent, close association between one or more organisms of different species

Mutualism – a symbiotic relationship in which both species benefit (ex: in subtropical regions, ants protect acacia trees by fighting invaders, acacia tree provides nectar to ants)

Commensalism – symbiotic relationship in which one species benefits and the other species is neither harmed nor benefited (ex: Spanish moss grows on and hangs from limbs of trees, but does not obtain any nutrients from tree, nor harm the tree)

Parasitism – symbiotic relationship in which one organism benefits at the expense of another, usually another species (ex: parasites such as bacteria, roundworms, tapeworms live in the intestines of organisms to obtain nutrients and reproduce, but cause disease in the organisms)

FOOD CHAIN:

- Path of energy from producer to consumer
- Each level is called a trophic level (trophic = energy)
- Approximately 10% energy is transferred to next level
- 90% used for personal metabolism and development

FOOD WEB:

- Interconnected food chains
- Shows all possible feeding relationships at each trophic level in a community

ECOLOGICAL PYRAMID:

- Representation of energy transfer
- Pyramid of Energy – each level represents energy available at that level, 90% decline
- Pyramid of Biomass – each level represents amount level above needs to consume
- Pyramid of Numbers – each level represents number of organisms consumed by level above it

SOME EXAMPLES OF ENVIRONMENTAL LIMITING FACTORS

Biotic (living)

Plants
Animals
Bacteria
Prey
Food Sources
(Nutrients)

Abiotic (nonliving)

Climate
Light
Soil
Water
Shelter
Pollution

SPECIES / POPULATION SURVIVAL:

- **Natural Selection** – mechanism for change in populations; occurs when organisms with favorable variations survive, reproduce, and pass their variations to the next generation; "survival of the fittest"
- **Adaptation (Behavioral or Physiological)** – evolution of a structure, behavior, or internal process that enables an organism to respond to environmental factors and lives to produce offspring
- **Limiting Factors (Environmental)** – any biotic or abiotic factor that restricts the existence, numbers, reproduction, or distribution of organisms
- **Genetic Mutations** – any change or random error in a DNA sequence (one gene or many; somatic cells or gametes)
- **Biodiversity** – variety of life in an area; usually measured as the number of species that live in an area
- **Evolution (Macroevolution vs. Microevolution)** – gradual change in a species through adaptations over time
- **Endangered Species** – number of individuals in the species falls so low that extinction is possible
- **Extinction** – disappearance of a species when the last of its members die
- **Carrying Capacity** – number of individuals that the resources of an environment can normally and persistently support.

CHARACTERISTICS OF LIVING THINGS:

- require food for energy to carry out life processes
- use energy to maintain homeostasis
- respond to stimuli in the environment
- grow and develop
- reproduce similar offspring
- pass genetic information to their offspring
- composed of cells
- composed of organic based compounds

EXPLANATIONS OF THE ORIGIN OF LIFE ON EARTH

Most modern organisms could not have survive the harsh conditions of Earth's early atmosphere. It is still uncertain where the first living things came from.

Several scientists contributed to the explanations: Miller-Urey, Oparin (atmospheric origin of organic compounds), Pasteur (disproved spontaneous generation of microbes)

Endosymbiotic Theory - states that free-living bacteria were engulfed by other prokaryotes. Explains how mitochondria, chloroplasts and other organelles formed

ALTERNATION OF GENERATIONS:

- type of life cycle found in some algae, fungi, and all plants where an organism alternates between a haploid (n) gametophyte generation and a diploid (2n) sporophyte generation

CYCLES:

(Matter cannot be created nor destroyed, but can be converted/recycled to other forms)

Water Cycle – water is recycled through evaporation, condensation, precipitation, runoff, groundwater, aquifers, respiration, transpiration, excretion, decomposition

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

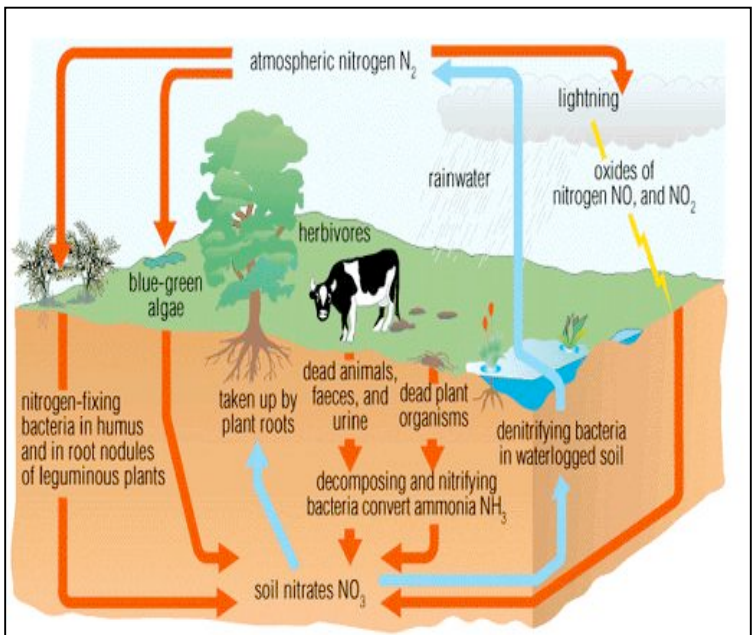
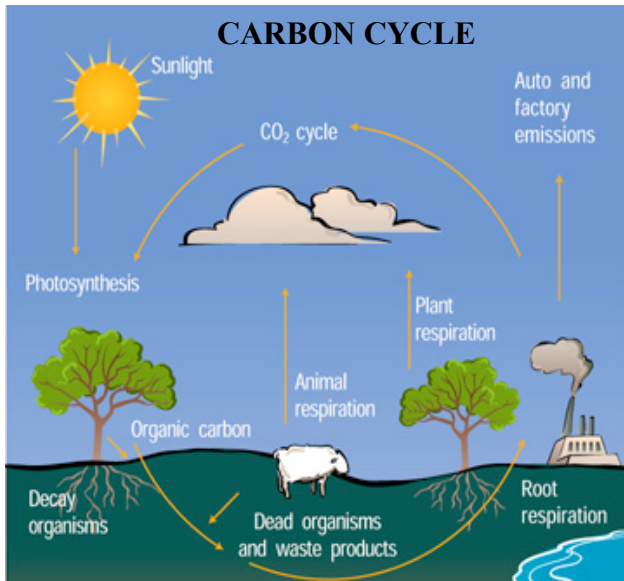
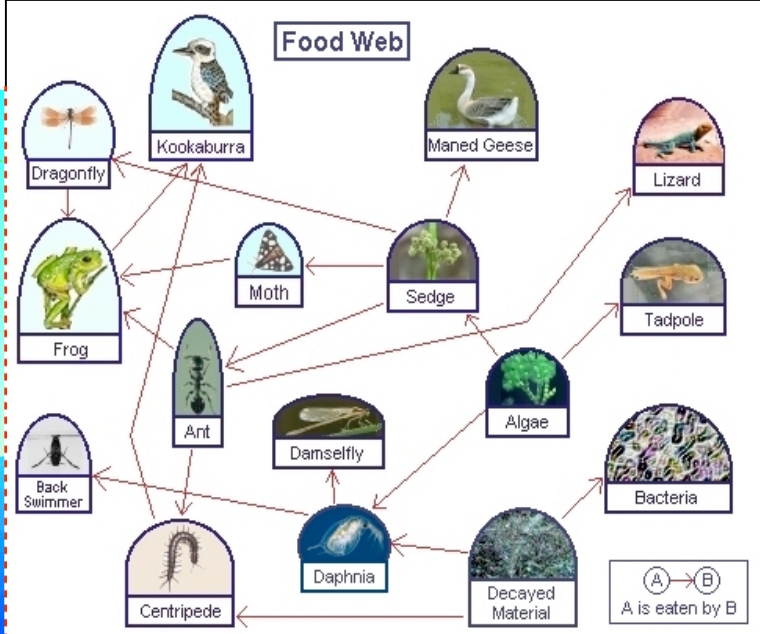
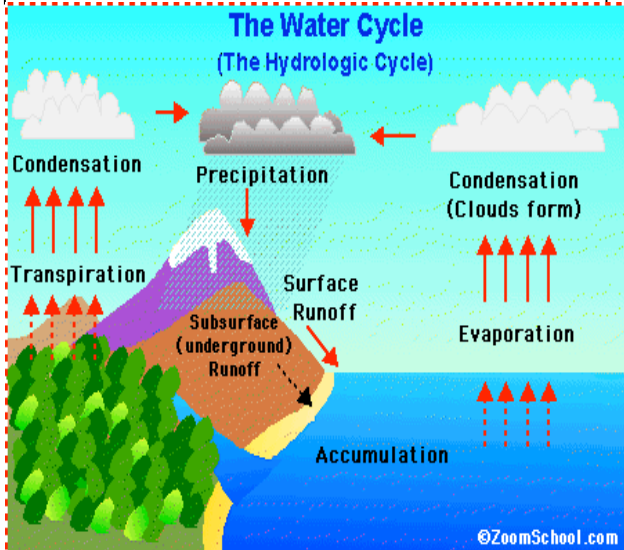
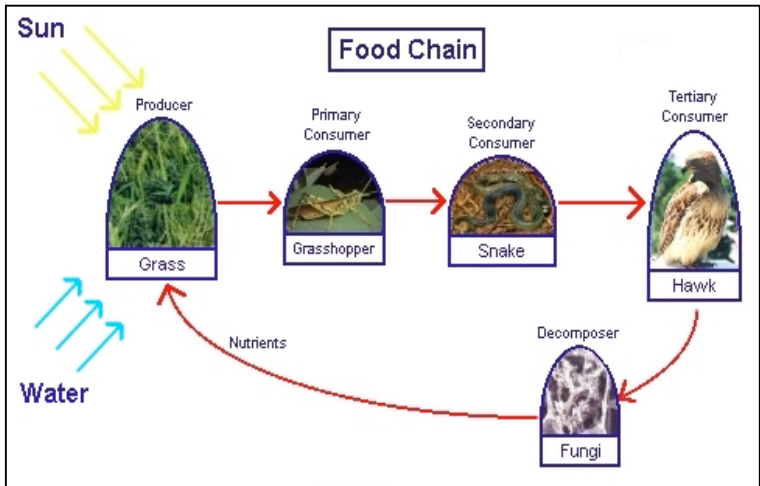
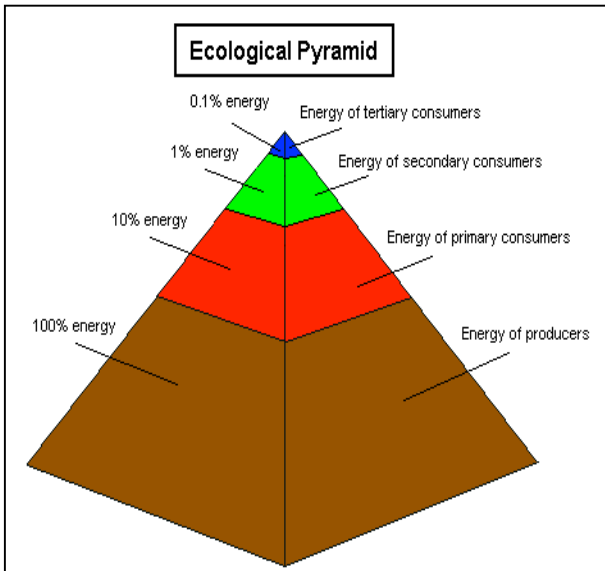
Carbon Cycle – carbon is recycled through respiration, photosynthesis, fuel combustion, decomposition; carbon can be atmospheric or dissolved, or can be found in organic compounds within the body

FACTORS THAT AFFECT CLIMATE CHANGE:

- distance from the sea
- ocean currents
- Direction of prevailing winds
- relief (altitude / mountains)
- proximity to the equator
- El Nino phenomenon
- human population growth
- pollution
- industry
- acid rain
- ozone depletion & greenhouse effect

FACTORS THAT AFFECT RESOURCE USE AND SUSTAINABILITY:

- population count
- number of producers and consumers
- percapita consumption
- rate of industrial, urban, and infrastructure development
- wealth of country / municipality
- amount of precipitation
- renewable or nonrenewable status
- pollution / degradation of land
- industry, manufacturing, commercialism
- recycling programs
- conservation programs
- substitution programs
- habitat destruction
- aquifer depletion
-



NITROGEN CYCLE

FLUCTUATIONS IN CARRYING CAPACITY

TYPES OF ECOSYSTEMS (BIOMES):

AQUATIC: based on flow, depth, temperature, chemistry

TERRESTRIAL: based on geography, rainfall, temperature

Tropical Rain Forest – significant diversity, warm, moist

Savanna – grassland with isolated trees, warm year-round, consistent rainfall, borders deserts

Desert – hot, dry, minimal rainfall, middle latitudes

Temperate Grassland – variety of grasses, cold winters, warm summers, seasonal rainfall, borders savannas

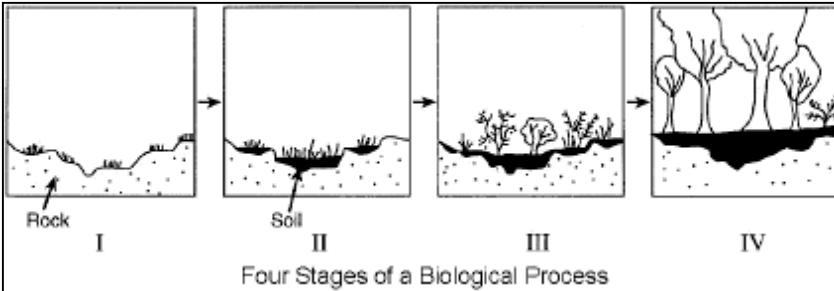
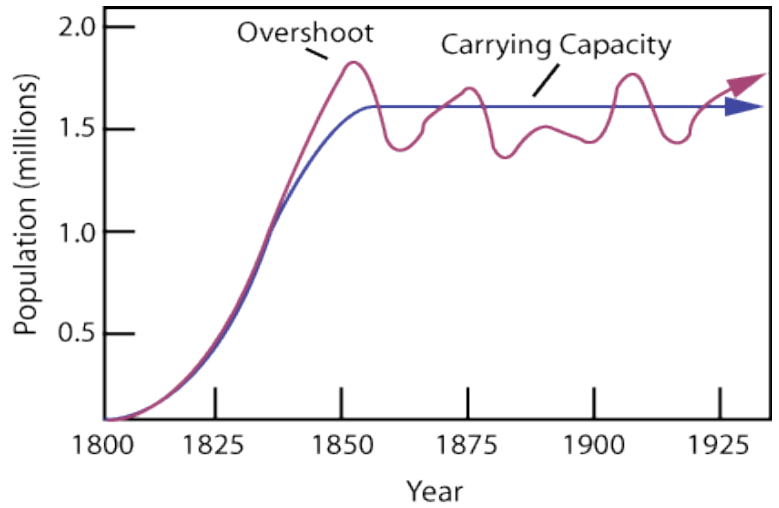
Temperate Forest – deciduous, seasonal growth and weather patterns

Taiga – coniferous, borders tundra

Tundra – cold, frozen

Marine – oceans, saltwater, large diversity

Freshwater – lakes, streams, lower diversity



SUCCESSION:

- orderly, natural changes, and species replacements that take place in communities of an ecosystem over time

Primary Succession – colonization of barren land by pioneer organisms (soil must be developed)

Secondary Succession – sequence of changes that take place after a community is disrupted by natural disasters or human actions (soil already present)

IMPACT OF HUMANS ON THE ENVIRONMENT:

- caused extinction of species through hunting, fishing, agriculture, industry, urban development
- growing population = greater demands on environment
- affected quality and quantity of land, air, water resources
- Pollution = pollutants
- Air Pollution = smog, acid rain, dust, smoke, gases, fog, carbon dioxide
- Water Pollution = sewers, industry, farms, homes, chemical waste, fertilizer, dirty dish water
- Land Pollution = landfills, dumpsites, runoff, negligence, urban wastes

CONSERVATION EFFORTS:

- conserve energy resources
- protect and conserve material resources
- control pollution (recapture wastes, carpooling, solid waste neutralization)
- wildlife conservation protect animals from habitat loss, over-hunting, pollution
- reduce, reuse, recycle programs
- sanitation and waste disposal programs

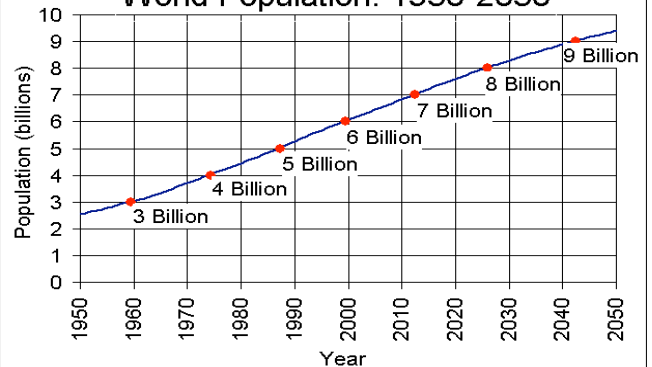
CRITICAL ISSUES:

- Global Warming, Pesticides, Population Growth

FACTORS THAT AFFECT POPULATION CHANGE:

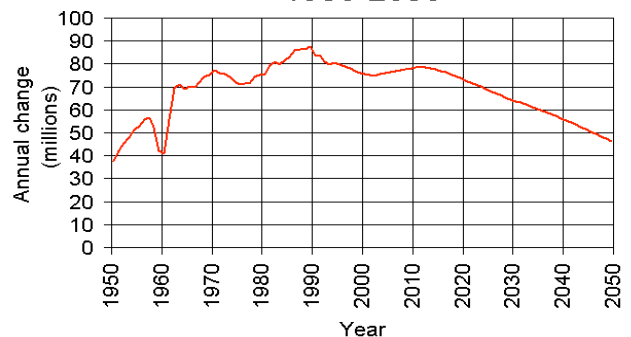
- natural increase of a population depends on the number of births and deaths
- if births outnumber deaths, there will be an increase in population
- growth rate of a population measured in terms of birth rate (number of births per 1000 people per year) and death rate (number of deaths per 1000 people per year)
- fertility rates (number of babies), life expectancy, migration / immigration also contribute to population change
- study of population is called demography; a census is a measure of the population at a particular time

World Population: 1950-2050



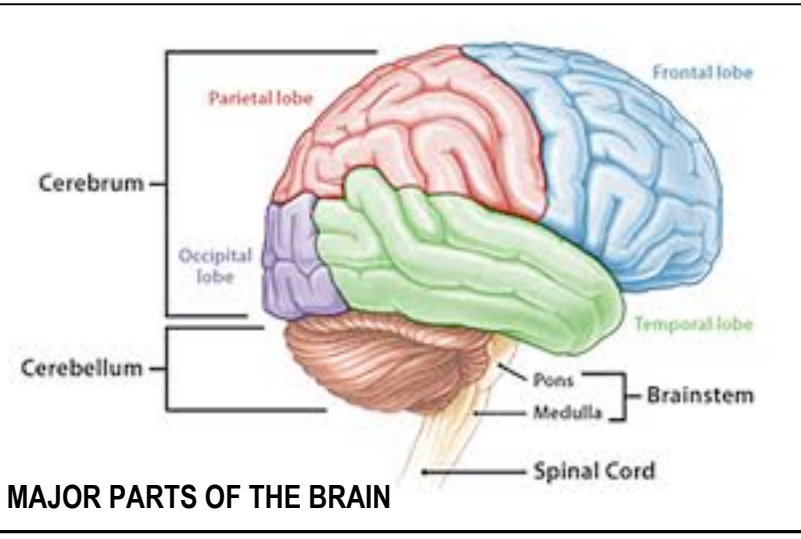
Source: U.S. Census Bureau, International Data Base, July 2007 version.

Annual World Population Change: 1950-2050



Source: U.S. Census Bureau, International Data Base, July 2007 version.

| First Trimester | Second Trimester | Third Trimester |
|---|---|---|
| Implantation of embryo Vital organs begin to form i.e. brain & spine-5 th wk: heartbeat start 7 th wk - umbilical cord joins embryo- placenta Sex of fetus at end | Fetus moves, kicks, swallows Internal organs mature Eyes now open Teeth forming ~ 8 oz, 8-12 inches | Heartbeat is stronger Baby grows rapidly All organs develop Mature respiratory system 38-42 wks: "full-term" birth ~ 6lbs, 18 inches |



MAJOR PARTS OF THE BRAIN

SCIENTISTS WHO CONTRIBUTED TO THE THEORY OF EVOLUTION

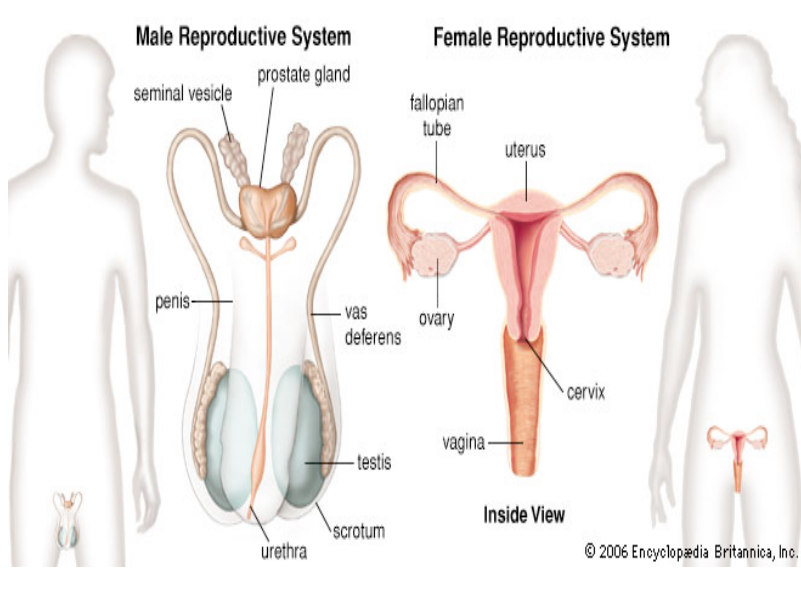
Thomas Robert Malthus (1798)- Malthus has become widely known for his theories about population and its increase or decrease in response to various factors

Jean-Baptiste Lamarck (1801) - known for classification of invertebrates and inheritance of acquired inheritance. First to propose theory of evolution

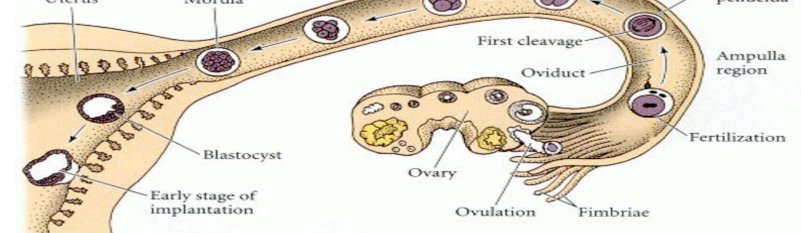
Charles Lyell (1830) - a geologist whose interpretation of geologic change as the steady accumulation of minute changes over enormously long spans of time was a powerful influence on the young Charles Darwin.

Charles Darwin (1842) - Darwin's general theory presumes the development of life from non-life and stresses a purely naturalistic (undirected) "descent with modification". That is, complex creatures evolve from more simplistic ancestors naturally over time. In a nutshell, as random genetic mutations occur within an organism's genetic code, the beneficial mutations are preserved because they aid survival -- a process known as "natural selection." These beneficial mutations are passed on to the next generation. Over time, beneficial mutations accumulate and the result is an entirely different organism (not just a variation of the original, but an entirely different creature).

Gregor Mendel (1865) - reported that traits were inherited in a predictable manner through the independent assortment and segregation of elements (later known as [genes](#)).



Embryonic Development



INVERTEBRATES

Three types of symmetry
No symmetry (disorganized)
Radial symmetry (around a central point)
Bilateral symmetry (equal on both sides)
 Specialized bodily functions
 No backbone, usually outer covering (exoskeleton)
 May be hydrostatic (water-based, aquatic)

Sponges (Porifera)
 No symmetry

Cnidarians (Coelenterata)
 Jellyfish, hydrostatic, radial symmetry
 Specialized stinging cells in tentacles

Flatworms (Platyhelminthes)
 Leeches, bilateral symmetry
 Suckers for removing fluids from host

Roundworms (Nematoda)
 Parasites, radial symmetry

Segmented worms
 earthworms
 decomposers

Mollusks (Mollusca)
 Clams, oysters (bivalves)
 Hard outer shell (calcium carbonate)
 Food source

Arthropods (Arthropoda)
 Crabs, insects (segmented body)
 Pollinators, bilateral symmetry

Echinoderms (Echinodermata)
 starfish
 radial symmetry

VERTEBRATES

Have a coelom (true body cavity)
 Skeletal systems (endoskeleton)
 Strong, flexible backbone (support)
 Bilateral symmetry
 Aquatic or terrestrial environments
 Organized systems
Jawless fishes
 Lampreys

Cartilaginous fishes
 Sharks, cartilage

Bony fishes
 Bass, trout
 Scales, paired fins, gills, bone
 External fertilization

Amphibians
 Salamanders, frogs
 Moist skin and lack scales
 Have gills as young, lungs and limbs as adults
 External fertilization

Reptiles
 Snakes, turtles
 Dry, scaly skin
 Internal fertilization
 Terrestrial eggs (leathery shells)
 Developed lungs, strong limbs

Birds
 Hawks, eagles, robin
 Feathers, hollow bones, strong muscles
 Efficient heart and lungs for flying
 Internal fertilization (terrestrial amniotic egg)

Mammals
 Humans, monkeys, whales
 Hair or fur
 Internal fertilization (internal development)

Male Reproductive System Structures

1. **testes** -- produces sperm and the hormone testosterone
2. **scrotum** -- pouch enclosing the testes keeping the sperm at an optimum temperature for development
3. **vas deferens** -- tube carrying sperm away from the testes
4. **prostate gland** -- the largest of several glands which add lubricating and other fluids to the sperm
-- this combination of sperm and fluids is called semen
5. **urethra** -- tube through the penis carrying sperm to the outside of the body
6. **penis** -- adaptation for internal fertilization of the female

Female Reproductive System Structures

1. **ovary** -- (females have two of these) -- produce female gametes or eggs and the hormone estrogen
2. **oviduct (fallopian tube)** -- carries the egg away from the uterus
-- internal fertilization normally occurs here
3. **uterus** -- implantation and development of the embryo and fetus before birth occurs here
4. **vagina or birth canal** -- entry point for sperm from the male and exit tube for the baby when it is born

TEST TAKING TIPS:

Make flash cards for each term and its definition for an extra study opportunity.

It is important to understand how many questions you will be answering, develop a time limit to answer *all* questions, and how to break down each question into its critical parts. Second, **Read each question carefully**, make note of the key word(s) in each question, and read each answer choice thoroughly before choosing a final answer. It is good to use the highlighter tool write down the key word(s) in each question. Highlight or circle similar key words or ideas in your answer choices in order to select or eliminate answer choices. This will help keep you focused and alert to what the question is asking. Once you have answered each question, check your answers against the answer key. For those questions that you answered incorrectly, *re-read* those questions and the answer choices and logically determine why you answered incorrectly and justify the reason for the correct answer. Don't get hung up over unfamiliar words. Later, without the time constraints, follow this process with each question. This will help you in the future when you are confronted with questions of similar content.

Good Luck and Good Testing! ☺