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 Organics, 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: Archaebacteria, 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: phylogeny, DNA / biochemical analysis, embryology, morphology, 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 *Homidae* (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 Prokaryote Unicellular, colonial Aerobic / anaerobic Decomposer Heterotrophic Photosynthetic (some) Chemosynthetic (some) Pathogenic Medicinal Classified by shape Binary fission Vaccines, antibiotics *Ex: streptococcus*	Ancient bacteria Unicellular Prokaryote Less widespread Protective cell wall Methanogens - use H2 and CO2 to produce methane (CH4) & energy Extreme Environments - Thermophiles - heat - Halophiles - salt *Ex. methanococcus*	Protists Eukaryote Unicellular Multicellular Aerobic Pathogenic / parasitic Animal-like (protozoa) Plant-like (algae) Medicinal, food source Mobile *Ex: amoeba*	Eukaryote Multicelluar Aerobic Decomposer Lack chlorophyll Pathogenic Saprophytic / parasitic Medicinal, food source Heterotrophic Sexual / asexual Alternation of generations Often symbiotic with algae *Ex: mushroom*	Eukaryote Multicellular Aerobic Producer Photosynthesis Cell wall (cellulose) Vascular system, seeds Poisonous Medicinal, food source Alternation of generations Roots, stems, leaves Pollination(fertilization) Germination Ex: *oak*	Eukaryote Multicellular Aerobic Consumer Cellular respiration Invertebrates Vertebrates Symmetry *Ex: Homo sapiens*

Note: Current classification systems reveal six kingdoms, where Monerans are divided into ***Archaebacteria (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.....*Certhidea*
   b. The beak is relatively stout and heavy.....go to 2
2. a. The bottom surface of the lower beak is flat and straight .....*Geospiza*
   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 .....*Camarhynchus*
   b. The lower edge of the upper beak is mostly flat .....*Platyspiza*

Bird X is most likely: _____

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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)

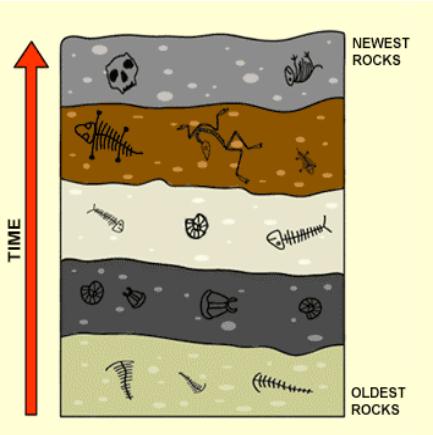
Roots – anchor, absorb water, store food
Stems – support, transport
Leaves – photosynthesis, produces food
Adaptations – seed, pollen, fruit, flowers
Pollination – fertilization, germination

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 exiting species. New species arise when populations are separated, environmental conditions in area influence traits required for survival

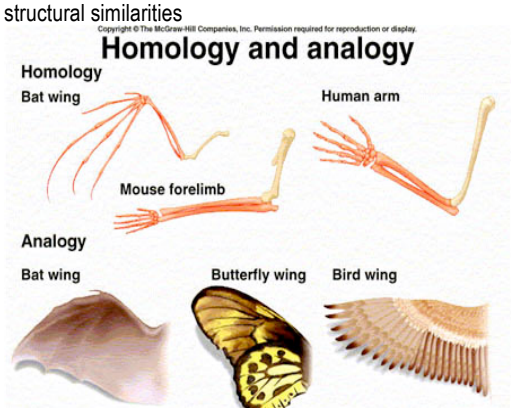
FOSSIL EVIDENCE FOR EVOLUTION

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



BIOGEOGRAPHY

Biogeography - is the study of the distribution of a species geographically. Biogeography relies on data a bout 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 caked Pangaea, that broke apart, and over millions of years, the continents moved to current location. Fossil records shows 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 or 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 98.6ºF, a fever is considered higher then 100ºF.

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)

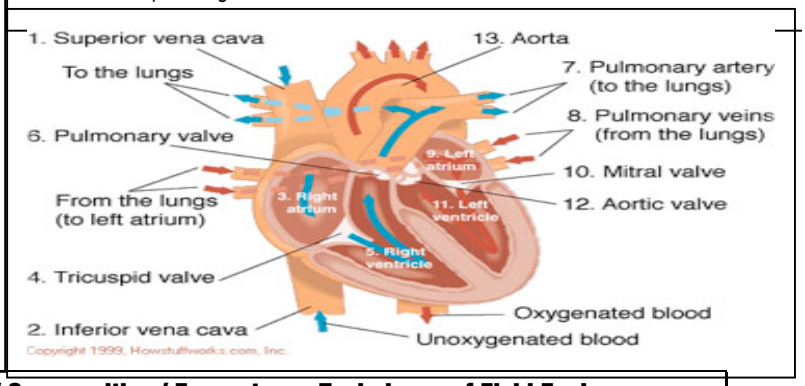
External Defenses:

- **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
Population – units of single species
Community – groups of interacting populations
Ecosystem – groups of interacting communities
Habitat – place where an organism lives
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)	Abiotic (nonliving)
Plants	Climate
Animals	Light
Bacteria	Soil
Prey	Water
Food Sources (Nutrients)	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
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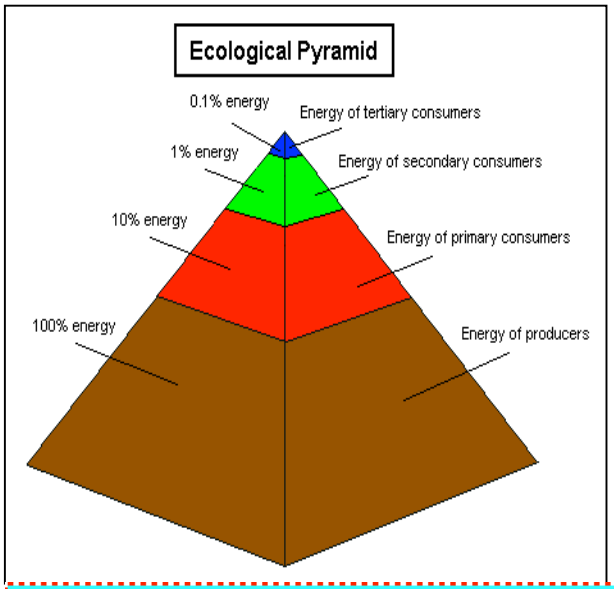
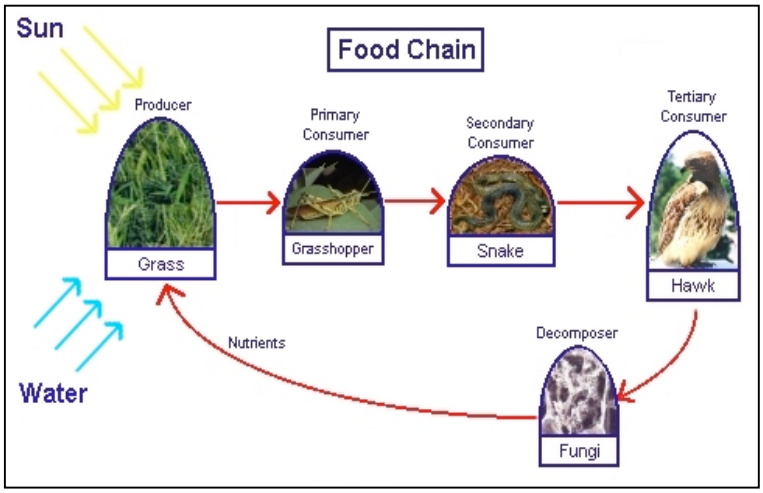
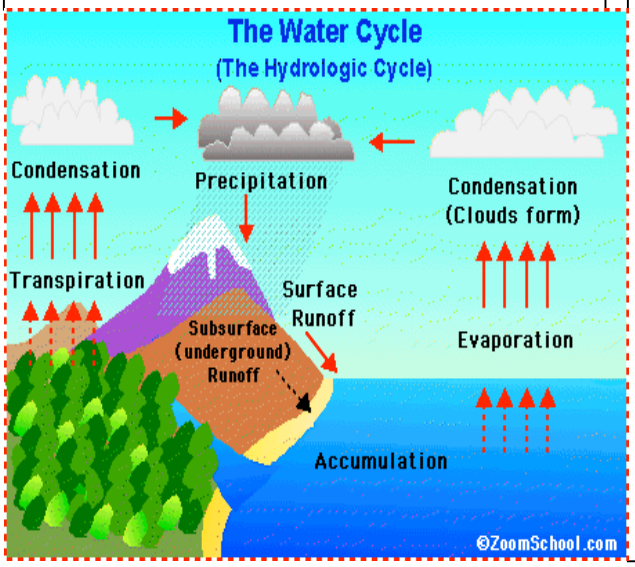
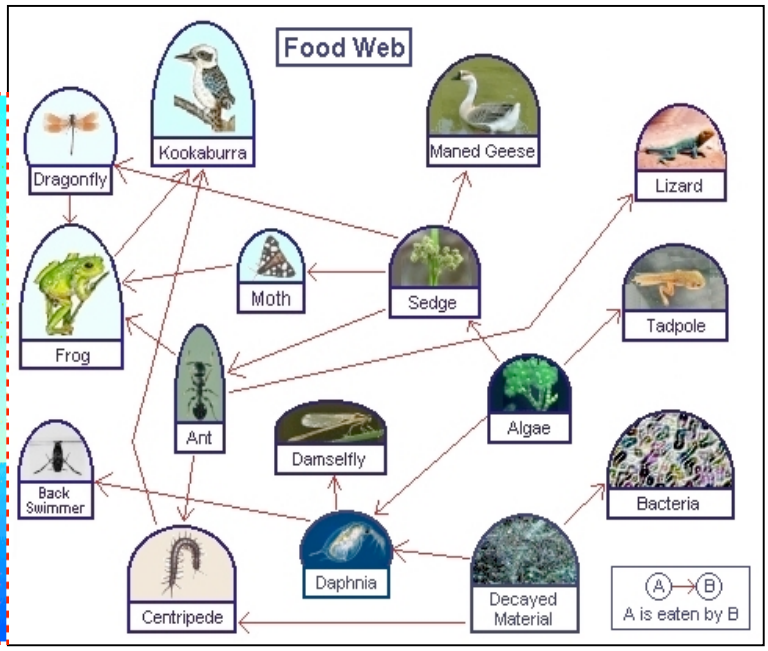
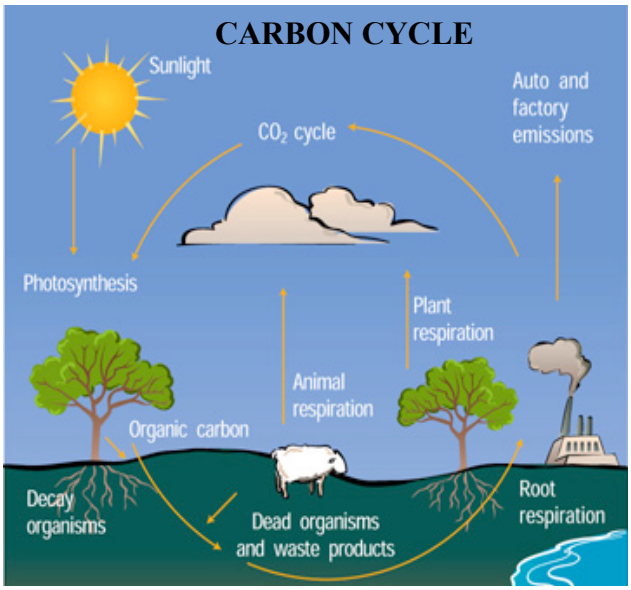
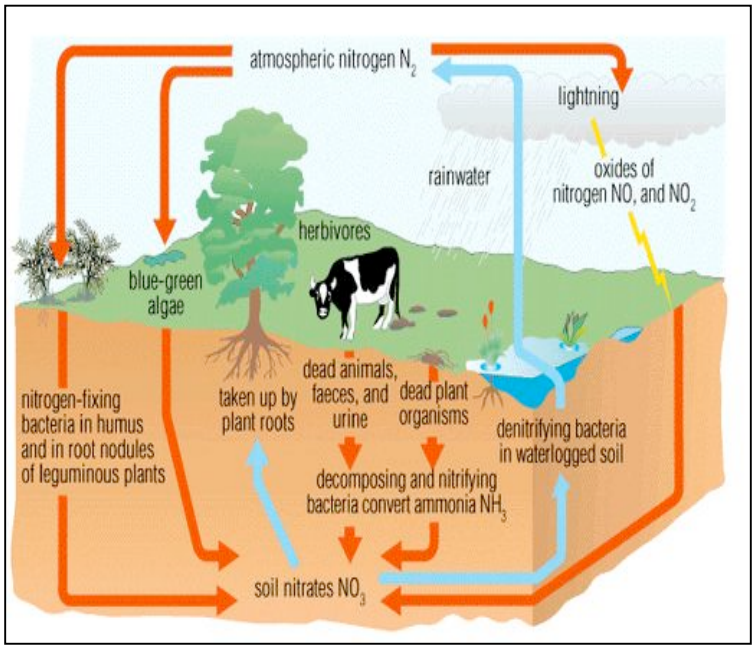








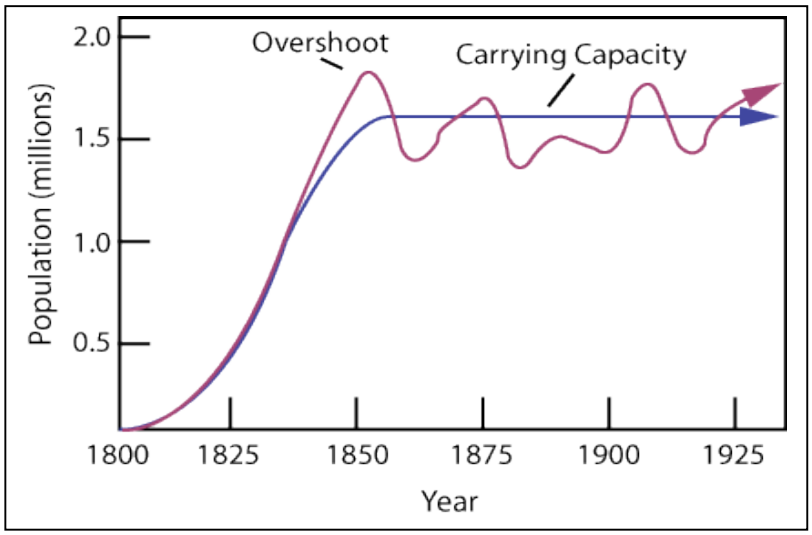


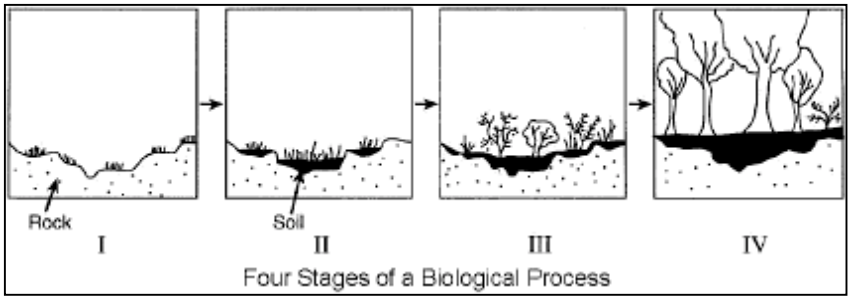


NITROGEN CYCLE

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



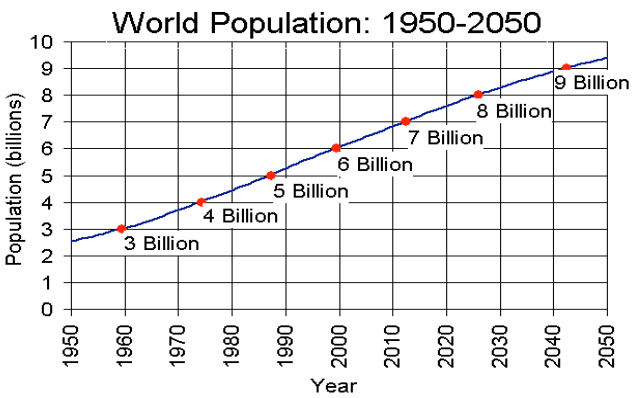


SUCCESSION:
- orderly, natural changes, and species replacements that take place in communities of an ecosystem over time
Primary Succession – colonization of barren land by pioneer organisms (soil must be developed)
Secondary Succession – sequence of changes that take place after a community is disrupted by natural disasters or human actions (soil already present)

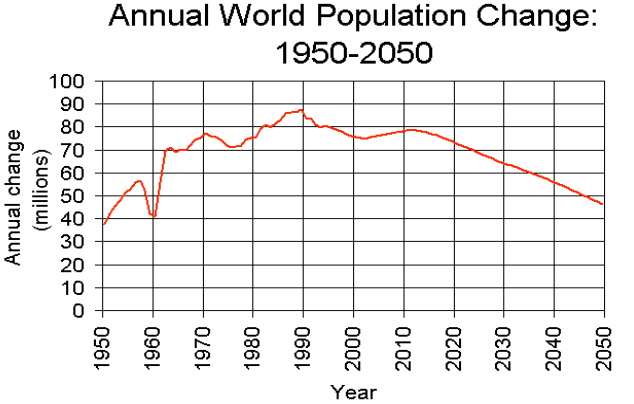
IMPACT OF HUMANS ON THE ENVIRONMENT:
- caused extinction of species through hunting, fishing, agriculture, industry, urban development
- growing population = greater demands on environment
- affected quality and quantity of land, air, water resources
- Pollution = pollutants
- Air Pollution = smog, acid 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



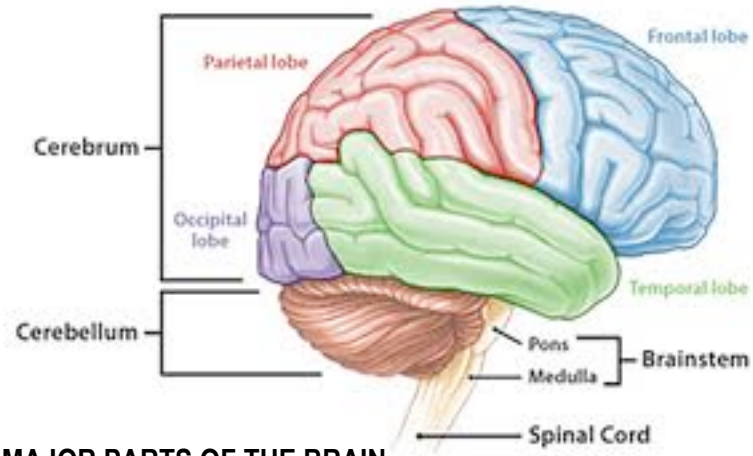
Source: U.S. Census Bureau, International Data Base, July 2007 version.



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

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

First Trimester	Second Trimester	Third Trimester
Implantation of embryo Vital organs begin to form i.e. brain & spine-5th wk: heartbeat start 7th 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

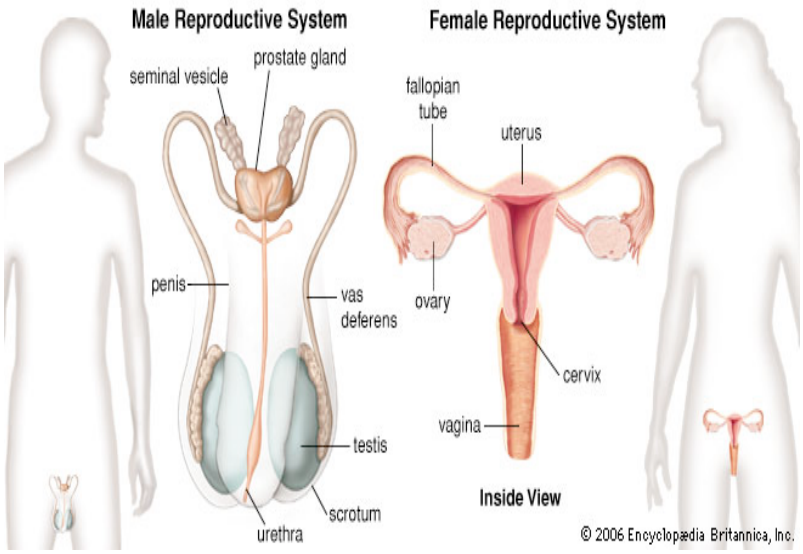
Thomas Robert Malthus (1798)**-** Malthus has become widely known for his theories about population and its increase or decrease in response to various factors

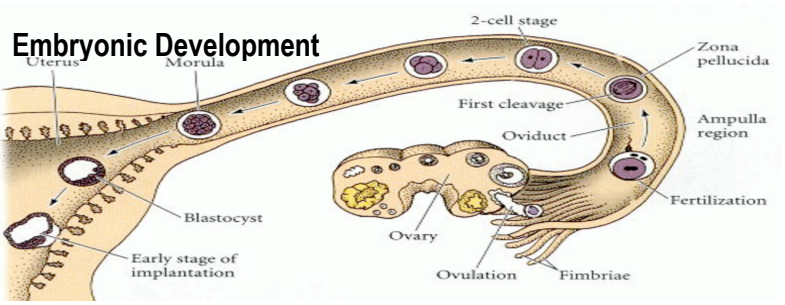
Jean-Baptiste Lamarck (1801) - known for classification of invertebrates and inheritance of acquired inheritance. First to propose theory of evolution

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).





INVERTEBRATES	VERTEBRATES
Three types of symmetry	Have a coelom (true body cavity)
No symmetry (disorganized)	Skeletal systems (endoskeleton)
Radial symmetry (around a central point)	Strong, flexible backbone (support)
Bilateral symmetry (equal on both sides)	Bilateral symmetry
Specialized bodily functions	Aquatic or terrestrial environments
No backbone, usually outer covering (exoskeleton)	Organized systems
May be hydrostatic (water-based, aquatic)	***Jawless fishes***
Sponges (Porifera)	Lampreys
No symmetry	***Cartilaginous fishes***
Cnidarians (Coelenterata)	Sharks, cartilage
Jellyfish, hydrostatic, radial symmetry	***Bony fishes***
Specialized stinging cells in tentacles	Bass, trout
Flatworms (Platyhelminthes)	Scales, paired fins, gills, bone
Leeches, bilateral symmetry	External fertilization
Suckers for removing fluids from host	***Amphibians***
Roundworms (Nematoda)	Salamanders, frogs
Parasites, radial symmetry	Moist skin and lack scales
Segmented worms	Have gills as young, lungs and limbs as adults
earthworms	External fertilization
decomposers	***Reptiles***
Mollusks (Mollusca)	Snakes, turtles
Clams, oysters (bivalves)	Dry, scaly skin
Hard outer shell (calcium carbonate)	Internal fertilization
Food source	Terrestrial eggs (leathery shells)
Arthropods (Arthropoda)	Developed lungs, strong limbs
Crabs, insects (segmented body)	***Birds***
Pollinators, bilateral symmetry	Hawks, eagles, robin
Echinoderms (Echinodermata)	Feathers, hollow bones, strong muscles
starfish	Efficient heart and lungs for flying
radial symmetry	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! ☺