

Evolution and Natural Selection Unit

Notes Name: _____

Evolution: evolution is change of a population of organisms from one generation to the next. Usually an advancement.

Evidence of Evolution

- The fossil record of changes in plants and animals over millions of years.
 - From simple to more complicated.
- Chemical and anatomical similarities of related life forms.
- The geographic distribution of related species.
- Genetics (DNA) A more recent branch of science that shows how organisms have evolved and are related on a genetic level.

Common Descent: All organisms on Earth are descended from a common ancestor or ancestral gene pool.

-Not observable

- Evolution is the change in the gene pool overtime.
 - Gene Pools can change when...
 - Populations can shrink
 - Diseases, extinctions, introduction of new better adapted species, predators.
 - Non-random mating
 - Organisms choose strongest mate, ones in similar boundaries,
 - Mutations in the genes
 - Genes can change. Some are good, some are bad.
 - The environment will decide.
 - Movement in and out of the population
 - Immigration, gene flow.

- Natural selection
 - Adaptations to the environment that do well replace poor ones. Usually a advancement.

The four parts to Darwin's theories.

- Organisms have changed over time.
- Organisms share a common ancestor.
- Change is a slow process over many generations.
 - Punctuated evolution shows us that it can during some periods speed up.
- The mechanism of evolutionary change was natural selection.

Descent with Modification: The passing on of traits from parent organisms to their offspring.

- Offspring will display small changes.

Natural Selection: Organisms best suited to their environment reproduce more often than others and pass the adaptation to their offspring (kids).

The mechanism for evolution is natural selection.

- #1.) Without checks like predators, populations would increase exponentially. Survival of the fittest!
- #2.) Most populations are stable in size except for seasonal changes.
- #3.) Natural Resources are limited. - A struggle for existence.
- #4.) No two individuals are alike.
- #5.) Variation is inheritable. (Animals pass their traits to their young).

Variation + Many Offspring + Heredity = Natural Selection.

Divergent evolution: When a group from a specific population develops into a new species.

Convergent Evolution: Similar evolved structures in unrelated animals.

Coevolution: The evolution of two or more species, each adapting to changes in the other.

- These ecological relationships include:
 - Predator/prey and parasite/host
 - Competitive species
 - Mutualistic species

Please record the following

- -Spoon beak.
- -Grabber Beak.
- -Magnetic Beak.
- -Tweezer Beak.

EARTH SYSTEM HISTORY NOTES

Earth System History and Astronomy

Earth History Components

- Earth system history has physical, chemical, and biological components
- Uniformitarianism: Laws of nature have not changed over time.
- The system is fragile. Changes in living conditions for animals have been numerous throughout earth's history.
- 99.5% of all things that have ever lived have become extinct.
- Principle of superposition - Oldest rocks and fossil are on bottom, youngest on top.

GEOLOGIC TIME SCALE								
Time Units of the Geologic Time Scale				Development of Plants and Animals				
Eon	Era	Period	Epoch					
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01	Earliest <i>Homo sapiens</i>			
			Pleistocene	1.6				
		Tertiary	Pliocene	5.3	"Age of Mammals"			
			Miocene	23.8				
			Oligocene	33.7				
			Eocene	55				
			Palaeocene	65				
	Mesozoic	Cretaceous	145	"Age of Reptiles"	Extinction of dinosaurs and many other species First flowering plants First birds Dinosaurs dominant First mammals			
		Jurassic	208					
		Triassic	248					
	Palaeozoic	Carboniferous	Permian	286	"Age of Amphibians"	Extinction of trilobites and many other marine animals First reptiles Large coal swamps Amphibians abundant		
			Pennsylvanian	320				
			Mississippian	360				
		Devonian	Silurian	410	"Age of Fishes"	First amphibians First insect fossils Fishes dominant		
			Ordovician	438				
Cambrian			505					
Vendian			Cambrian	545			"Age of Invertebrates"	First land plants First fishes Trilobites dominant First organisms with shells
				Vendian				
Proterozoic	Archean	Collectively called Precambrian		First multicelled organisms				
		comprises about 87% of the geological time scale						
Hadean	Archean			First one-celled organisms Age of oldest rocks				
					Origin of the earth			

Precambrian

Hadean, Archean, and Proterozoic Eon's

Earth's Molten layers form (Denser to middle)

Formation of Earth's Crust (cooling).

- Meteorites bombard the planet and carry with it water molecules and amino acids (building blocks of protein).

Moon created from protoplanet impact

Atmosphere originates (No oxygen yet)

Earliest life begins (primitive protocells)

- Microbes helped produce an oxygen atmosphere through photosynthesis.

First Multi-cellular life (many cells)

Explosion of new animals (sea)

Paleozoic Era

Vendian, Cambrian, Ordovician, Silurian, Devonian, Carboniferous, and Permian Periods.

Marine invertebrates dominate

Jawed Fish Evolve

Plants invade land (Oxygen to atmosphere)

Insects emerge

First Amphibian

First Reptiles

First winged insect

Mesozoic Era

Triassic, Jurassic, Cretaceous Periods

Dinosaurs dominate

First Birds

First Mammals

First Flowers

K-T Mass Extinction Event, 65mya

Cenozoic Era

Tertiary, and Quaternary Periods

Mammals change

Earliest Monkeys

Climate becomes drier

Panama attaches South America to North America

First human hominids

Modern Man (Whoa)

Civilization

Age of Exploration, Industrial and Computer Age

HUMAN EVOLUTION NOTES

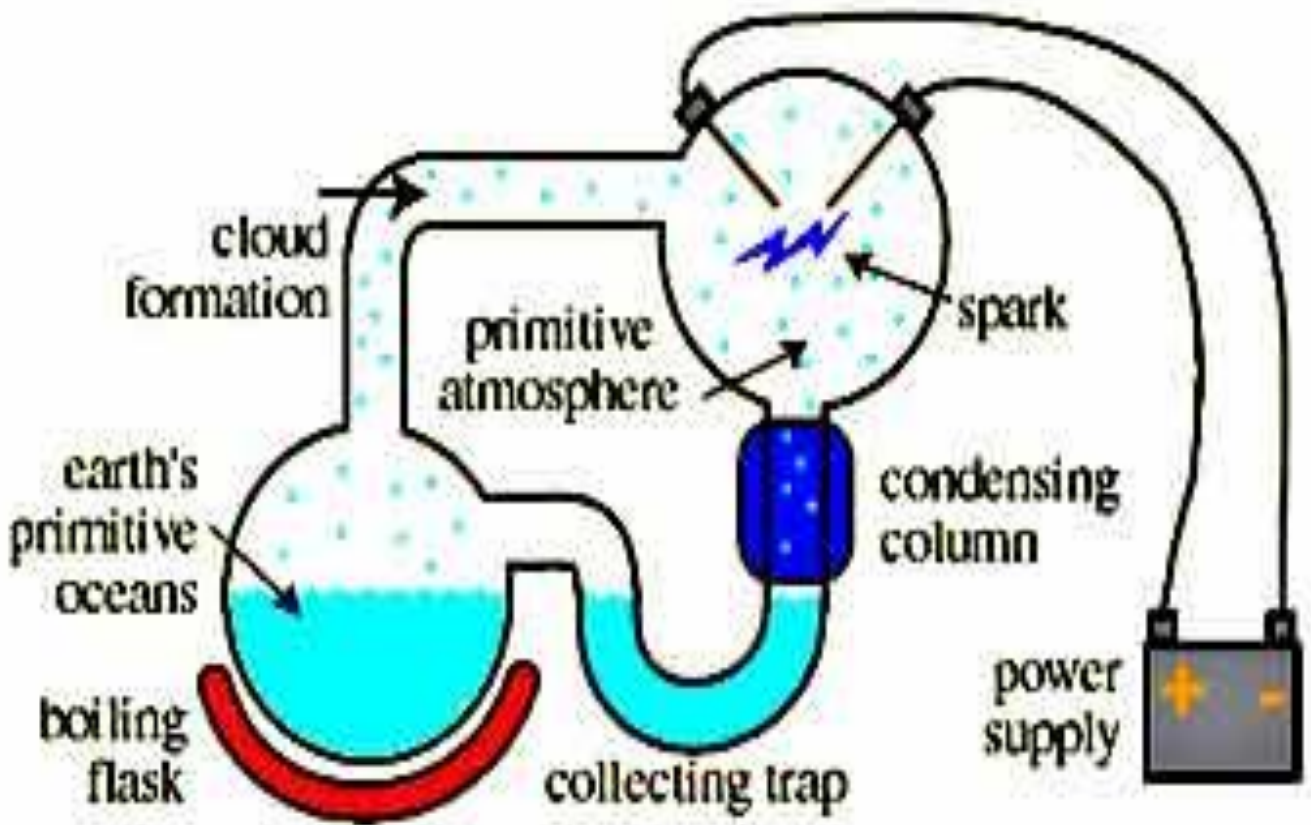
- Hominid: any of a family (Hominidae) of erect bipedal primate mammals comprising recent humans.
- Opposable thumb - Gripping (most primates have).
- Bipedalism - Walking on two feet (regularly).

- Hominids first appeared roughly 7 million years ago (A blink in geologic time).
- Many species of hominids evolved and have become extinct (lots of fossil evidence).
- We are the only surviving hominid (Homo sapien sapien).
- Hominid dentition is very close 2:1:2:3
- Wisdom teeth - Molars leftover from when we ate mostly tough plants.

ON ORIGINS NOTES

- Organism - Any living thing
 - Characteristics of living things
 - Made of cells.
 - Moves.
 - Responds to a stimulus.
 - Uses Energy.
 - Adjusts to Changes.
 - Maintains steady body conditions.
 - Maintains homeostasis.
 - Reproduces.
 - Grows and Develops.
 - Grow-To increase in size.
 - Develop-To change in ability.
 - Adapts to Change.
 - Evolves / Inherits traits that promote survival.
 - Has a life span.
- In Science theory
 - Abiogenesis explains the origin of life.
 - Evolution explains how life changes once it exists.
 - The two are different.
- Needs of Living Things
 - Energy - Supplied by the sun (most of the time) and stored in food. TINSTAAFL!
 - Oxygen - To burn the food in cells. (Respiration)
 - Water - To keep things moving in and out of cells. (Universal Solvent)

- Minerals- For proper chemical balance.
- The four general ideas about the origin of life.
 - Special creation - divine forces (god).
 - E.T. extraterrestrial origin - landed from space.
 - Spontaneous origin (abiogenesis) - life came from non-living materials.
 - Science viewpoint
 - Which includes
 - -Evolution (Darwinism).
 - -Cosmology (astronomy)
 - -Geology (Earth System History)
 - -Abiogenesis (Primitive life / organic chemistry).
- Origins of the Universe, a timeline.
 - Big Bang roughly 10-18 billion years ago.
 - 4.6 billion years ago: Earth was created.
 - 3.8 billion years ago: life arose.
 - Prebionts - Nonliving structures that evolved into the first living cells. (Simple)
 - 2.0 billion years ago: Eukaryotic cells (single cells with a nucleus) evolved.
 - 0.5 billion year ago: Oxygen began to saturate the atmosphere.
- Miller-Urey Experiment
 - Methane (CH₄)
 - Ammonia (NH₃)
 - Water (H₂O)
 - Hydrogen (H₂)



- The experiment used
 - Electricity (lightning)
 - Ultra-violet (UV) light (no ozone yet).
 - Heat (convection currents).
 - Cooling (condensation)
 - No oxygen (no plants).

A protein = 100 amino acids of 20 varieties

Proteins can build DNA / RNA

- Water aided in origin of life in three ways
 - As a solvent - Everything dissolves in water.
food, oxygen, minerals,
 - Participant in chemical reactions such as photosynthesis.
 - Medium
 - Organisms move through, waste travels away, sex cells travel through, etc

ECOLOGICAL SUCCESSION NOTES

Name: _____

EVERYTHING IS CHANGING

Ecological succession: The gradual replacement of one community of living things by another community.

Primary Succession: Begins in an area with no previous life supported (bare rock).

Secondary Succession: Succession in an area that previously colonized life but is now disturbed.

Plant Succession: Plants are replaced (succession is dominated by plants).

Animal Succession: Animals are replaced (Animals help succession).

Pioneer Species: The first species to colonize after a disturbance.

Climax Community: The final stage of succession, remaining until a major disturbance.

The order of ecological succession from primary succession

- Bare Rock
- Lichens
 - Acids secreted by the lichens attack the rock (chemical weathering) and create soil fragments.
- Mosses
 - Create humus and retain moisture.
- Grasses and Sedges
- Meadow Stage
 - Grasses
 - Yearly plants
 - Weeds

- Old Field Community
 - Perennials (year after year).
 - Goldenrod, Milkweed.
- Sun Loving Shrubs
 - Soil base now forms.
 - Sumac, Willow, Dogwood, Apple.
- Sun Loving Trees
 - Organic matter increases from fallen leaves.
 - Poplar, Birch, Quaking Aspen.
- Conifers
 - Enriched soil allows pines to grow
 - Pines are sun loving and grow well
 - Eventually they shade out their offspring, no new pines grow.
- Shade Tolerant Hardwoods
 - These can grow in shade.
 - Oak, Hickory, Ash.
- Climax Community (Shade loving hardwoods)
 - Beech Trees, and Maples
 - Climax means final community.

Events that can restart succession.

- - A forest fire.
- - A volcanic event.
- - Logging / Human Impact.
- - Erosion.
- - Ice Age / Glaciers.

Fire: Some seeds require a fire event or very hot temperature after they have been dispersed to germinate.

Fire ecology: A branch of ecology that focuses on the origins of wildland fire and its relationship to the environment that surrounds it, both living and non-living.

Fire Dependence: This concept applies to species of plants that rely on the effects of fire to make the environment more hospitable for their regeneration and growth.

Area of focus: Nutrients and Aquatic Systems.

Eutrophic

- Having concentrations of nutrients optimal or for plant or animal growth. It is used to describe nutrient or soil solutions.

Mesotrophic

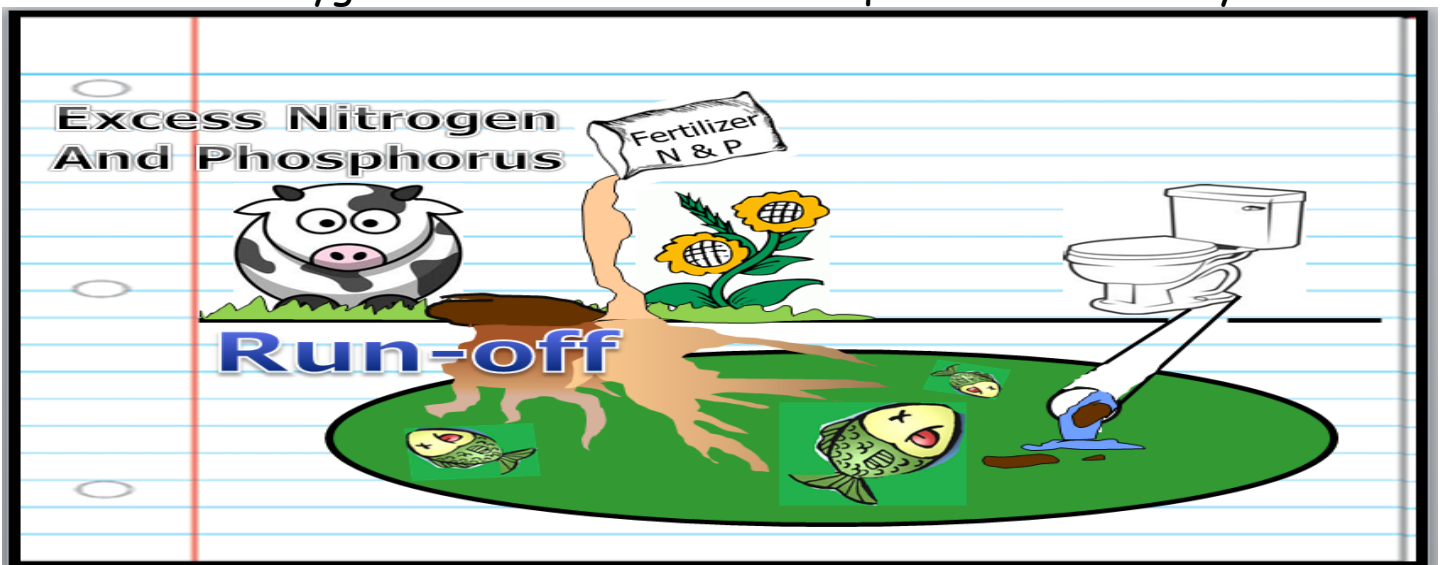
Production is considered moderate.

Oligotrophic

Describes a lake or river with low productivity.

Eutrophication

- Aquatic plants use Phosphorus and Nitrogen and grow out of control.
- Aquatic plants overpopulate and die.
- Bacteria break down dead plants and use oxygen in water (respiration).
- No oxygen left for fish / other aquatic life and they die.



SAVE THESE NOTES. Do Not Lose

