AP Biology: Unit 7 Cheat Sheet

by kmz_2022 via cheatography.com/145729/cs/31763/

Natural Selection Background

2 definitions of evolution

1. descent with modification

2. change in the genetic composition of a population from generation to generation

natural selection:	individuals with certain inherited traits tend to survive and reproduce more than others because of those traits
artificial selection:	breeding to encourage the occurrence of desirable traits

*individuals don't evolve, *populations evolve*

*natural selection only works on traits that differ in individuals

*environmental factors change, so favorable traits change

Important People

1. Linnaeus

- made the format of naming species

2. Cuvier

- *catastrophism:* catastrophes cause changes in species

3. Hutton

- Earth's geological features due to mechanisms still around today (ex. rock cycle)

4. Lyell

- *uniformitarianism:* same processes occurring today also happened in the past

5. Lamarck

- *use and disuse:* parts of the body used become more advanced and those not used deteriorate

- *inheritance of acquired traits* = organisms pass modifications to offspring

6. Darwin

- development of the theory of *natural selection*

Darwin's Evidence for Evolution

1. homology

↳ similarity in characteristics resulting from a shared ancestry

- *homologous structures:* structures in different species that are similar (structurally) because of common ancestry

- *vestigial structure:* feature of an organism that is a historical remnant of one once used

Darwin's Evidence for Evolution (cont)

2. embryology

↳ structures present in embryos can explain the similarities in different species

- *convergent evolution:* similar features in independent evolutionary lineages

- *analogous structures:* characteristics that are similar because of convergent evolution

3. fossils

- indicate structural similarities between different species

- document formation of new species

4. biogeography

↳ study of the past and present geographic distribution of species

5. artificial selection

Allele Frequency

3 MECHANISMS THAT CHANGE ALLELE FREQUENCY

1. Natural Selection

↳ improves the match between organism and the environment

2. Genetic Drift

↳ chance events alter allele frequencies

↳ *founder effect*~ few individuals isolated from the larger population & establish a new population

↳ *bottleneck effect*~ population is reduced by natural disasters/human actions

3. Gene Flow

↳ transfer of alleles between populations (from migration & mating)

genetic variation: differences in individuals composition of their genes/DNA segments (ex. mutations)

↳ in sexual reproduction= *crossing over; independent assortment; fertilization*

geographic variation: differences in the gene pools of geographically separate populations

↳ *cline*~ graded change in a character along a geographic axis

(^ *microevolution* ^)

Hardy-Weinberg

Hardy-Weinberg principle:	frequencies of alleles and genotypes remain constant for each generation

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Hardy-Weinberg (cont)

↳ Hardy-Weinberg equilibrium predicts the allele frequencies in a nonevolving population

5 Conditions

1. NO Mutations

2. Random Mating

3. NO Natural Selection

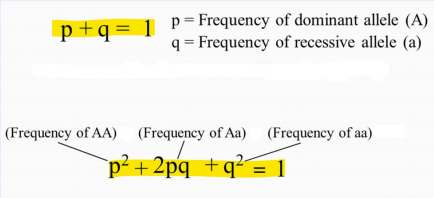
4. Large Population Size

5. No Gene Flow

* if one not present --- genes evolving

(^ *microevolution* ^)

Hardy-Weinberg Equations



Selection

relative fitness:	contribution an individual makes to the gene pool in relation to their ability to survive in their environment

3 MODES OF SELECTION

1. Directional selection	favors 1 extreme/side
2. Disruptive selection	favors both extremes/sides
3. Stabilizing selection	favors intermediate

Sexual Selection

sexual selection:	individuals with certain characteristics are more likely to obtain a mate
sexual dimorphism:	differences between secondary sex characteristics of males and females
intrasexual selection:	competition among individuals of 1 sex for mates
intersexual selection:	1 sex choosy in selecting their mates of the other sex
heterozygote advantage:	better reproductive success of heterozygotes (preserve variation)

(^ *microevolution* ^)

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Speciation

adaptive radiation	period in which organisms form many new species whose adaptations have them fill different niches
punctuated equilibrium	long periods which a species undergoes little change interrupted by brief periods of sudden change
reproductive isolation:	biological factors that impede members of 2 species from producing viable, fertile offspring
postzygotic barrier:	reproductive barrier that prevents hybrid zygotes from developing
hybrid:	offspring resulting from the mating of 2 different species
prezygotic barrier:	reproductive barrier that hinders the fertilization between species
PREZYGOTIC BARRIERS	
1. Habitat isolation	different habitats then they never interact
2. Temporal isolation	breed at different times of the day/seasons/years
3. Behavioral isolation	courtship rituals differ
4. Mechanical isolation	morphological differences
5. Gamete isolation	sperm can't fertilize egg
POSTZYGOTIC BARRIERS	
1. Reduced hybrid viability	genes of parents impair hybrid development/survival
2. Reduced hybrid fertility	hybrid sterile due to chromosomes from parents
3. Hybrid breakdown	when hybrids mate, offspring are feeble/sterile
Species Concepts	
a. *morpho-logical*	by body shape/structural features
b. *ecological*	by ecological niche
c. *phylog-enetic*	smallest group that share a common ancestor
d. ** biolog-ical**	by inbreeding of members

Speciation (cont)

↳ limitations: designates absence of gene flow & doesn't apply to asexual organisms

Speciation Types	
a. *allopatric speciation*	when a species is geographically isolated from original population
↳ geographic separation → mutations → reproductive isolation → speciation	
b. *sympatric speciation*	when a species is isolated with NO geographic isolation
↳ ex). disruptive selection; polyploidy; lateral transfer	
c. *parapatric speciation*	when species interbreed over a geographic continuum
↳ ex). clines- elevation change	

(^ *macroevolution* ^)

Phylogeny

phylogeny	evolutionary history of a species/group of organisms
phylog-enetic tree	branching diagram representing the evolutionary history of organisms
taxonomy	naming and classifying forms of life
taxon	taxonomic unit at any given level of classification
cladistics	organisms are placed into groups called clades based on common descent
clade	groups of species that includes an ancestral species & ALL its descents
monoph-yletic group	a common ancestor & ALL its descendents
paraph-yletic group	a common ancestor & SOME of its descendants
polyph-yletic group	derived from 2+ different ancestors
outgroup	group that is least closely related to the other oganisms
ancestral character	character shared by members of a certain clade originated in an ancestor not a member of the clade
derived character	character that is new/unique to a certain clade

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Phylogenetic Tree vs. Cladogram

* represent hypotheses

Binomial Nomenclature

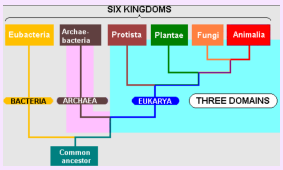
- made by:	*Linnaeus*
- two parts:	genus & species
- rules:	first word capitalized, second lowercase
	all italicized/underlined

8 LEVELS OF CLASSIFICATION

(Dear King Philip Came Over For Good Soup)

Domain → **K**ingdom → **P**hylum → **C**lass → **O**rder → **F**amily → **G**enus → **S**pecies

Kingdoms & Domains



* protista kingdom not really considered (closely related to the other eukarya kingdoms)
* evidence of common ancestry of all eukaryotes = *membrane-bound organelles, linear chromosomes, & introns*

Prokaryotes Information

(bacteria, archaea, & protists)

capsule/slime layer	protects against dehydration/shield against immune system
fimbriae	hair like appendages used to attach to host
pilli	appendages that pull 2 cells together
nucleoid	region in a prokaryotic cell where DNA is located
positive chemotaxis	movement TOWARDS nutrients/oxygen
negative chemotaxis	movement AWAY from a toxic substance
endospore	can survive in harsh/insufficient environments (dormant but viable)

POPULATION GROWTH

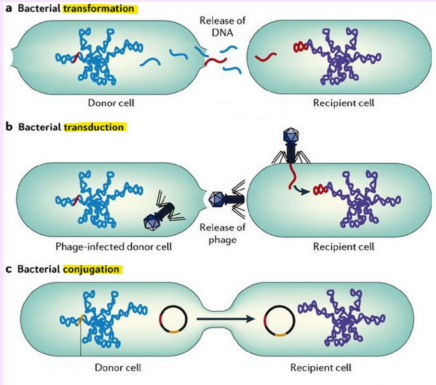
Prokaryotes Information (cont)

- in ideal lab conditions =	20 minutes
- typical human intestines =	12-24 hours

4 Limitations

1. *exhaust* nutrient supply
2. *poison* themselves with metabolic wastes
3. *competition* from other microorganisms
4. *consumed* by other organisms

Bacterial DNA Transfer Types



transformation: assimilation of external DNA
transduction: viruses carry bacterial DNA from one cell to another
conjugation: direct transfer of DNA

Endosymbiosis

Mitochondria~

- first eukaryotes acquired mitochondria by engulfing an aerobic prokaryote

↳ evidence: DNA data & found in all eukaryotes

Plasids~

- eukaryotes acquired photosynthetic bacterium that evolved into plastids

↳ evidence: plastid and photosynthetic bacterium genes closely resemble

secondary endosymbiosis	process in which a eukaryotic cell engulfed a photosynthetic eukaryotic cell

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Early Earth

- Miller & Urey experiment:	demonstrated how the atmosphere could spontaneously produce organic molecules
↳ other possible source of organic molecules: *volcanoes or deep-sea vents*	
protocell	abiotic precursor of a living cell that had an internal chemistry different from its surroundings
↳ created spontaneously when *lipids are added to water*	
***RNA World**	life on Earth began with an RNA molecule that could copy itself
↳ **ribozymes~** enzyme that makes copies of RNA	

EVENTS

1. earth formation
2. stromatolites/oldest cells (unicellular)
3. photosynthetic bacteria (releases O_2)
4. aerobic respiration
5. eukaryotic organisms
6. sexual reproduction
7. multicellular/terrestrial algae

* more O_2 in atmosphere helps ozone protect against radiation

Cambrian explosion	brief time in history when there was an explosion of land & water diversity
↳ claws & defensive adaptation become present	
mass extinction causes...	volcanic eruptions; asteroids/comets; human actions

Fossils

FOSSILIZATION RATES	
HIGH	LOW
- existed a long time	- existed a short time
- abundant/widespread	- not abundant
- hard shells/skeleton	- soft/no shell/ no skeleton
- sedimentary rock	- not in sediments
radiometric dating	method to determine absolute age based on half-life
- isotope used:	carbon 14 (becomes nitrogen 14)

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