



Crack Notes [Biology 9] Populations

Mendelian Genetics

Definitions

Phenotype: expression of a trait (what organism looks like)

Genotype: genetic makeup of a trait (what organism's genes are)

Allele: for diploid organisms, each gene has two variations, each variation is an allele

-> Usually we simplify it to be one of two types: dominant or recessive

Dominance: when one allele is expressed in phenotype regardless of what other allele is

Homozygous: when individual has two of the same allele, i.e. two dominant/two recessive

Heterozygous: when individual has one dominant, one recessive allele

Mendel's Laws

Law of Segregation: each gamete has same chance of receiving either allele

-> Phenotype is dominant if one or two dominant alleles, recessive if two recessive alleles

Law of Independent Assortment: genes on different chromosomes will assort independently

Punnett Square

Write down possible alleles for one parent along top, possible alleles for other parent along left; center of table has all possible offspring

Monohybrid cross: 3:1

Dihybrid cross: 9:3:3:1

Sex-linked traits: if traits are on sex chromosome, they can only be on X

-> So Dad will have XH/Xh and Y gametes, Mom will have two XH/Xh gametes

-> If Mom's gamete is recessive/has the disease, then all sons must have it

Carrier: if Mom has a dominant and recessive allele for a sex-linked trait, she won't express the recessive phenotype but her sons might

Pedigrees

Is the condition dominant or recessive? (look for skipped generations)

Is the condition sex-linked? (look for more males than females having the condition)



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Evolution

Gene pool: all alleles in a population

Evolution: change in the gene pool

Taxonomic Classification

"King Philip Came Over For Great Sex" Kingdom-phylum-class-order-family-genus-species

We're in phylum chordata, subphylum vertebrata, class mammalia

Plants/fungi: replace phylum with divisions

Domains: bacteria, archaea, eukarya (which contains protista, fungi, plantae, animalia)

Species: organisms that reproduce fertile offspring with each other in the wild

Populations

Niche: how a species occupies its environment (location, food, etc)

Survival of the fittest: only one species can survive in a niche over a long period of time

r-selection: reproductive strategy where you make lots of offspring with no parental care

-> Exponential growth curve, usually organisms in rapidly changing environments

K-selection: reproductive strategy where you make few offspring with lots of parental care

-> Sigmoidal growth curve leveling off at *carrying capacity*

Evolution

Speciation: how new species are formed

-> *Adaptive radiation*: when one species, when separated, evolves into multiple species

Bottleneck: when many organisms die in a population, so that allele frequencies change

Divergent evolution: two or more species with common ancestor share structure of ancestor

Convergent evolution: similar structures evolve in two or more species with different ancestors

-> Wings in bats and birds, fins in whales and fish

Polymorphism: occurrence of distinct forms/phenotypes within a species

Genetic drift: in a small population, allelic frequencies can shift over time

Symbiosis - relationship between two species

Mutualism: benefits both

Commensalism: benefits one, does not affect the other

Parasitism: benefits one, hurts the other

Hardy-Weinberg Equilibrium $p^2 + 2pq + q^2$ frequency of gene w/ two alleles, $p + q = 1$

Large population, mutational equilibrium, no significant immigration/emigration (no gene pool changes), random mating, no selection for fittest organism

Crack the DAT

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Origin of Life

12-15 billion years ago: Big Bang, start of Universe

4.6 billion years ago: start of solar system

4.5 billion years ago: start of Earth

-> Atmosphere has H_2S , NH_3 , CH_4

-> *Urey-Miller experiment* created amino acids, etc from these conditions

-> *Coacervates*: bubbles of lipids/proteins that evolved into cells

3.6 billion years ago: first microorganisms - heterotrophs that eat organic compounds

2.3 billion years ago: first photosynthetic bacteria (sunlight + water + CO_2 -> O_2 + organic)

1.5 billion years ago: first eukaryotes

470 million years ago: first fish

300 million years ago: first reptiles

220 million years ago: first birds, first mammals

Chordates are deuterostomes, and during their development have a coelom, notochord, pharyngeal slits, a dorsal/hollow nerve cord, and a tail