

# Biology chapter 16 1 genes and variation

## answers

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**What is the relationship between allele frequency and a gene pool?** A gene pool is the sum of all the alleles (variants of a gene) in a population. Allele frequencies range from 0 (present in no individuals) to 1 (present in all individuals); all allele frequencies for a given gene add up to 100 percent in a population.

**How does genetic drift lead to a change in a population's gene pool?** Genetic Drift. Genetic drift is the change in frequency of an existing gene variant in the population due to random chance. Genetic drift may cause gene variants to disappear completely and thereby reduce genetic variation. It could also cause initially rare alleles to become much more frequent, and even fixed.

**How natural selection can affect traits controlled by single genes?** Natural selection on single-gene traits can lead to changes in allele frequencies and, thus, to changes in phenotype frequencies. Natural selection on polygenic traits can affect the distributions of phenotypes in three ways: directional selection, stabilizing selection, or disruptive selection.

**How does the range of phenotypes differ between single-gene traits and polygenic traits?** A trait that is controlled by only one gene is called a single-gene trait. Single-gene traits may have only two or three phenotypes. The trait that is controlled by two or more genes is a polygenic trait. Polygenic traits can have several possible genotypes and phenotypes.

**How to find allele frequency?** An allele frequency is calculated by dividing the number of times the allele of interest is observed in a population by the total number of copies of all the alleles at that particular genetic locus in the population. Allele

frequencies can be represented as a decimal, a percentage, or a fraction.

**How do you calculate the gene pool?** A gene pool is all of the alleles for a particular gene (or set of genes) present in individuals within a population. The frequency of alleles within a population can be calculated as (# specific allele / Total # alleles) Evolution is the change in heritable traits (alleles) within a population over time.

**What changes the frequency of a gene?** Gene frequencies tend to remain constant from generation to generation when disturbing factors are not present. Factors that disturb the natural equilibrium of gene frequencies include mutation, migration (or gene flow), random genetic drift, and natural selection.

**What are the factors affecting allele frequency?** Genetic equilibrium and population heterogeneity are influenced by five factors. These elements are referred to as evolutionary agents. These are the following: mutations, genetic recombination, gene flow or gene migration, genetic drift, natural selection.

**How many alleles does a person have for each gene?** An individual inherits two alleles, one from each parent, for any given genomic location where such variation exists. If the two alleles are the same, the individual is homozygous for that allele. If the alleles are different, the individual is heterozygous.

**What is the role of migration and mutation in changing allele frequencies?** Migration will change gene frequencies by bringing in more copies of an allele already in the population or by bringing in a new allele that has arisen by mutation. Because mutations do not occur in every population, migration will be required for that allele to spread throughout that species.

**What is another name for the evolutionary force called gene flow?** Gene flow — also called migration — is any movement of individuals, and/or the genetic material they carry, from one population to another.

**What does the allele frequency have to total in the Hardy-Weinberg equilibrium?** In addition, the sum of the allele frequencies for all the alleles at the locus must be 1, so  $p + q = 1$ .

**What is a genetic inheritance pattern in which both genes influence a characteristic?** In codominant inheritance, two different versions (alleles) of a gene are expressed, and each version makes a slightly different protein. Both alleles influence the genetic trait or determine the characteristics of the genetic condition.

**How does stabilizing selection work?** Stabilizing selection results in a decrease of a population's genetic variance when natural selection favors an average phenotype and selects against extreme variations. In directional selection, a population's genetic variance shifts toward a new phenotype when exposed to environmental changes.

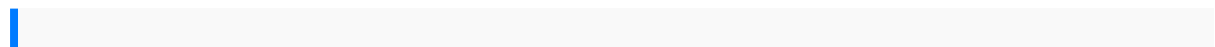
**Why polygenic inheritance can produce a greater variety of phenotypes for a trait?** A polygenic pattern is a type of inheritance pattern where one trait is controlled by multiple genes. Each gene has multiple alleles and creates a continuous pattern of expression with many phenotypes.

**What is the difference between an allele and a gene pool?** The fact that genes exist in alternate forms, called alleles, forms the basis for the study of population genetics. Populations are made up of members of the same species that interbreed.

**What changes in allele frequency in a gene pool?** Genetic drift is change in allele frequencies in a population from generation to generation that occurs due to chance events. To be more exact, genetic drift is change due to "sampling error" in selecting the alleles for the next generation from the gene pool of the current generation.

**What is the relationship between the terms gene pool and gene flow?** gene flow, the introduction of genetic material (by interbreeding) from one population of a species to another, thereby changing the composition of the gene pool of the receiving population.

**What are the factors affecting allele frequency in a gene pool?** These are the following: mutations, genetic recombination, gene flow or gene migration, genetic drift, natural selection.



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