

Review Sheet: Defining Alleles

Alleles

A diploid individual has two copies of every gene, but these two copies (alleles) can be slightly different. Each allele codes for a variant of a characteristic. Fur color can act as a good example to think about alleles. There is a gene for fur color. The variants of fur color (brown, red, black, white, or orange) are coded for by different alleles. There can be numerous alleles for any gene. The DNA of each allele differs only slightly.

Defining Alleles

Each allele must be defined when completing a genetics problem. Not doing so means someone else may not understand what you are saying. You must define every allele by giving it a letter and then stating what it is expressed as. The letter you choose to represent an allele tells you about the allele. An uppercase letter is dominant to a lowercase letter. A superscript + can denote a wildtype allele. (You can read more about wildtype and mutant alleles in the Haplosufficiency guide.) Every allele of a gene must have the same letter, but you can choose which letter that is. X and Y are not great letters to use for alleles unless you know they exist on a sex chromosome and letters such as O, U, and Z are hard to tell if they are uppercase so should be avoided when possible.

Genetics courses aim to prepare you to be a good scientist so real-world examples of content can allow you to understand why you learn each topic. Imagine you are working in a genetics lab. You study a gene involved in mouse fur color while the lab next door studies a gene involved in mouse fur length. If you were to trade lab notes with them, everyone should be able to understand each other's notes. If you only wrote things like "Aa and AA", nobody else would know the color of the mouse fur.

While you may not be in a situation like the one above, you still must define every allele you use. There are questions where you may deal with multiple gene and many alleles. If you do not define your alleles, it can become challenging to complete the problem correctly and a grader may not be able to follow your answer. Below is an example of what defining alleles may look like.

Example:

The following example defines two alleles for a gene A. Gene A in this example is a gene for flower color and each allele represents a trait (a version) of flower color that could be represented on a chromosome.

A-Purple Flowers

a-Red Flowers

Note how there is a single letter used for both alleles. This denotes that these alleles belong to a gene called "gene A". An allele represents exactly one copy of the gene, so only one single letter is paired with the description of how it is expressed. The capital A paired with purple flowers also shows us that this is the dominant allele, and it is expressed as purple flowers.

A common mistake made is stating an entire genotype (two alleles) and then stating what phenotype that individual has. This is not defining alleles and most graders and professors will not give you any credit for this. Another common mistake to avoid is not being consistent with the letter used for a single gene. If you define each allele with a different letter (e.g., A for the first allele, B for another allele, C for a third allele...) you are actually saying these are alleles for different genes.

As you work through genetics problems, make sure all of your alleles are defined correctly. Failure to do so can result in confusion and a large loss of points. Before you submit any assignment or problem, make sure your alleles are defined correctly.