GENETICS: Student Practice Sheet

Monohybrid Cross

In the following examples, the trait of black colored fur on a rat is studied. Black fur (B) is dominant over brown fur (b). For each example, predict the distribution of phenotype and genotype in the offspring for the parents described.

×		

In this example, a homozygous dominant male (BB) is crossed with a homozygous recessive female (bb).

What is the distribution of genotypes in the offspring? _____

What is the distribution of phenotypes in the offspring? _____

×		

In this example, both parents are heterozygous (Bb).

What is the distribution of genotypes in the offspring? _____

What is the distribution of phenotypes in the offspring? _____

×		

In this example, a heterozygous make (Bb) is crossed with a homozygous recessive female (bb).

What is the distribution of genotypes in the offspring? _____

What is the distribution of phenotypes in the offspring? _____

If one of the parents is homozygous dominant (BB), what can always be said about the offspring? _____

_____

Dihybrid Cross

In this example, we're going to see what happens when two traits are examined at the same time. We'll examine the color of fur again (Black = B and brown = b), but we'll also examine another trait, the tail. A long tail (T) is dominant over a short tail (t).

×				

In this example, both parents are heterozygous for both traits (BbTt).

What percentage of offspring have black fur? _____

What percentage of offspring have brown fur?_____

How does this compare to the monohybrid cross of heterozygous parents in the monohybrid cross above? _____

What is the distribution for the four genotypes in the Punnett square?

_____

Co-Dominance

In this example, we're going to examine blood type, which results from a co-dominant trait. Type A blood results from having a Type A allele (I^A), Type B blood results from a different allele (I^B), Type AB blood results from both of these alleles (I^AI^B), and Type O blood results from being homozygous recessive (ii).

×		

In this example, a father is heterozygous for Type A blood (I^Ai) and a mother is heterozygous for Type B blood (I^Bi).

What genotypes are seen for the off spring? _____

What phenotypes do these genotypes correspond to? _____

What are the only ways to produce offspring who have Type O blood? _____

_____

What is the only way to have offspring with Type AB blood? _____

_____

Incomplete Dominance

In this example, we'll examine a species of flower that produces blue and yellow flowers. The blue trait (BB) and the yellow trait (YY) exhibit incomplete dominance and produce green flowers when heterozygous (BY).

×		

In this example, blue (BB) flowers are crossed with green (BY) flowers .

What is the distribution of genotypes in the offspring? _____

What is the distribution of phenotypes in the offsprsing? _____

If you wanted to produce yellow flowers, what genotypes would the parents have to have?

_____

Sex-Linked Traits

Hemophilia is a disease which results from the blood's inability to clot normally. It is an X-linked recessive disease, so a normal X chromosome (X) is dominant over a carrier X chromosome (X^h). The gene would be expressed if it were paired with a Y chromosome.

×		

In this example, a mother who carries the hemophilia trait (XX^h) has children with an unaffected father (XY).

What is the distribution of genotypes in the offspring? _____

What is the distribution of phenotypes in the offsprsing? _____

What is the percentage of male offspring who express hemophilia disease? _____

What is the percentage of female offpring who express the hemophilia disease? _____

If a hemophiliac son were to have children, what percentage of his sons would have hemophilia? _____

In this box, list characteristics that mitosis and meiosis have in common.

List some key differences between mitosis and meiosis.

Meiosis …	but mitosis …

Describe each of the following possibilities of what can happen to chromosomes during meiosis. Explain the impact on the genes. Draw pictures to illustrate.

	Description and Drawing
Nondisjunction	
Crossing over	
Insertion	
Deletion	
Inversion	

For each of the following gene technology applications, describe what it is and why it is important.

Karyotype	
Pedigree	
Genetically Modified Organisms	
Gene Therapy	
DNA Fingerprinting	
Cloning	
Transgenic Animals and Recombinant DNA	