CORN GENETICS & MENDEL'S LAWS

Directions: see the Canvas page for directions on how to submit your work. You are uploading a file. <u>It is recommended that you print these pages and write your answers directly on the page.</u>

This exercise is examining inheritance of kernel color in corn. Kernel color is determined by one gene. There are 2 alleles of the gene for kernel color: (1) purple which is dominant and (2) yellow which is recessive

Problem #1: Procedure for Monohybrid Cross

Consider the following genetic cross:

true breeding (pure breeding) purple female X true breeding (pure breeding) yellow male

What are the genotype and phenotype ratios of the F1 generation? What are the genotype and phenotype ratios of the F2 generation? F1 genotypic ratio: 0:4:0, F1 phenotypic ratio: 4:0

F2 genotyoic ratio: 1: 2: 1, F2 genotypic ratio: 3:1

Step 1: Indicate the genotypes of each parent: (use any letter of the alphabet to symbolize the alleles)

Key: P = dominant allele (purple)

y = recessive allele (yellow)

Genotypes of the parents:

Female PP

Male yy *remember, genotype is 2 letters

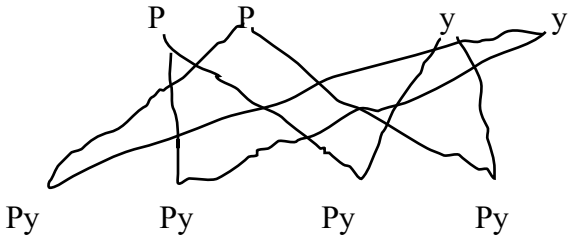
Step #2: Indicate the P generation by writing the parents genotypes in the equation below

Female PP X Male yy

Step #3: Indicate the types of gametes each parent produces with respect to the gene for kernel color

Female: P(Purple) + P (Purple) Male: y(yellow) + y(yellow)

Step #4: Determine the genotype and phenotype ratios of the F1 generation by symbolizing the possible ways the gametes in step #3 can fuse together



Genotypic ratio: 0PY: 4Py: 0py

Phenotypic ratio: 4Purple: 0 yellow

*remember, when writing ratios, you must specify: (1) the probability, as a number, for each genotype and (2) the probability, as number, for each phenotype

Step #5: The F1 will be crossed together to produce the F2 generation. Indicate the genotypes of the parents. Remember the parents in this part of the cross are the F1 individuals shown as the answer to question #4 above.

Genotypes of the parents:

Female _____Py_____

Male _____Py_____

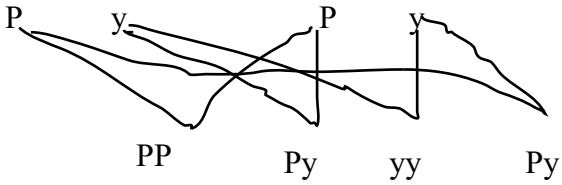
Step #6: Fill in the equation below with the genotypes of the parents

Female _____Py_____ X Male _____Py_____

Step #7: Indicate the types of gametes each parent produces with respect to the gene for kernel color

Female: P(purple)+ y (yellow) Male: P(Purple) + y (yellow)

Step #8: Determine the genotype and phenotype ratios of the F2 generation by symbolizing the possible ways the gametes in question #7 can fuse together



genotypic ratio: 1PP: 2Py: 1yy

Phenotypic ratio: 3Purple: 1yellow

*remember, when writing ratios, you must specify: (1) the probability, as a number, for each genotype and (2) the probability, as a number, for each phenotype

Problem #2: Another Monohybrid Cross

Consider the following cross:

heterozygous female X homozygous recessive male

What is genotype and phenotype ratio of the F1 generation? genotypic ratio: 1:1
Phenotypic ratio: 1:1

Step 1: Indicate the genotypes of each parent below: (use any letter of the alphabet to symbolize the alleles)

Key: __P___ = dominant allele (purple)

_____y_ = recessive allele (yellow)

Genotypes of the parents:

Female __Py_____

Male _____yy_____

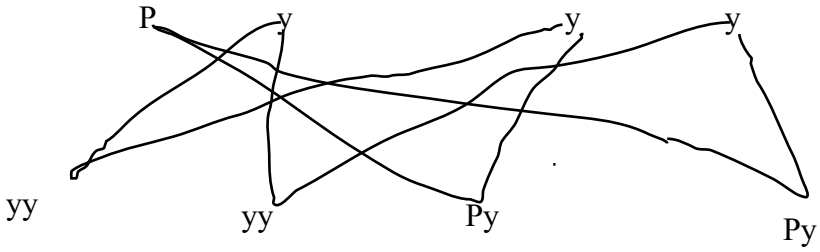
Step #2: Indicate the P generation by writing the parents genotypes in the equation below

Female _____Py_____ X Male _____yy_____

Step #3: Indicate the types of gametes each parent produces with respect to the gene for kernel color

Female: P(purple) + y(yellow) Male: y(yellow) + y(yellow)

Step #4: Determine the genotype and phenotype ratios of the F1 generation:



Genotypic ratio: 1Py: 1yy

Phenotypic ratio: 1purple: 1 yellow

*remember, when writing ratios, you must specify: (1) the probability, as a number, for each genotype and (2) the probability, as a number, for each phenotype
step 3B.

Problem #2: Mendel's Laws

Based on his results, Gregor Mendel developed 4 laws about genetics. In this course, we examine only 3 of these laws.

Law of Unit Character: states that genes determine traits.

Where in a genetics problem do you apply this law? (look at the problems you did above to help you).

It is applied when determining the character traits based on the known genotypes. For example in the above problems we found out that the yy gene codes for the yellow color which is recessive while the PP gene codes for the dominant color.

Law of Segregation: states that members of a gene pair separate in the formation of gametes so that the gamete has only 1 copy of each gene.

Where in a genetics problem to you apply this law?

This is applied when trying to determine the probability of offsprings having a certain phenotype. One can look at the parental genotypes then predict the offsprings' phenotype using a punnet square where the gametes are indicated and crossed.

Law of Dominance: states that one gene may mask or hide the expression of another.

Where in a genetics problem to you apply this law?

This law can be used to determine whether an organism exhibiting a certain character is dominant or heterozygous for that genotype. This is because homozygous dominant genotypes and heterozygous genotypes have the same phenotype.