11–3 Exploring Mendelian Genetics

A. Independent Assortment

1.   To determine if the segregation of one pair of alleles affects the segregation of another pair of alleles, Mendel performed a _____ cross.

Example: The pollen (sperm) give half of the genetics…. The seed (egg) give half of the genetics. These genes come from the parent plant and it happens *randomly.*

Example: In Jessica's family history I carry red, blonde, and brown hair in my DNA. Jessica, herself, expresses the brown hair gene. When an egg is made each month she puts each hair color gene in an egg randomly.

B. A Summary of Mendel's Principles

1.   Genes are passed from _____ to their _____

2.   If two or more forms (_____) of the gene for a single trait exist, some forms of the gene may be dominant and others may be recessive.

3.   In most sexually reproducing organisms, each adult has two copies of each gene. These genes are segregated from each other when gametes are formed. The alleles for different genes usually segregate independently of one another.

4.   Some alleles are neither dominant nor recessive, and many traits are controlled by multiple alleles or multiple genes.

Law of Dominance: this is what we have learned the past week.

If R = Red and r= white…. Then RR & Rr are red…… and rr= white

If T= tall   and t=short……Then TT & Tt are tall……. and tt short

There are only TWO options- you are red or white- that is Law of Dominance

*The below are all the exceptions to this rule!!!

C. Incomplete Dominance (TB p. 272)

1.   Incomplete dominance- when one allele is not completely dominant over another

2.   In incomplete dominance, the heterozygous phenotype is _____ the two homozygous phenotypes

a.   Ex: A cross between red (RR) and white (WW) flowered plants produces pink-colored flowers (RW)….. this is the same thing as
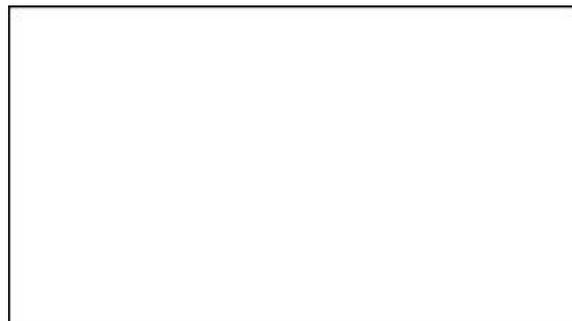
RR= red	Rr= PINK	rr= white
TT- tall	Tt- medium	tt- short

D. Codominance (TB p. 272)

1.   In codominance, _____ contribute to the phenotype.

2.   In certain varieties of chicken, the allele for black feathers is codominant with the allele for white feathers.

3.   Heterozygous chickens are speckled with *both black and white feathers*.
        a.   The black and white colors do not blend to form a new color, but appear separately.
Here is another example: Let's look at the chicken example in more detail….. and lets pretend that the chicken can follow different laws…. Depending on what Law we are looking at, the phenotype would be different. This is why when looking at a word problem you need to ask yourself what law the Punnett square is following.

	Feather Type		
Codominance Law →	TT= black	Tt= black & white	tt= white
Incomplete dominance →	TT= black	Tt= gray chicken	tt= white
Law of Dominance →	TT= black	Tt= black	tt= white

E. Multiple Alleles (TB p. 273)
1. Multiple alleles- genes that are controlled by more than two alleles
2. An individual *can't have more than two alleles*. However, more than two possible alleles can exist in a population.
3. A rabbit's coat color is determined by a single gene that has at least *four different alleles*.

Example: Look at TB p. 273… look at the KEY- the C is the <u>most dominant</u> option. If a rabbit inherits a 'C' then it is a "full color rabbit" – there are 4 genotype options listed for this under the picture.

Example: The next most dominant is C^{ch} …. So there are 3 possible options for a "Chinchilla color rabbit

F. Polygenic Traits (TB p. 273)
1. Polygenic- traits controlled by two or more genes
2. _____ in humans is a polygenic trait controlled by more than four different genes.

G. Applying Mendel's Principles
1. Thomas Hunt *Morgan* used _____ (*drosophila*) to advance the study of genetics.
2. Morgan and others tested Mendel's principles and learned that they applied to other organisms as well as plants.
3. Mendel's principles can be used to study _____ of human traits and to calculate the probability of certain traits appearing in the next generation.
H. Genetics and the Environment
1. Characteristics of any organism are determined by the interaction between _____ and the

_____
a. Ex: genes affect a sunflowers height and color.
b. But the environment (_____, _____, amount of water, _____, etc.) also influence the characteristics of the plant.

Example: Hydrangea's planted in acidic soil are pink….. if the same plant was in basic soil then flowers would be blue!