Name _____ Lab 5-B

Lab Objectives:
- Define the following terms: phenotype, genotype, punnet square, autosomal, dominant and recessive, sex linked,
- Investigate some common phenotypes and discuss the potential genotypes they are associated with.
- Perform simple punnet square problems and a dihybrid square.

Let's start by reviewing a few terms and by defining some new ones:
- We have learned that genes are heritable information carried on specific molecules we call DNA. Alternate forms of a certain gene were called alleles.

- Genotype refers to the genes that an individual possesses. We will discuss human genotype as it relates to a single trait or possibly 2 traits. We will not consider the full complement of genes all at one time.

- Phenotype refers to the expression (what you can see) of a person's genotype.

- According to Mendelian genetics, some genes are dominant while others are recessive. Possessing both the dominant and recessive allele for a given trait makes you a heterozygote.

    Homozygous Recessive:

    Homozygous Dominant:

    Heterozygote:

- We have learned that humans possess 22 autosomal pairs and one pair (#23) of sex chromosomes.   The 23rd pair carries the trait for sex but it also carries other traits. These are called sex traits because they are found on the 23rd chromosome.

Mendel created a pure breeding Parent generation called the P generation. He cross bred the P generation to produce an F1 generation. Show the following cross in a punnet square. PP X pp

What phenotype and genotype do you see in the F1 generation?

Now cross members of the F1 generation to produce an F2 generation. What is the phenotype and genotype distribution of the F2?

Here are some examples of autosomal human characteristics. Let's complete the chart below by doing an informal survey of the class (or your lab group).
Remember that if you express a dominant trait your genotype is not truly knowable however if you have a recessive trait you know your genotype.

Characteristic	Dominant or recessive		Possible genotypes	# in class	% of class
hairline	Widow's peak DOMINANT	Straight hairline recessive	WW Ww Ww		
Earlobes	Unattached Dominant	Attached recessive	EE or Ee Ee		
Freckles	Dominant		FF, Ff or ff		
Hair on back of hand	Present is dominant No hair is recessive		HH, Hh Or hh		
Hitchhikers thumb	Dominant: you don't have hyperextension		TT, Tt Or tt		
Interlacing of fingers	L over R is dominant R over L is recessive		ll or li li		

If your parents both have straight hairllines, is it possible that your maternal grandfather has a widow's peak?   What hairline do you have?

If you have hair on the back of your hand, is it possible that both your parents do not have hair on the back of their hand?

GENETICS PROBLEMS

1. Which of the following genotypes represents a gamete? Why?

    a. Aa

    b. AB

    c. AaBb

2. Show all the different kinds of gametes that could be produced by the following individuals after meiosis. In other words, these are diploid genotypes. What would be the genotype of the gametes?

    a. Aa

    b. Bb

    c. AA

    d. TTRR

    e. CcDd

    f. AABb

    g. Aabb

    h. Aabb

3. In dogs, wire hair is due to a dominant gene (W) and smooth hair is due to its recessive allele (w).

    a. If a homozygous wire-haired dog is mated with a smooth haired dog, what type of offspring could be produced?

    b. What type of offspring could be produced in the F2 generation?

    c. Two wire-haired dogs are mated. Among the offspring of their first litter is a smooth-haired pup. If these two wire-haired dogs mate again, what are the chances that they will produce another smooth-haired pup?

       What are the chances the pup will be wire-haired?

    d. A wire-haired male is mated with a smooth-haired female. The mother of the wire-haired male was smooth haired. What are the phenotypes and genotypes of the pups they could produce?

4. In snapdragons, red flower color is incompletely dominant over white flower color. The heterozygous plants have pink flowers.

    a. If a red-flowered plant is crossed with a white-flowered plant, what are the genotypes and phenotypes of the plants of the F1 generation?

    b. What are genotypes and phenotypes of the F2 generation?

    c. What kinds of offspring would be produced when a red-flowered plant is crossed with a pink flowered plant?

    d. What kinds of offspring would be produced when a pink flowered plant is crossed with a white flowered plant?

5. In humans, colorblindness is a recessive, sex-linked trait.

    a. Two normal people have a colorblind son. What are the genotypes of the parents and what genotypes and phenotypes are possible among their children?

    b. A couple has a colorblind daughter. What are the possible genotypes and phenotypes of the parents and the daughter?

6. In snapdragons, heterozygotes have pink flowers, and homozygotes have either red or white flowers. When plants with red flowers are crossed with plants with white flowers, what proportion of the offspring will have pink flowers?

   a) 0   b) 25%   c) 50%   d) 75%   e) 100%

7. A couple has three children, all of whom have brown eyes and blond hair. Both parents are homozygous for brown eyes (BB), and one is blond (rr) while the other is a redhead (Rr). What is the probability that the next child will be a brown-eyed redhead?

   a) 1/16   b) 1/8   c) 1/4   d) 1/2
   e) 1

8. In some cats, black color is due to a sex-linked (X-linked) recessive gene (b); the dominant allele (B) produces orange color. The heterozygote (Bb) is calico. What kinds of offspring would be expected from the cross of an orange male and a black female?

   a. Black females and orange males

   b. Orange females and black males

   c. Calico females and black males

   d. Black females and calico males

   e. Orange females and orange males