**Genetics Review** **Name: _____** **Block: _____**

**Part 1: One Trait Crosses**

1. Describe the genotypes below using vocabulary terms given in class.
   a. DD: _____
   b. Dd: _____
   c. dd: _____

2. In humans, brown eye color (B) is dominant over blue eye color (b). what are the phenotypes of the following genotypes?
   a. BB: _____
   b. bb: _____
   c. Bb: _____

3. In class, I had asked all students to follow certain steps when setting up their cross and working with punnett squares. List the steps you should follow:

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

4. Using the steps above, complete the simple one trait crosses below:
   a. A heterozygous male, black eyed mouse is crossed with a red eyed, female mouse. Please make sure to use a punnett square and show your genetoypic and phenotypic ratios.

   b. A heterozygous, smooth pea pod plant is crossed with a true breeding smooth pea pod plant. Determine the genotypic and phenotypic ratios for this cross below.

   c. In humans, acondroplasia "dwarfism" (D) is dominant over normal (d). A homozygous dominant person dies before the age of one. A heterozygous person is a dwarf. A homozygous recessive individual is normal. A dwarf man marries a dwarf woman.

      i. What is the probability of having a normal child? _____
      ii. What is the probability that the next child will also be normal? _____
      iii. What is the probability of having a child that is a dwarf? _____
      iv. What is the probability of having a child that dies before the age of one from this disorder?

      _____.

d. In humans, free earlobes (F) is dominant over attached earlobes (f). If one parent is homozygous dominant for free earlobes, while the other has attached earlobes, can they produce any children with attached earlobes?

e. In pea plants, yellow seeds (Y) are dominant and green seeds (y) are recessive. A pea plant with yellow seeds is crossed with a pea plant with green seeds. The resulting offspring have about equal numbers of yellow and green seeded plants. What are the genotypes of the parents?

f. In another cross, a yellow seeded plant was crossed with another yellow seeded plant and it produced offspring where about 25% were green seeded plants. What are the genotypes of both parents?

**Part 2: Two Trait Crosses**

5. When you study two different traits at the same time, we call this a two trait cross. The number of possibilities increases and instead of having only a 4 box punnett square, you now will work with a 16 box punnett square. Use what you know about a two trait cross to answer the questions below and complete the two trait crosses given.

    a. Determine the possible gametes from a parent with the following genotypes**. (these gamete possibilities would go on the top and left hand side of your punnett square)**

        i. DDRR: _____

        ii. ddRr: _____

        iii. DdRr: _____

    b. In pea plants, the round allele is dominant over the wrinkled seed allele and the yellow seed allele is dominant over the green seed allele. The genes for seed texture and those for seed texture will segregate independently. A plant heterozygous for both traits is crossed with a plant that is wrinkled and heterozygous for seed color. R = round, r = wrinkled, Y = yellow, y = green. Use a punnett square to perform this cross and determine the expected genotypic and phenotypic ratios.

c. In humans there is a disease called PKU which is caused by a recessive allele. People with this allele have a defective enzyme and cannot break down the amino acid phenylalanine. This disease can result in cognitive delay or even death. Let "E" represent the normal enzyme. Also, in humans there is a condition known as galactose intolerance or galactosemia. This condition is also caused by a recessive allele. Let "G" represent the normal allele for galactose digestion. In both diseases, the normal condition is dominant over the recessive. If two adults were heterozygous for both traits, what are the chances of having a child that:

   i. Completely normal: _____
   ii. Has only PKU: _____
   iii. Has only Galactosemia: _____
   iv. Has BOTH diseases: _____

**Part 3: Incomplete Dominance and Co-dominance**

6. In Four o'clock flowers the alleles for flow color are both equal therefore neither is dominant over the other. We call this condition "incomplete dominance" or "co-dominance". It violates Mendel's Principle of Dominance and you will observe a 3rd phenotype. Since there is no "dominant" trait, we use two different letters for the genotype.
   a. Predict the offspring when two pink four o'clock flowers are crossed. Determine the genotypic and phenotypic ratios from this cross.

   b. In humans, straight hair (SS) and curly hair (CC) result in hybrids who have wavy hair (SC). Cross a curly haired female with a wavy haired male. Determine the genotypic and phenotypic ratios for this cross.

   c. In some breeds of cats, black fur and white fur is co-dominant, resulting in kittens that are black and white. Cross a black cat with a cat that has both colors in its fur. Determine the genotypic and phenotypic ratios for this cross.

d. In some chickens, the gene for feather color is controlled by codominance. The allele for black is B and the allele for white is W. The heterozygous phenotype is known as erminette (black and white spotted).

   i. What is the genotype for black chickens? ____

   ii. What is the genotype for white chickens? ____

   iii. What is the genotype for erminette chickens? ____

e. Two erminette chickens were crossed. Show the Punnett square.

   i. What's the probability they would have a black chick? ____%

   ii. What's the probability they would have a white chick? ____%

**Part 4: Multiple Alleles**

7. So far we have studied traits or genes that are coded for by just two alleles. But, some traits are coded for by more than two alleles. One of these is blood type in humans. In humans, there are 4 types of blood; type A, type B, type AB, and type O. The alleles A and B are codominant to each other and the O allele is recessive to both A and B alleles. So, knowing this:

   a. What are the possible genotypes for a person with blood type B? _____

   b. What is the only genotype that will produce O type blood? _____

   c. What is the only genotype that will produce AB type blood? _____

   d. What are the possible genotypes for a person with blood type A? _____

8. You are blood type O and you marry a person with blood type AB. Complete a punnett square and list the possible blood types (phenotypes) of your offspring.

9. In the 1950's, a young woman sued film star/director Charlie Chaplin for parental support of her child. Charlie Chaplin's blood type was on record as type AB. The mother of the child had type A blood and her son had type O blood.

   a. Complete a punnett square for the possible cross between Charlie Chaplin and the mother.

   b. The judge ruled in favor of the mother and ordered Charlie Chaplin to pay child support costs of the child. Was the judge correct in his decision based on blood typing evidence? Explain why or why not and REFER to the punnett square in "a" to support your answer.

10. Suppose a newborn baby was accidently mixed up in the hospital. In an effort to determine the parents of the newborn, the blood types of the baby and two sets of parents were determined.
    a. Baby 1 had type O  Mrs. Brown had type B  Mr. Brown had type AB
       Mrs. Smith had type B  Mr. Smith had type B

    b. Draw punnett squares for each couple. **(NOTE: you may need to do more than one punnett square for each couple)**

    c. To which parents does baby #1 belong? Why? Use your punnett squares to support your answer.