Name:_____ Period:_____ Date:_____

# Non-Mendelian Genetics Practice

Most genetic traits have a stronger, dominant allele and a weaker, recessive allele. In an individual with a heterozygous genotype, the dominant allele shows up in the offspring and the recessive allele gets covered up and doesn't show. This is called **complete dominance**.

However, some alleles don't completely dominate others. In fact, some heterozygous genotypes allow both alleles to partially show by blending together how they are expressed. This is called **incomplete dominance**. Other heterozygous genotypes allow both alleles to be completely expressed at the same time like spots or stripes. This is called **codominance**. Examples of each are listed below.

*Write what each heterozygous phenotype would look like based on the genotype and gene interaction.*

1. If a red (RR) flower and a white (rr) flower were crossed, resulting in 100% Rr, what phenotype would be seen according to the rules of **complete dominance**?

2. If a red (RR) flower and a white (rr) flower were crossed, resulting in 100% Rr, what phenotype(s) would be seen according to the rules of **incomplete dominance**?

3. If a red (RR) flower and a white (rr) flower were crossed, resulting in 100% Rr, what phenotype(s) would be seen according to the rules of **codominance**?

**Incomplete dominance practice:** *For the questions below, use the following information:*
Snapdragons are incompletely dominant for color. They have phenotypes red, pink, or white. The red flowers are homozygous dominant, the white flowers are homozygous recessive, and the pink flowers are heterozygous.

*Give the genotypes for each of the phenotypes below using the letters "R" and "r" for alleles.*

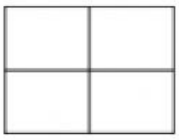
4. red snapdragon genotype: _____

   pink snapdragon genotype: _____

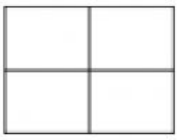
   white snapdragon genotype: _____

*Show genetic crosses between the following snapdragon parents using the Punnett squares provided, and record the percentage of offspring of each color below.*

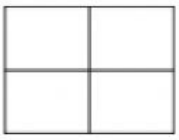
5. pink x pink



   red x white



   pink x white



6. How many red? ____
   How many pink? ____
   How many white? ____

   How many red? ____
   How many pink? ____
   How many white? ____

   How many red? ____
   How many pink? ____
   How many white? ____

**Codominance practice:** *For the questions below, use the following information:*
In Smileys, eye shape can be starred (SS), circular (CC) or a circle with a star (CS).

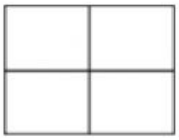
*Give the genotypes for the pictured phenotypes.*

7.   

_____ _____ _____

*Show genetic crosses between the following Smiley parents using the Punnett squares provided and record the number of offspring displaying each phenotype.*

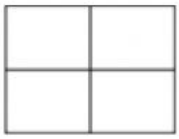
8. star-eyed x circle-eyed



9. Phenotypes of offspring: _____

   Genotypes of offspring: _____

circle-star eyed x circle-star eyed



How many offspring are circle-eyed? _____

How many offspring are circle-star eyed? _____

How many offspring are star-eyed? _____

Human blood types are determined by genes that follow **codominance** patterns of inheritance. There are two dominant alleles, A and B, and one recessive allele, O.

| Blood Type (phenotype) | Genotype | Can donate blood to: | Can receive blood from: |
|---|---|---|---|
| O | ii (OO) | A, B, AB, and O (universal donor) | O |
| AB | $I^AI^B$ (AB) | AB | A, B, AB, and O (universal recipient) |
| A | $I^AI^A$ or $I^Ai$ (AO) | AB, A | O, A |
| B | $I^BI^B$ or $I^Bi$ (BO) | AB, B | O, B |

10. Write the genotype for each person based on the information in the chart above.

    a. Homozygous Type B blood _____

    b. Heterozygous Type A blood _____

    c. Type O blood _____

    d. Type AB blood _____

    e. Can there be a homozygous Type AB? _____

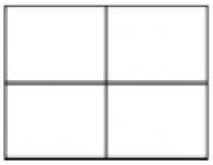
11. Complete the Punnett square showing all the possible blood types for the offspring produced by a Type O mother and a Type AB father.

    a. How many offspring will be Type O? _____

    b. How many offspring will be Type A? _____

    c. How many offspring will be Type B? _____

    d. How many offspring will be Type AB? _____



**Sex-Linked Inheritance**

Some traits are coded for by genes located on the sex chromosomes. Most of these genes are located on the **X chromosome**. In order for a female to express a recessive sex-linked trait, she must inherit two copies of the recessive allele. Females who inherit one recessive allele and one dominant allele do not express the recessive trait and are called **carriers**. Males only need to inherit one copy of the recessive gene in order to express the trait.

In humans, color blindness is a sex-linked trait located on the X chromosome. Females can have normal vision ($X^BX^B$), be carriers ($X^BX^b$), or be color blind ($X^bX^b$). Males will either be color blind ($X^bY$) or have normal vision($X^BY$).

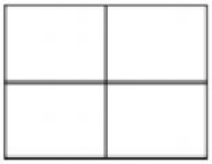
*Show genetic crosses of individuals with or without color blindness.*

12. color blind man x normal vision woman

13. Probability of color blind girls: _____

14. Probability of color blind boys: _____

normal vision man x carrier woman



Probability of color blind girls: _____

Probability of color blind boys: _____

15. Can males be carriers of sex-linked traits? _____