Modes of Inheritance

**Testcrosses (backcrosses):**

* Used to determine the genotype of an organism whose genotype is unknown.
* Take the male you don’t know and cross it with a recessive female.
* ie, R = round; r = wrinkled
  + - R\_\_ x r r

**Incomplete Dominance:**

* Alleles are equally dominant, not dominant or recessive, and we see the appearance of a new phenotype
  + A blending of traits
  + white x red → pink
* Allele Representation
  + - C = color
    - CR = red; CW = white
    - CRCW = pink

*Example: a) Cross a white snapdragon with a red snapdragon*

*b) Cross F1’s*

**Codominance:**

* A form of incomplete dominance (both alleles expressed in an intermingled form)
* Both phenotypes are visible
  + - i.e., white x red = red and white

**Inheritance of Blood Type**:

Blood is usually grouped according to several separate groupings. These groupings are based upon the presence or absences of a certain cell marker proteins. One such grouping is called the ABO group. This particular group is of interest because it is governed by three different alleles. Two of the alleles are codominant and one exhibits simple recessiveness. The presence of protein A on the red blood cell is called Blood Type A. Protein A is found on cells of persons who possess an allele IA. This allele is dominant for protein A. The same rule applies to Type B blood. The allele IB governs the presence of the protein B on the red blood cell.

What would be the genotype of a person having blood type AB?

Type O blood has no protein markers of this group on it. Persons having type O blood have two recessive alleles which are represented by the symbol i.

1. What are the possible genotypes for the following blood types?
   1. Type A
   2. Type B
   3. Type AB
   4. Type O
2. Predict the outcomes of the following crosses:
   1. Purebred Type A x Type O
   2. Purebred Type B x Type O
   3. Heterozygous A x Heterozygous B

**Genetics Worksheet #2: Codominance & Incomplete Dominance**

1. In carnations, the gene for red flowers (CR) and white flowers (CW) show incomplete dominance. The heterozygous results in a pink color. Determine the phenotypic and genotypic ratios of the following crosses:
   1. red carnation x pink carnation
   2. pink carnation x pink carnation
   3. white carnation x pink carnation
2. A geneticist notes that crossing a round-shaped radish with a long-shaped radish produces oval shaped radishes. If the oval radishes are crossed with oval radishes, the following phenotypes are noticed in the F2 generation: 100 long, 200 oval, and 100 round radishes. Use symbols to explain the results obtained for the F1 and F2 generations.
3. Chinese primrose flowers are a species with flower color determined by multiple alleles. The alleles are arranged in order of dominance as follows: A (white flowers), ac (cream color), and a (yellow flowers).
   1. List all of the genotype possibilities for the following:
      1. white colored flowers
      2. cream colored flowers
      3. yellow colored flowers
   2. Determine the genotype and phenotype of the F1 generation of the following crosses
      1. Heteroxygous cream x yellow
      2. Aac x aca
      3. Aac x aa
4. A pet fancier bought two mice, male and female, both grey in color. Offspring of these two mice were: 3 white, 7 grey, 3 black
   1. What are the genotypes of the offspring?
   2. Which of these alleles is dominant?
   3. If a black mouse is bred with a grey mouse, what percent of the offspring would you expect to be black? Justify your answer.