SHOW ALL WORK!

**Monohybrid Crosses**

1) In tomatoes, tall stature (T) is dominant over dwarf stature (t). If you cross a homozygous tall plant with a homozygous dwarf plant in the parental generation, what would the phenotypic and genotypic ratios of the F₁ progeny (offspring) be?

   If the F₁s were crossed, what would the genotypic and phenotypic ratios of the progeny be? What would this generation be called?

2) What genotype would you cross the tall plants obtained in the F₁ generation with in order to determine if they were homozygous or heterozygous? What is this type of cross called? Show your work to gain a better understanding of this concept.

3) In guinea pigs black coat (B) is dominant over white coat (b). In a cross between two black coated guinea pigs, the following progeny were obtained:

   - 8 black coated guinea pigs
   - 3 white coated guinea pigs

   From these data, determine the genotypes of the parents of the guinea pigs produced from this cross.
4) One day while perusing the grapes at my local Safeway store, I spied a mutant fruit fly that had no wings. This trait is called vestigial (vg) to fruit fly geneticists and is recessive to the wild type allele for normal wings (+). So, I captured the little devil and decided to cross this vestigial fly with one of my prized normal winged flies. All of the progeny from this cross have normal wings. What is the genotype of my prized normal winged fly? If I were to cross two of the F1s, what would the expected genotypic and phenotypic ratios of the F2 generation be?

5) In snapdragons, the alleles for flower color exhibit an incomplete dominance between the two alleles (red, C\textsuperscript{r}, and white, C\textsuperscript{w}). The floral color of a heterozygous plant is pink as these flowers have less red pigment than homozygous red plants. What offspring are produced from a cross of a heterozygous plant and a homozygous white flowered plant?

### Dihybrid Crosses

6) For the following parental genotypes indicate the potential gamete types.

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<tr>
<th>Genotype</th>
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<tr>
<td>AABB</td>
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<td>AaBb</td>
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7) In tomato plants, tall plant alleles (D) are dominant over dwarf plant alleles (d), and red fruited alleles (Y) are dominant over yellow fruited alleles (y). A homozygous tall, red-fruited plant is crossed with a homozygous dwarf, yellow-fruited plant. What are the potential types and proportions of offspring from this cross?

What is the outcome if two plants from the F₁ generation are crossed?

8) How would you determine the genotype of a tall, red-fruited tomato plant?

What would be the results of the test-cross if the tall, red-fruited plant was:
- homozygous for both genes?
- heterozygous for only height?
- heterozygous for only fruit color?
- heterozygous for both genes?

9) In humans hair color is controlled by two interacting genes. The same pigment, melanin, is present in both brown-haired and blond-haired people, but brown hair has much more of it. Brown hair (B) is dominant over blonde hair (b). Whether any melanin can be synthesized depends on another gene. The dominant form (M) allows melanin synthesis; the recessive form (m) prevents melanin synthesis. Homozygous recessive (mm) individuals are albino. What will be the expected genotypic and phenotypic proportions in the children of the following parents: double heterozygous brown-haired mother and blonde-haired heterozygous melanin production (Mm) father?
Sex-Linked Problems

10) One of the genes for baldness is located on the X chromosome and is recessive to the allele for normal hair at the same gene. If a bald male were to marry a carrier female, what would be the probability that the first born son would be bald? What percentage of the females produced in this liaison would be carriers?

11) Dave is color blind. Color blindness is sex-linked and the allele which is responsible for this driving menace is recessive to the allele for normal color vision. Judith, Dave’s wife, has normal vision. Dave and Judith had twelve offspring, all of which had normal vision. Their children were equally distributed as to sex. What is Judith’s most likely genotype? Could she be a carrier? Why or why not?

12) The gene for hemophilia, the inability of the blood to clot, is located on the X chromosome. The allele for normal clotting (H) is dominant over the hemophiliac allele (h) and females who are heterozygous for this gene are said to be carriers. In a cross between a phenotypically normal female and a normal male, who had a rather large family I might add, the following offspring were observed:

5 normal females, 2 hemophiliac males, and 3 normal males

What was the genotype of the mother? What are the possible genotypes of each of the females produced through these matings? What is the genotype of the normal males?