**AP Biology: Punnett Squares 2**

*Complete these problems on your own paper.*

1. In humans, tongue rolling is a dominant trait, those with the recessive condition cannot roll their tongues. Bob can roll his tongue, but his mother could not. He is married to Sally, who cannot roll her tongue. What is the probability that their first born child will not be able to roll his tongue?

2. In goats, a recessive gene causes the goats to "faint" when they are startled. A farmer breeds two goats (that have never fainted) and their first offspring faints two days after its birth. What must the parent's genotypes have been? Show the cross to prove it.

3. In guinnea pigs, short hair is dominant to long hair. Also in guinnea pigs, black eyes are dominant to red eyes. A male guinnea pig that is heterozygous for both traits is crossed with a female that is long haired and red eyed. What are the expected phenotypes of their offspring and in what proportion?

4. If both parents are heterozygous for both traits, what are the expected phenotypes of their offspring and in what proportion? (You do not need to show a punnett square for this one)

5.  In horses, trotter (T) is dominant over pacer (t).  A trotter is mated to a pacer and the offspring is a pacer.  Give the genotypes of all of the horses.

6. In a certain cactus, prickly spines can be two pronged or one pronged. If a true breeding one-pronged cactus is crossed with a true breeding two-pronged cactus, the F1 generation has a mixture of spines, some are two-pronged, some are one-pronged.

a. Is this an example of codominance or incomplete dominance?

b. Show the F2 generation (a cross between the two F1's). What are the phenotypes of the offspring and in what proportion?

7. In this same cactus, if you cross a plant that has red flowers to one that has yellow flowers, you produce a plant that has orange flowers.  Is this codominance or incomplete dominance?   Show the cross of an orange flowered plant to a red flowered plant.

8.   A red flowered, two-pronged cactus is crossed with a yellow flowered one-pronged cactus.  What are the resulting offspring and in what proportion?

9.  A man with type AB blood is married to a woman with type O blood.  What are all the possible blood types of their children?

10. Coat color in cats is a codominant trait and is also located on the X chromosome. Cats can be black, orange or calico. A calico cat has black and orange splotches. In order to be calico. the cat must have an allele for the black color and an allele for the orange color. Use a punnett square to show why there are no male calico cats.

11. A female calico cat is crossed with a male black cat. What are the phenotypes of the offspring and in what proportion?

12. Also located on the X chromosome of a cat is a gene that codes for deafness. This gene is recessive. A black female cat that is heterozygous for deafness (Dd) is crossed with a orange male cat that is not deaf. Show the cross. What are the phenotypes of the offspring and in what proportion? Hint: place two letters on the X chromosome in your cross.   (You will need to use two superscript letters on your X chromosome)

13.  In humans, colorblindness is sex linked and recessive.  If a woman is a carrier for the trait, what is the chance that her sons will be colorblind?   Her daughters?   (Assume the father has normal vision.)

14. In a cross involving two marked loci, you recover 150 parental gametes and 50 recombinant gametes. What is the recombinant frequency between these loci?

15. An ABC / abc individual (ABC is not necessarily in the gene order) is crossed to an abc / abc individual and gametes are scored. Out of a total of 1000 gametes, the following data is observed:

abc 395

ABC 382

aBC 105

Abc 98

abC 9

ABc 8

AbC 2

aBc 1

Using this data, compute the recombination frequencies and construct a map.