

Punnett Practice!

Directions: Answer the following questions on a separate piece of paper. You must show the cross, then a Punnett Square, and finally your answers to the questions in a short phrase. Be sure to answer all the parts of each question.

1. Woodrats are medium sized rodents with lots of interesting behaviors. You may know of them as packrats. Let's assume that the trait of bringing home shiny objects (H) is controlled by a single gene and is dominant to the trait of carrying home only dull objects (h). Suppose two heterozygous individuals are crossed. What are the genotypic ratio and phenotypic ratios?
2. Albinism is a single locus trait with normal pigment being dominant (A) and the lack of pigment being recessive (a). About 70% of Americans perceive a bitter taste from the chemical phenylthiocarbamide (PTC). The ability to taste this chemical results from a dominant allele (T) and not being able to taste PTC is the result of having two recessive alleles (t). A normally pigmented woman who cannot taste PTC has a father who is an albino taster. She marries a homozygous, normally pigmented man who is a taster but who has a mother that does not taste PTC. What are the genotypes of the possible children? What percentage of the children will be albinos? What percentage of the children will be non-tasters of PTC?
3. Wolves are sometimes observed to have black coats and blue eyes. Assume that normal coat color (N) is dominant to black (n) and brown eyes (B) are dominant to blue (b). Suppose the alpha male and alpha female of a pack (these are the dominant individuals who do most of the breeding) are black with blue eyes and normal colored with brown eyes, respectively. The female is also heterozygous for both traits. How many of the offspring (assume 16) living in the pack will have each of the following genotypes? What percent of the offspring will be normal colored with blue eyes?
4. A boy, whose parents and grandparents had normal vision, is color-blind. What are the genotypes for his mother and his maternal grandparents? Use X^B for the dominant normal condition and X^b for the recessive, color-blind phenotype.
5. The bison herd on Konza Prairie has begun to show a genetic defect. Some of the males have a condition known as "rabbit hock" in which the knee of the back leg is malformed slightly. We do not yet know the genes controlling this trait but for the sake of our question, we shall assume it is a sex-linked gene and that it is recessive. Now, suppose that the herd bull (the dominant one which does most of the breeding) who is normal (X^N) mates with a cow that is a carrier for rabbit hock. What are his chances of producing a normal son? If he mates with this cow every year, what percentage of their daughters have normal knees? What percentage of their daughters will be carriers of rabbit hock?