

Sex-linked Inheritance of Color-blindness

In a pedigree, squares represent males while circles represent females. Shaded circles or squares indicate an affected individual.

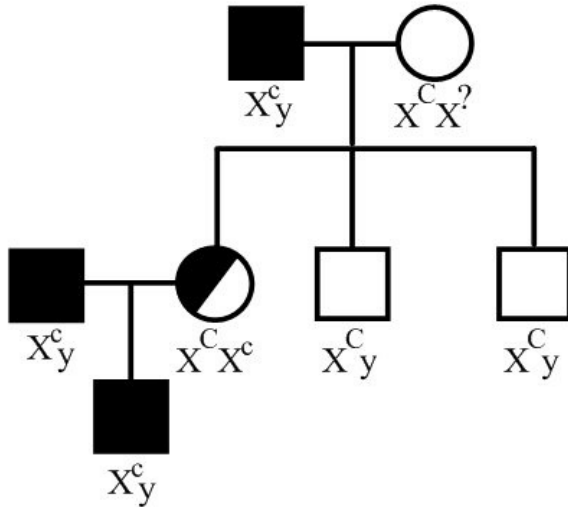


Figure 1

a) Consider the cross between a color-blind female and a normal male. Construct a Punnett square for the cross. If color-blindness is recessive, what are the phenotypes of the female and male children of the cross? (all female will be carriers; all males will be color-blind)

b) If one of the daughters in the cross above married a color-blind man, what are the chances of them having a color-blind son? (chance of having a color-blind son is $\frac{1}{2} \times \frac{1}{2}$ although half of sons will be color-blind) A color-blind daughter? (chance of having a color-blind daughter is $\frac{1}{2} \times \frac{1}{2}$ although half of daughters will be color-blind)

c) What are the phenotypes of the original parents in the pedigree in Figure 1? (mother normal; father color-blind)

d) How can you be sure the genotype of the daughter of the original parents is heterozygous? (male child is color-blind, therefore, must have received color-blind allele from mother)

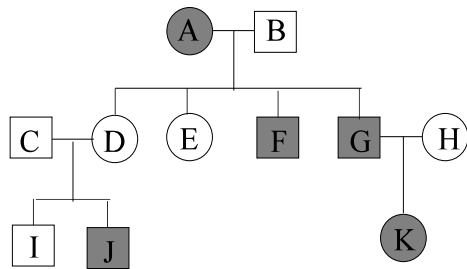


Figure 2

e) Can the genotype of the original female be determined? (No. She could be homozygous or heterozygous and still produce children with the given genotypes)

f) Could the sons have color-blind daughters. Explain. (No. The X chromosome they receive from their father would have the normal vision allele)

color-blind)

g) Would it be possible for the sons to have color-blind sons? Explain. (Only if the mother were a carrier or

h) Fill in the genotype for each individual in the pedigree in Figure 2. (A - $X^C X^c$; B - $X^C y$; C - $X^C y$; D - $X^C X^c$; E - $X^C X^c$; F - $X^c y$; G - $X^c y$; H - $X^C X^c$; I - $X^C y$; J - $X^c y$; K - $X^c X^c$)

i) Show the possible phenotypes and genotypes from the cross between individuals C and D. ($X^C X^c$, $X^C y$, $X^c X^c$, $X^c y$; males with normal or color-blind vision, females with normal vision)