

GENETICS

LESSON 8: SEX-LINKED TRAITS & PEDIGREES

Learning Outcomes

- I can use a Punnett square to determine the probability of genotypes and/or phenotypes for sex-linked traits.
- I can use a Punnett square to interpret a pedigree analysis.

Sex-Linked Traits

- Y chromosome only codes for 71 protein-coding genes while the X chromosome codes for 842 protein-coding genes
- results in males being more susceptible to certain to some disorders
- Example: colour blindness
 - gene for normal colour vision is carried on the X chromosome
 - X^C = normal vision
 - X^c = colour blindness

	Male Normal Vision	
	X^C	X^C
Female Normal Vision	X^C	$X^C X^C$
	Y	$X^C Y$
		$X^C Y$
	0% chance colour blind female 0% chance colour blind male	

	Male Colour Blind	
	X^C	X^c
	X^c	$X^C X^c$
	Y	$X^C Y$
		$X^c Y$
	0% chance colour blind female 0% chance colour blind male	

	X^C	X^c
Female Carrier	X^C	$X^C X^c$
	Y	$X^C Y$
		$X^c Y$
	0% chance colour blind female 50% chance colour blind male	

	X^C	X^c
	X^c	$X^C X^c$
	Y	$X^C Y$
		$X^c Y$
	50% chance colour blind female 50% chance colour blind male	

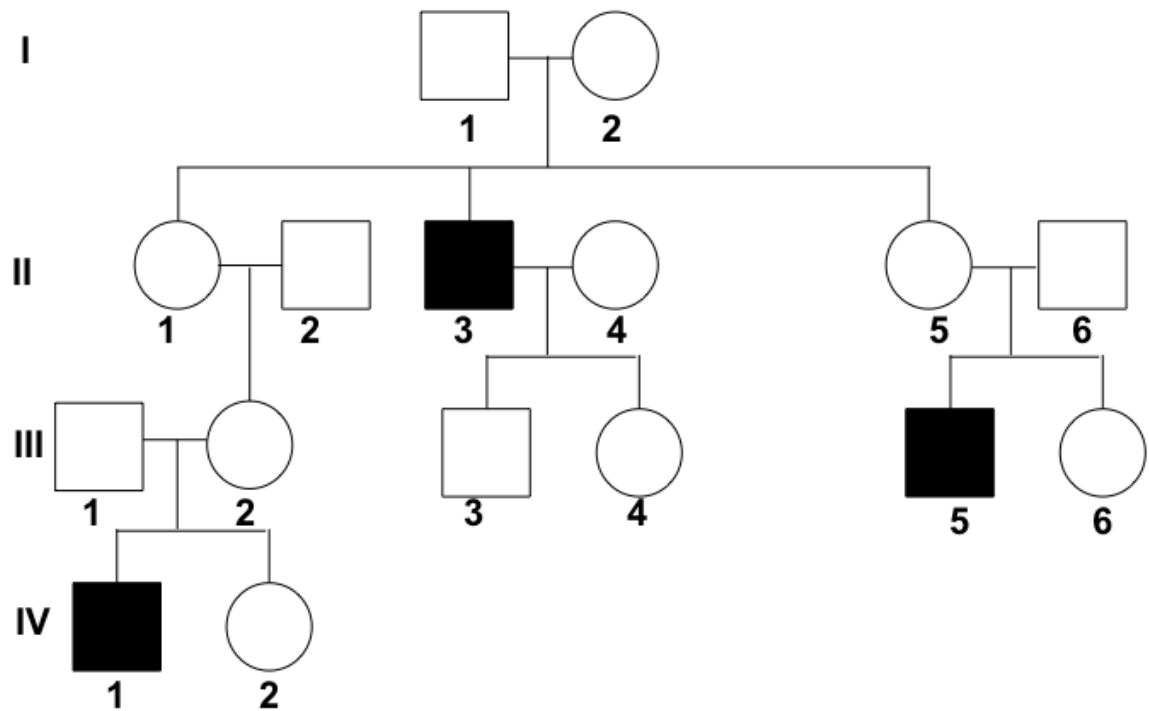
	X^c	X^c
Female Colour Blind	X^C	$X^C X^c$
	Y	$X^c Y$
		$X^c Y$
	0% chance colour blind female 100% chance colour blind male	

	X^c	X^c
	X^c	$X^c X^c$
	Y	$X^c Y$
		$X^c Y$
	100% chance colour blind female 100% chance colour blind male	

Pedigree Analysis

- the study of the inheritance of genes within a multigenerational family unit
- uses shaded and unshaded symbols to represent different aspects within a pedigree
- the common symbols used are:
 - circles = female square = male
 - shaded = affected unshaded = unaffected (but may be a carrier)
 - horizontally connected male and female = mating couple
 - vertically connected males and females = children
 - Roman numerals are used to indicate generations
 - numbers indicate individuals within that generation

example: Colour blindness pedigree



Questions

1. What is the genotype of the male child II-3?
2. What are the genotypes of his parents?
3. What are the genotypes of his children (III-3 and III-4)?
4. What is the genotype of wife (II-4)?
5. Is this condition caused by a dominant or recessive allele?

Answers:

1. $X^c Y$
2. $X^c Y$ (Dad) and $X^C X^c$
3. $X^c Y$ and $X^C X^c$
4. $X^C X^C$ or $X^C X^c$
5. The condition is caused by recessive allele.