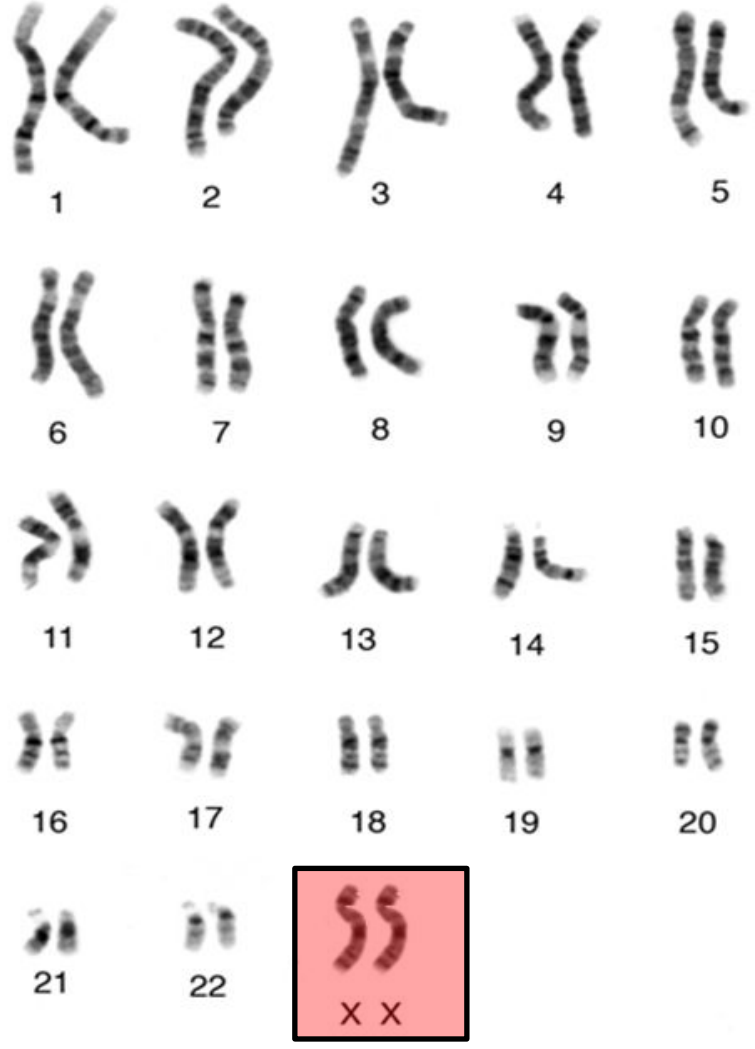

Sex-Linked
Inheritance

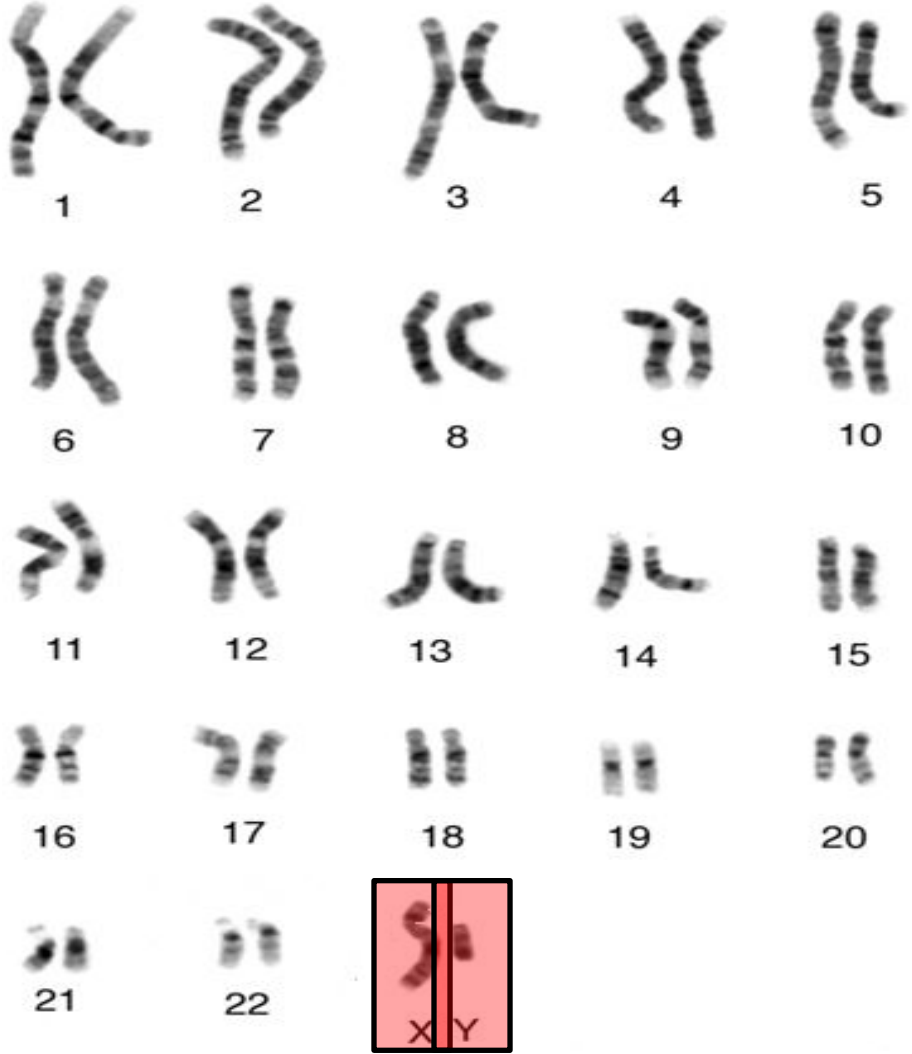
Sex Determination

- Sex is determined by genes found on the X and Y chromosomes
- Females: all eggs have X chromosome



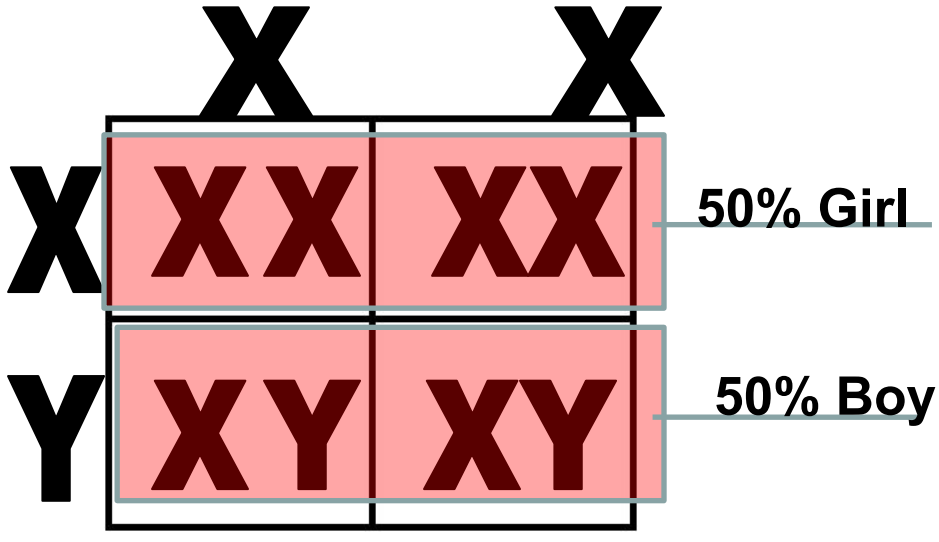
Sex Determination

- Sex is determined by genes found on the X and Y chromosomes
- Females: all eggs have X chromosome
- Males: ½ sperm cells contain X; and the other ½ contain Y



Sex Determination

- There is a 50/50 chance of child being a boy/girl



Sex-Linked Disorders

- **<u>Defined</u>**: Inherited conditions found on X chromosome
- **Usually recessive**
- Females: XX chromosomes
  - $X^H X^H$ = healthy
  - $X^H X^h$ = healthy carrier
  - $X^h X^h$ = disease
- Males: XY chromosomes
  - $X^H Y$ = healthy
  - $X^h Y$ = disease
- Rare in women (back-up X chromosome)

$X^H X^H$
$X^H X^h$
$X^h X^h$

$X^H Y$
$X^h Y$

H = healthy h = disorder

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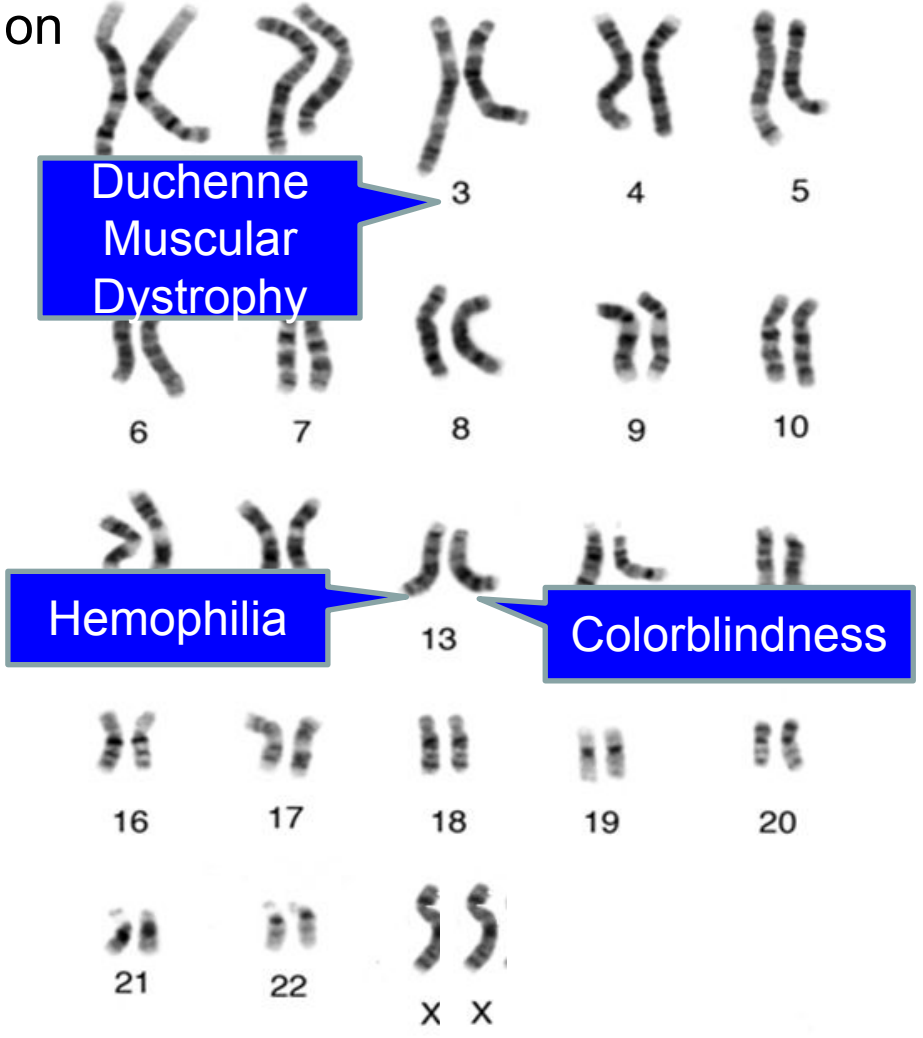
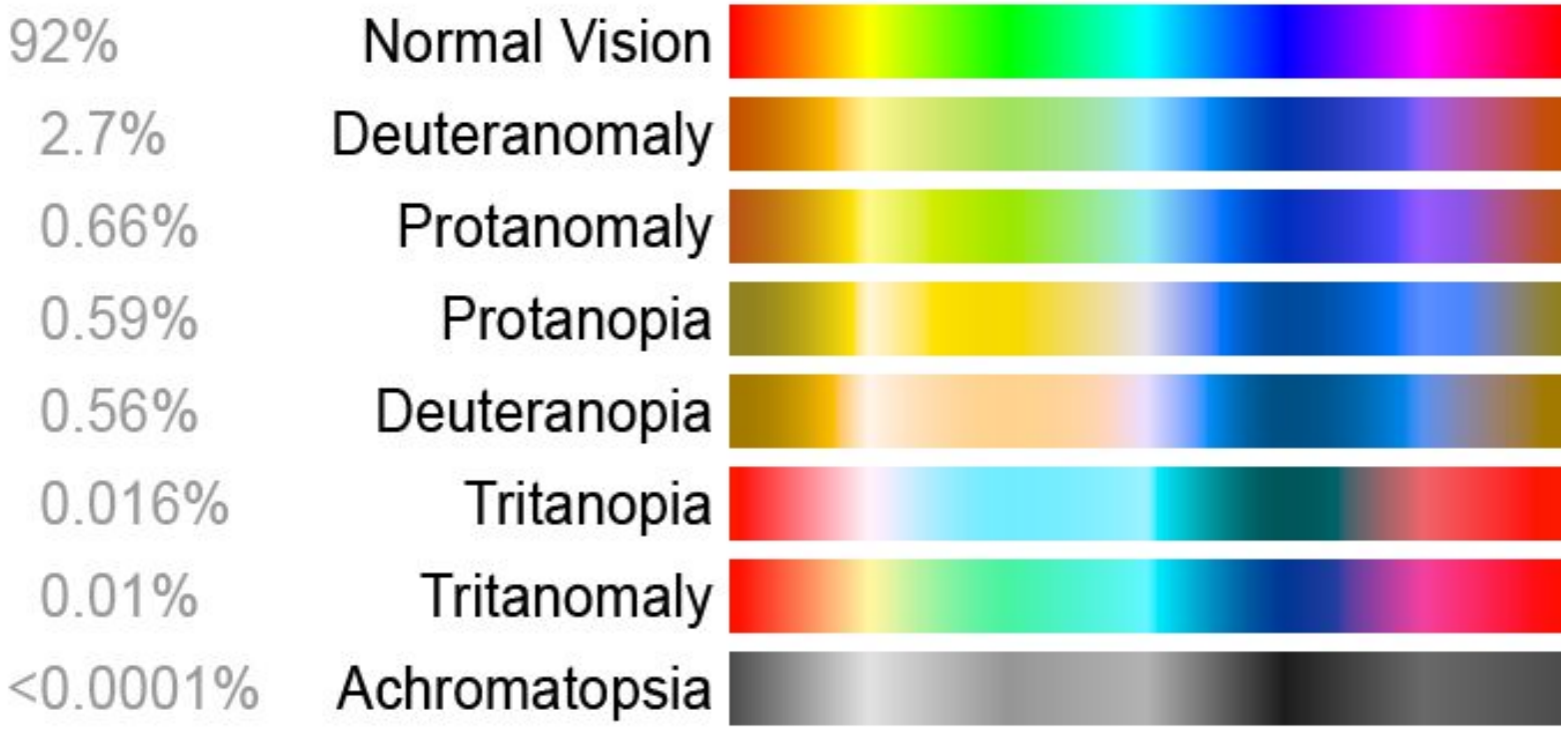
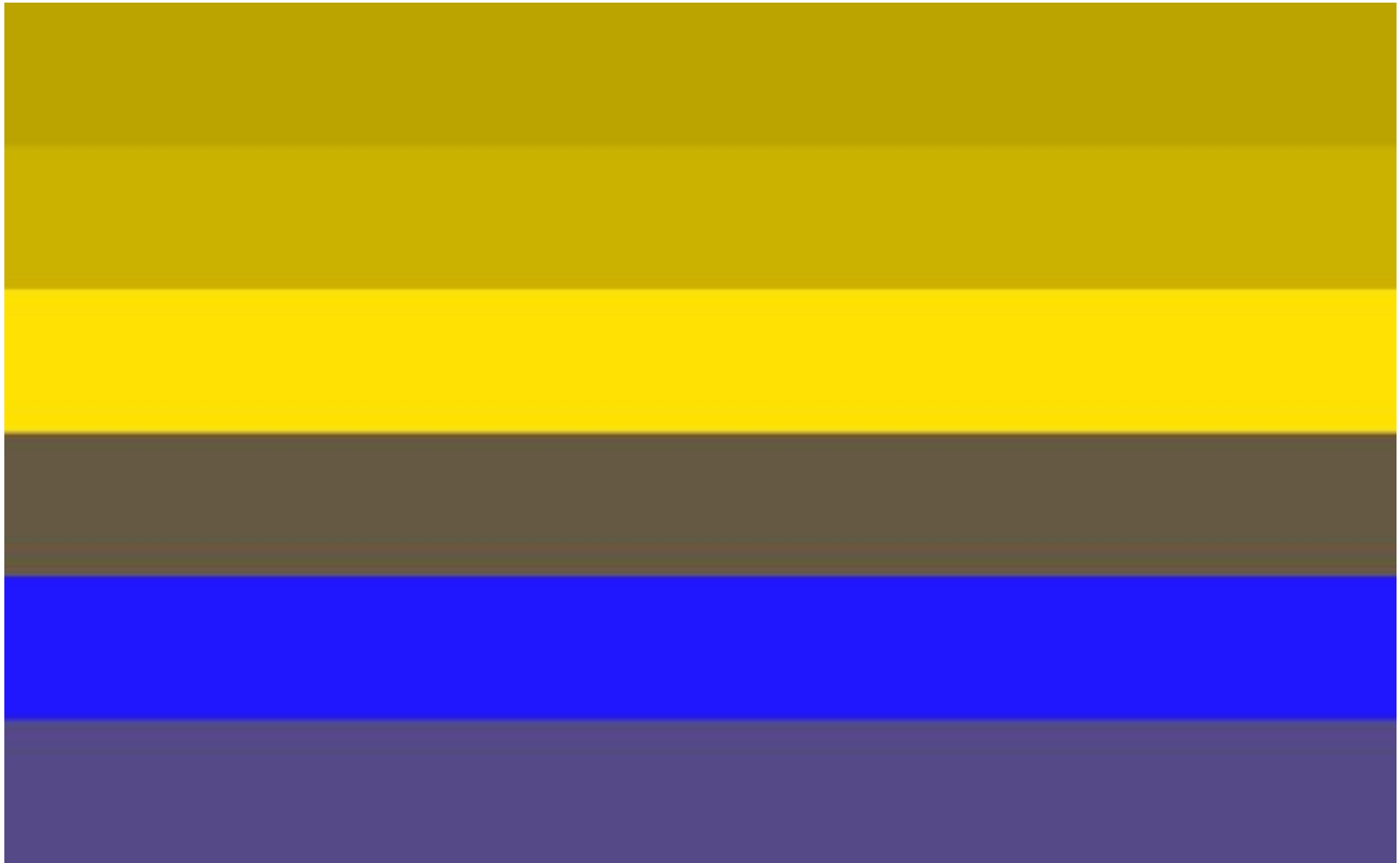
- **Examples of disorders:**



Types of Colorblindness



Deuteranomal(2.7%)

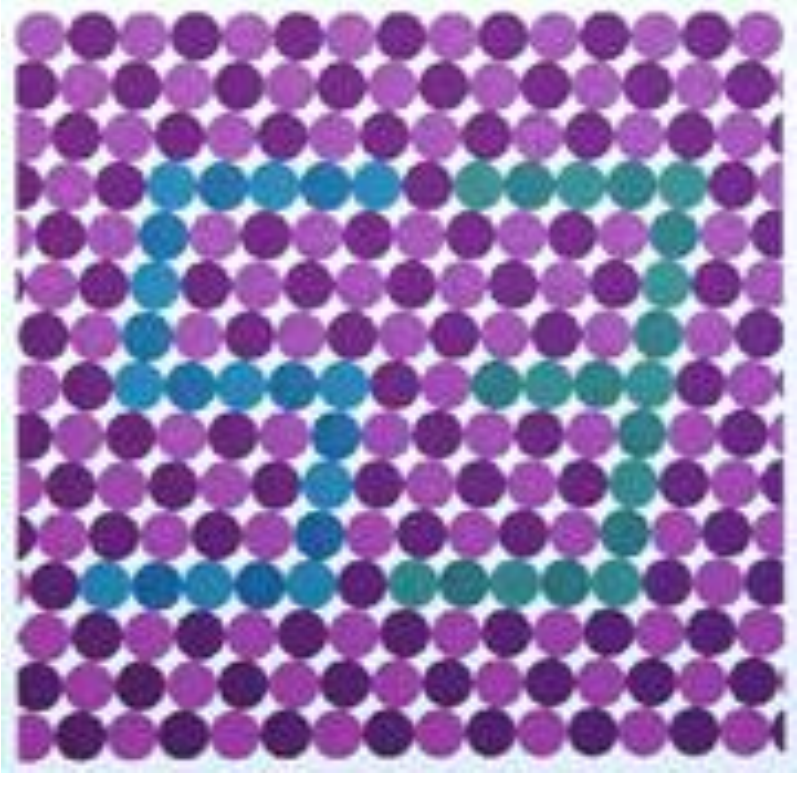


Protanopia (0.59%)

Tritanopia (0.016%)

Colorblind Test:

Do you see a number inside the picture?



53

Colorblind Test:

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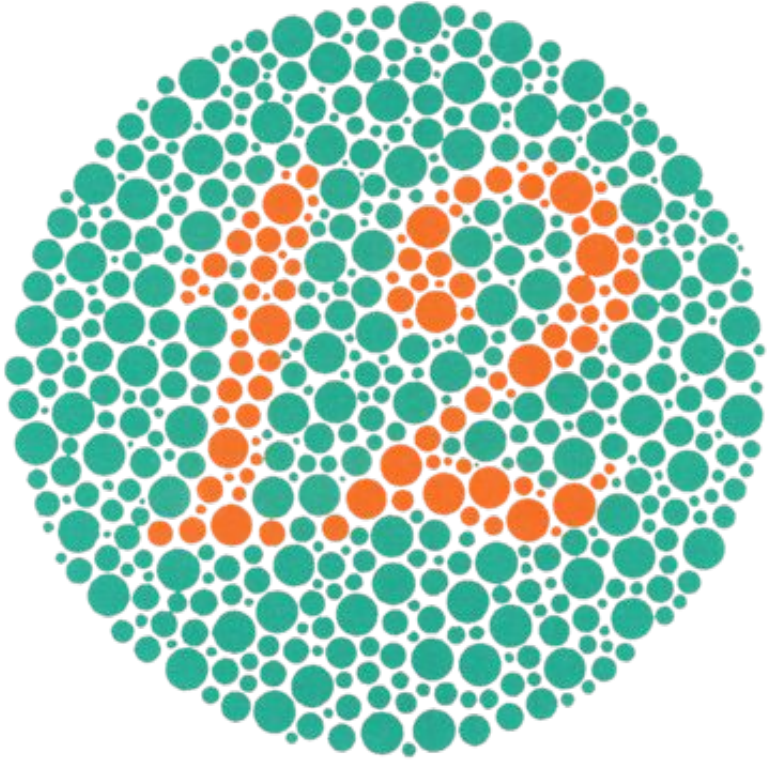

12

Colorblind Test:

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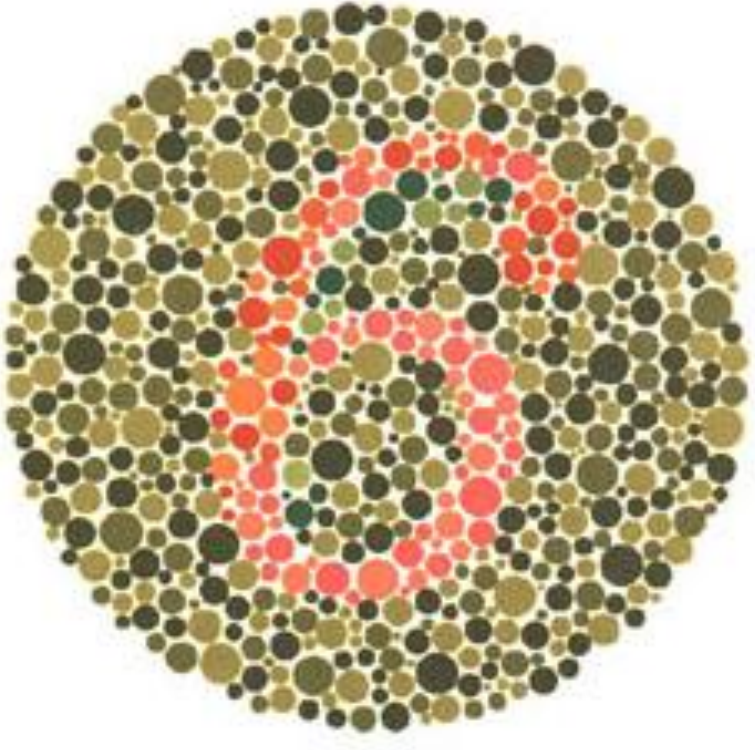
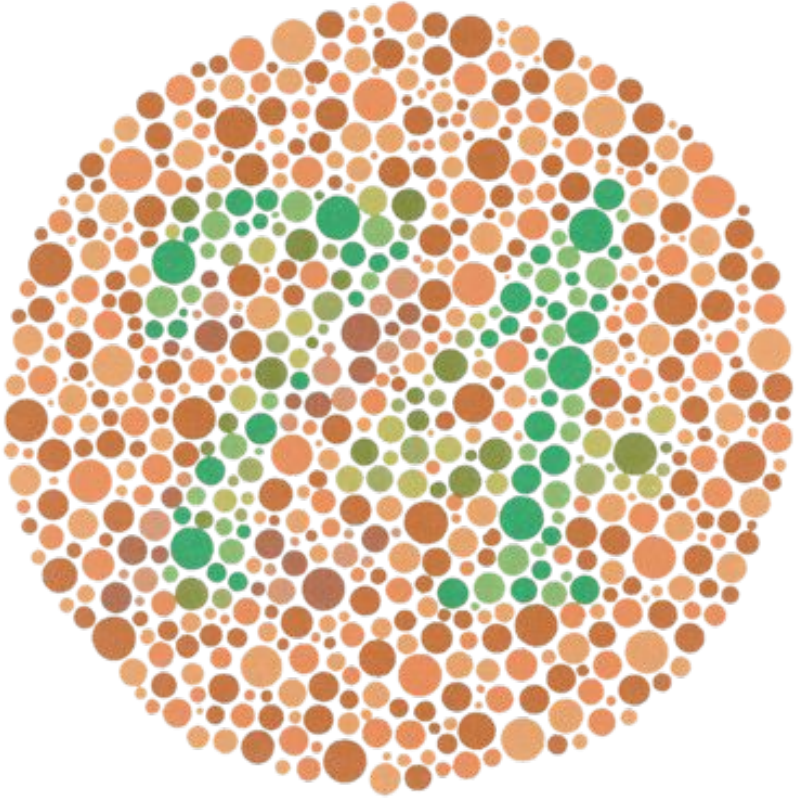


6

Colorblind Test:

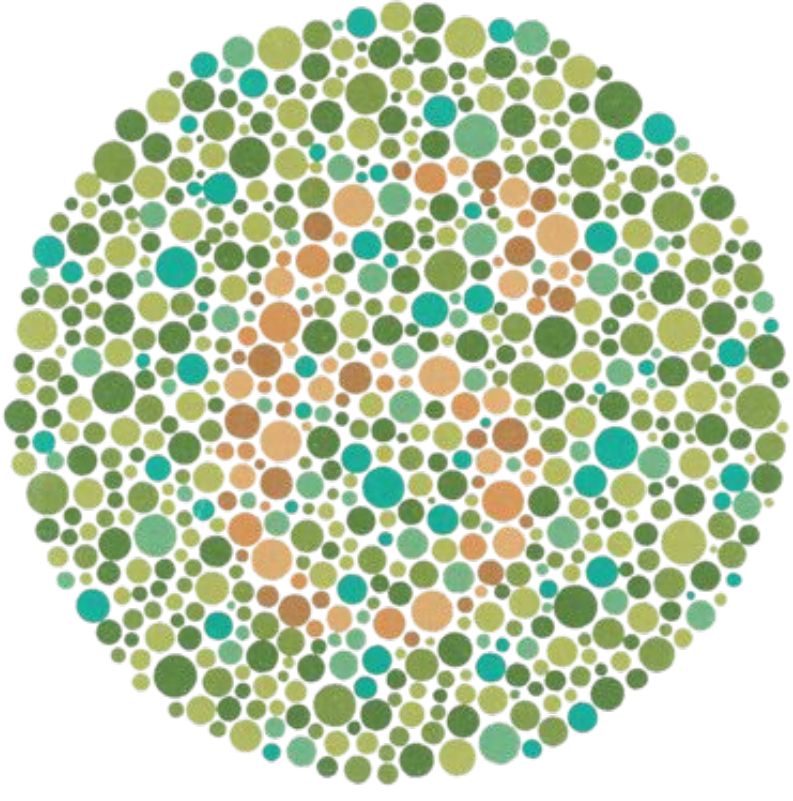
Do you see a number inside the picture?



74

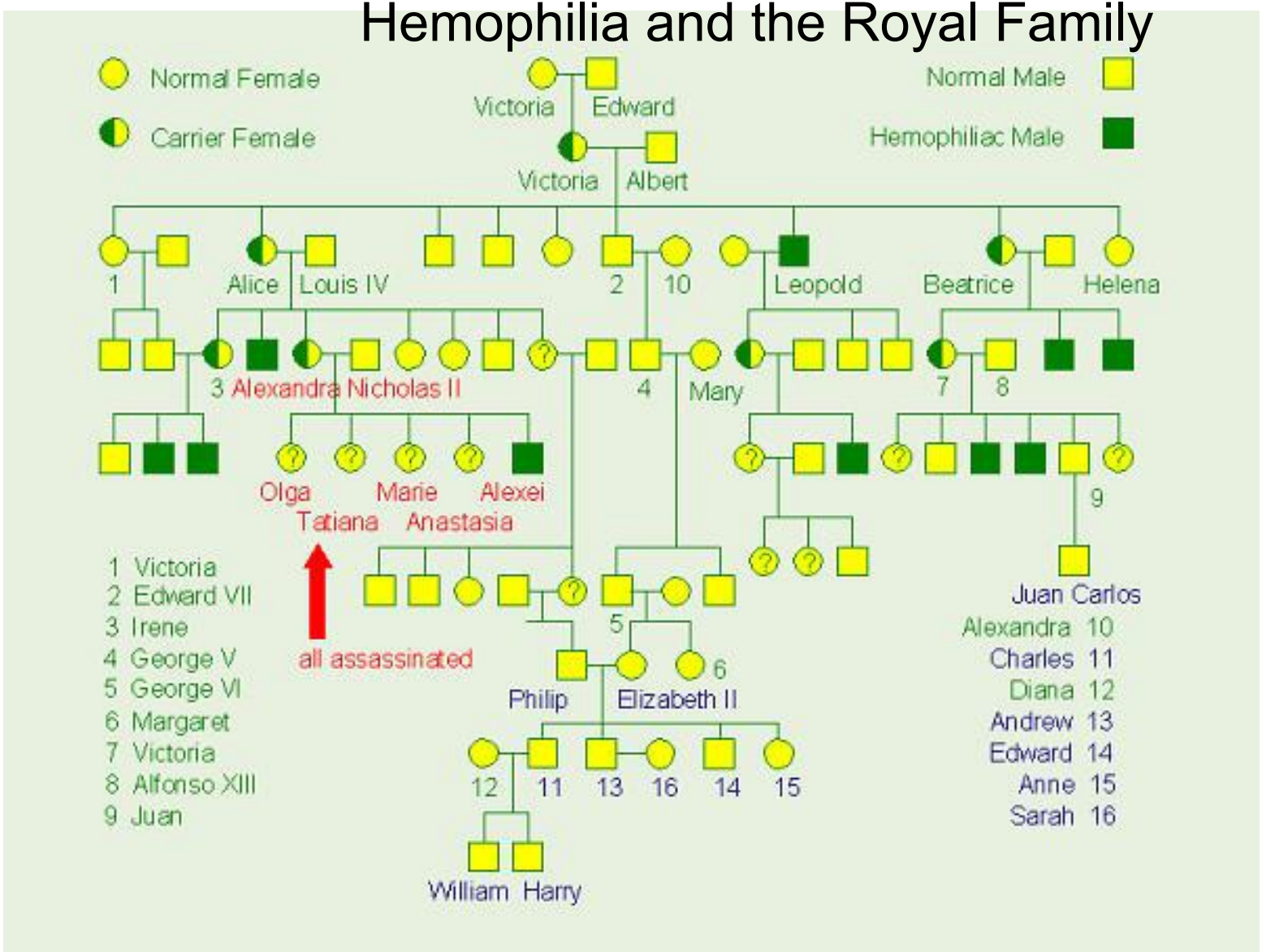
Colorblind Test:

Do you see a number inside the picture?



6

Hemophilia and the Royal Family



1 min: Discuss with your neighbor.

Jen is a healthy carrier ($X^H X^h$) of hemophilia and Adam has no history in his family ($X^H Y$).

	X^H	Y
X^H	$X^H X^H$ Healthy girl	$X^H Y$ Healthy boy
X^h	$X^H X^h$ Healthy girl (carrier)	$X^h Y$ Hemophiliac boy

What is the probability of:

a. Daughter with hemophilia?

0%

b. Carrier child?

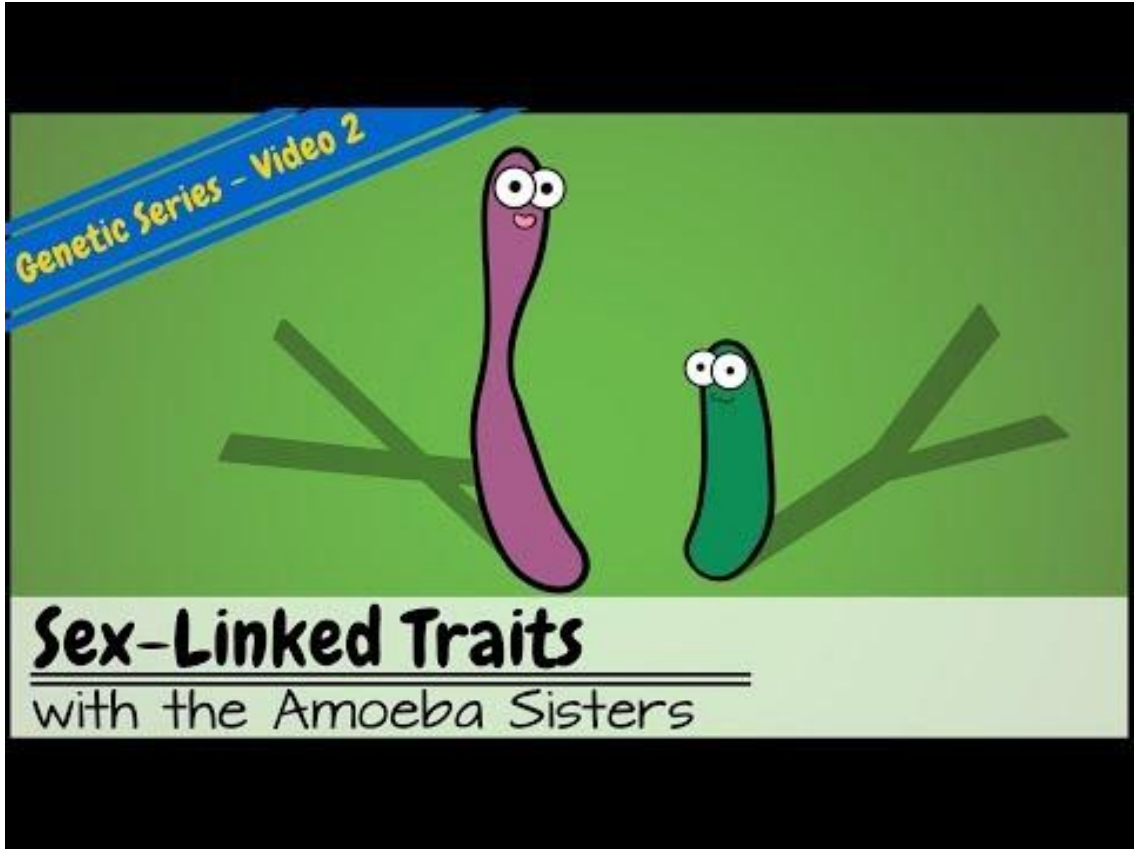
25%

c. Child with hemophilia?

25%

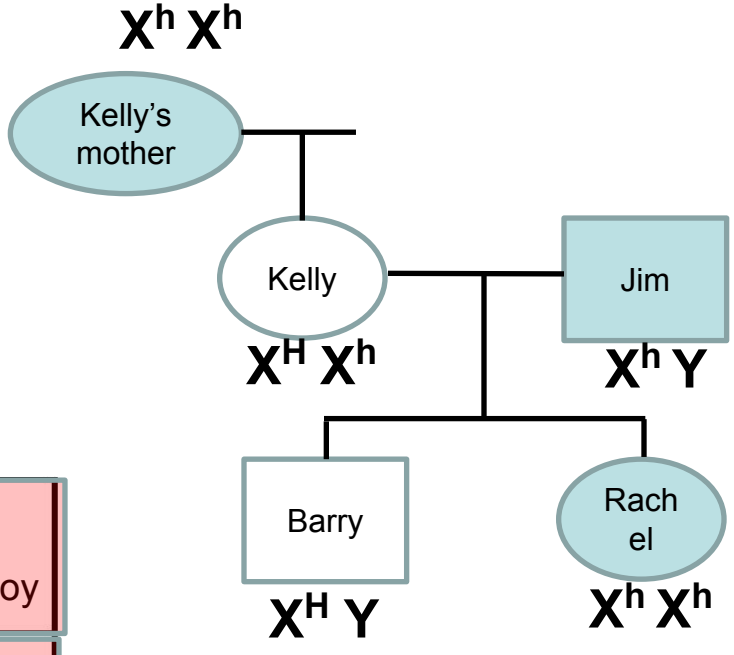
d. Two healthy children?

9/16 (56%)


Genetic Series - Video 2
Sex-Linked Traits
with the Amoeba Sisters

edpuzzle

Hemophilia is a sex linked disorder. Kelly does not have hemophilia even though her mother did. Jim (Kelly's husband) is a hemophiliac. Their first child Barry is healthy but their other child Rachel is a hemophiliac. Draw a Pedigree for this family and a Punnett square for Jim and Kelly.



	X^h	Y
X^H	$X^H X^h$ Healthy girl (carrier)	$X^H Y$ Healthy boy
X^h	$X^h X^h$ Hemophiliac girl	$X^h Y$ Hemophiliac boy

What is the probability of getting a:

a. Healthy son?

b. Healthy daughter?

c. Child with hemophilia?

50%

d. Carrier child?

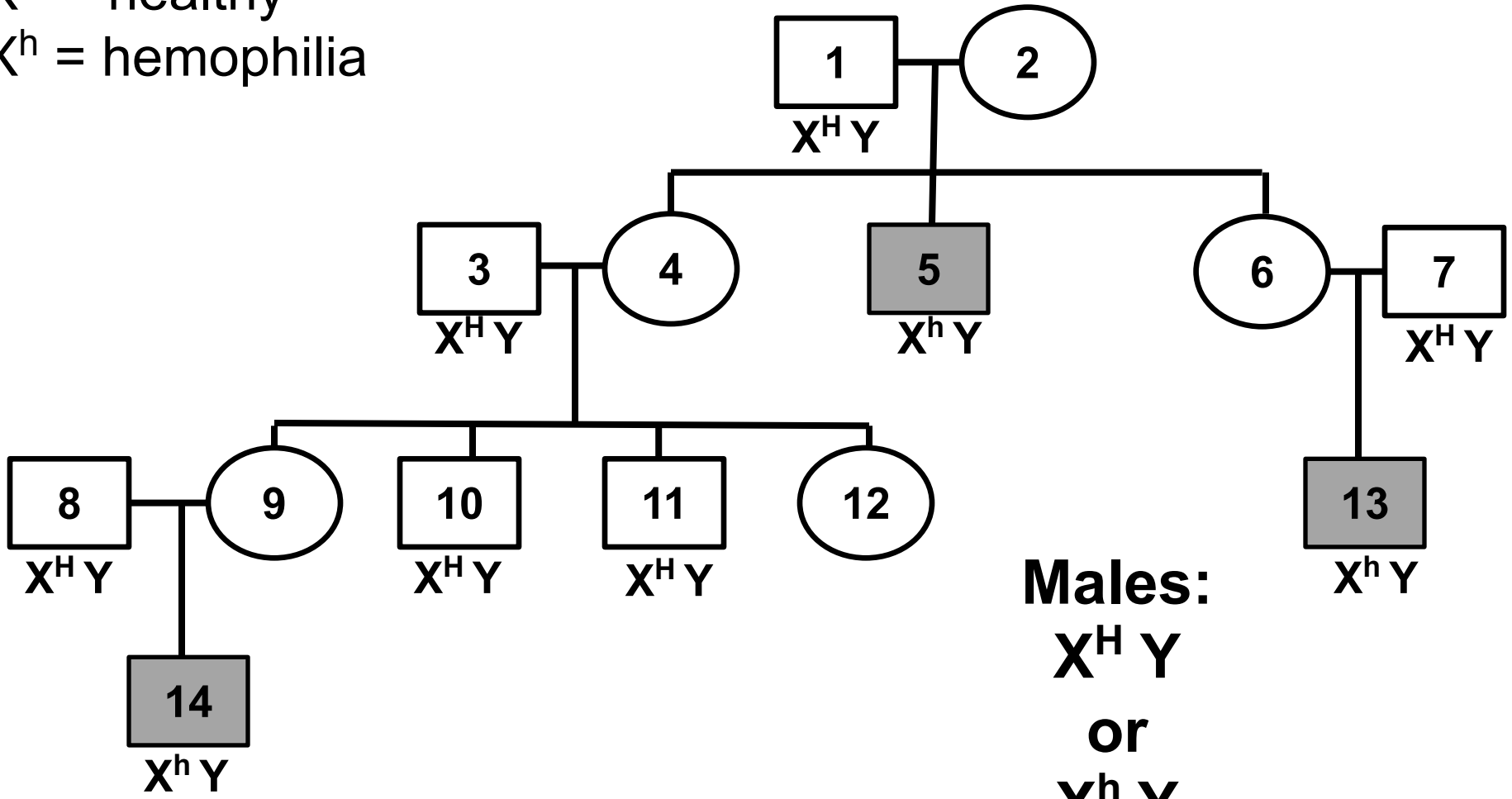
25%

Key

X^H = healthy

X^h = hemophilia

Sex linked recessive: Hemophilia



Males:

$X^H Y$

or

$X^h Y$

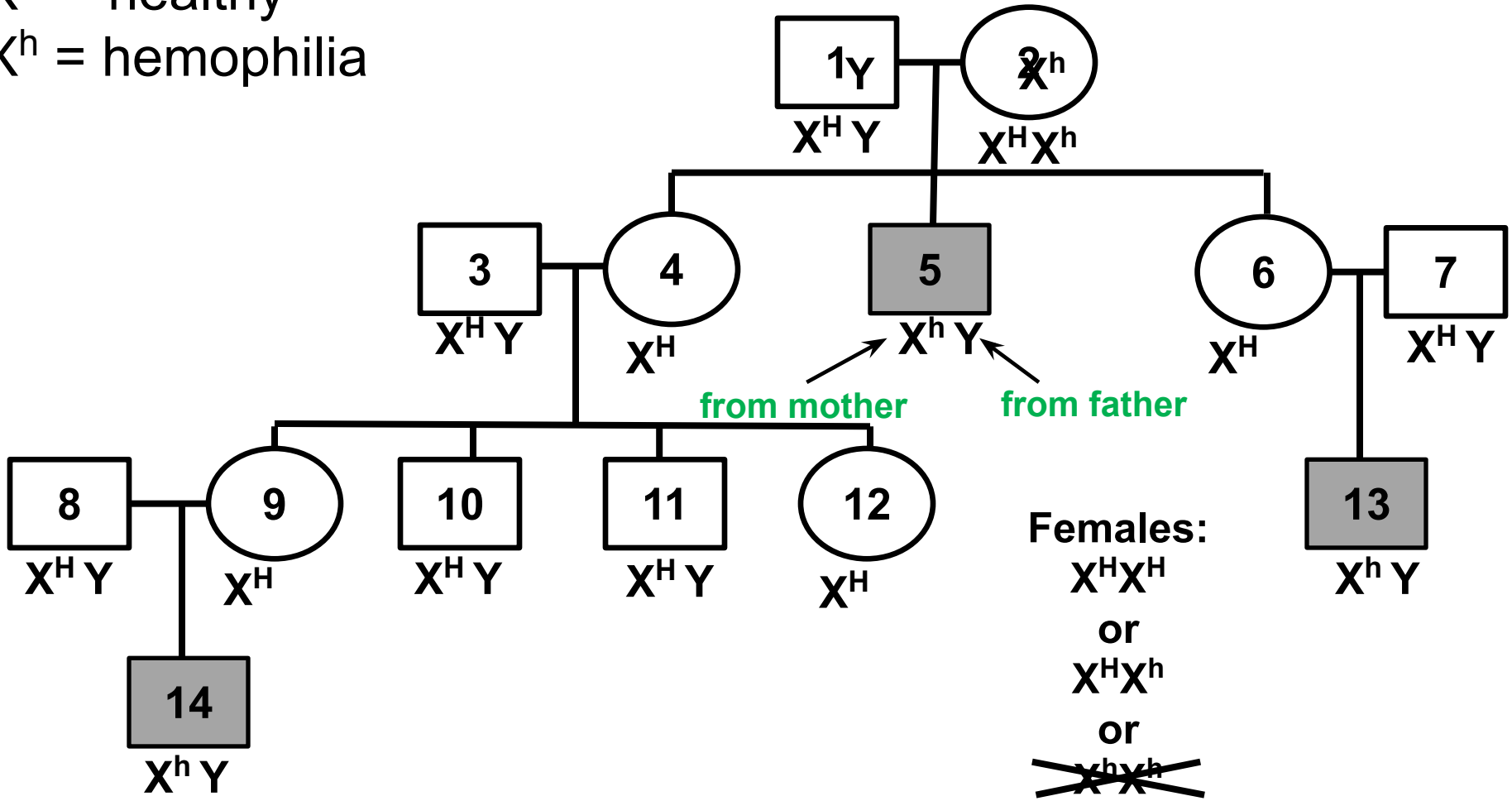
Hint: Only 1 person is unknown.

Key

X^H = healthy

X^h = hemophilia

Sex linked recessive: Hemophilia



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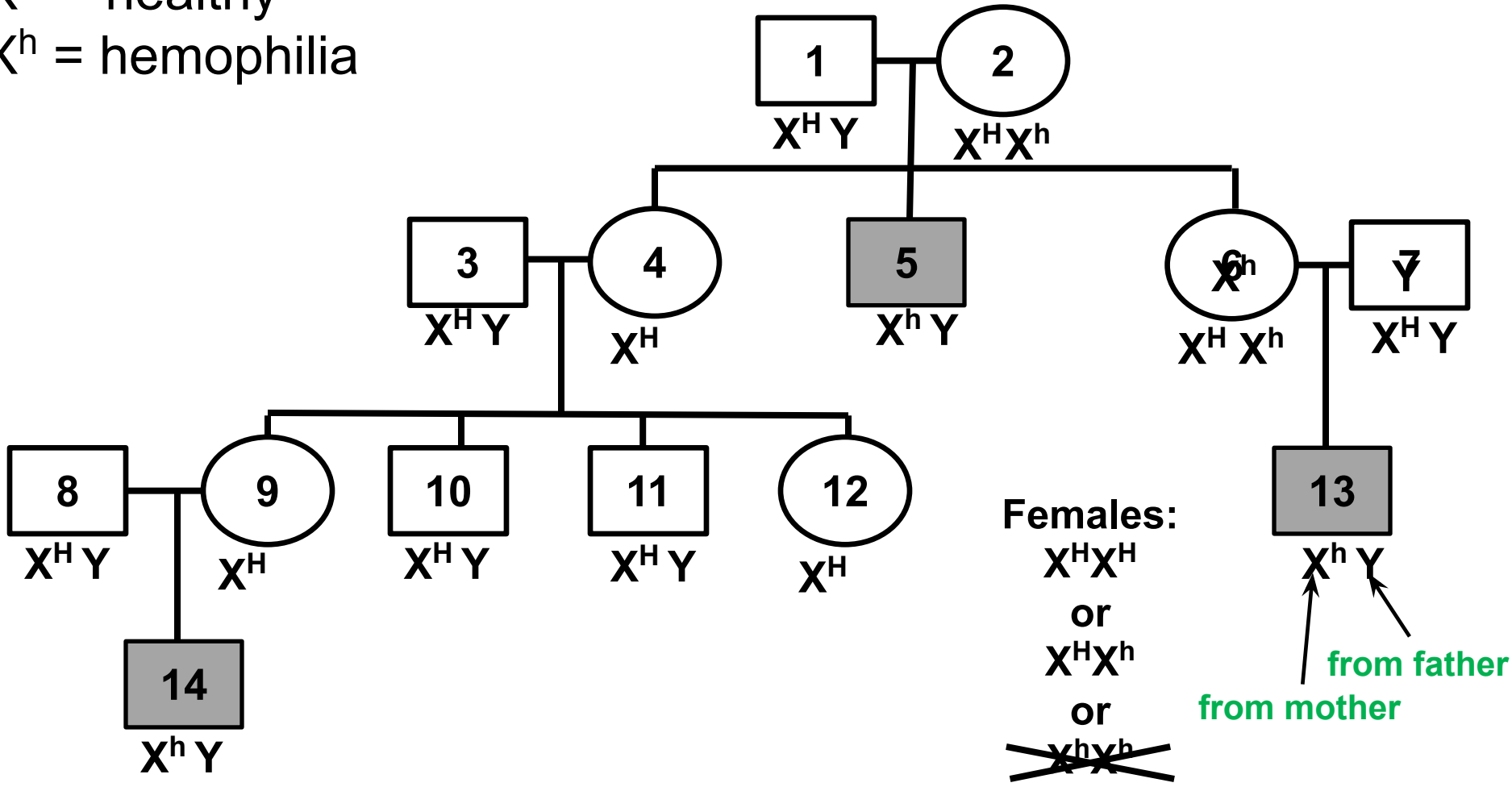

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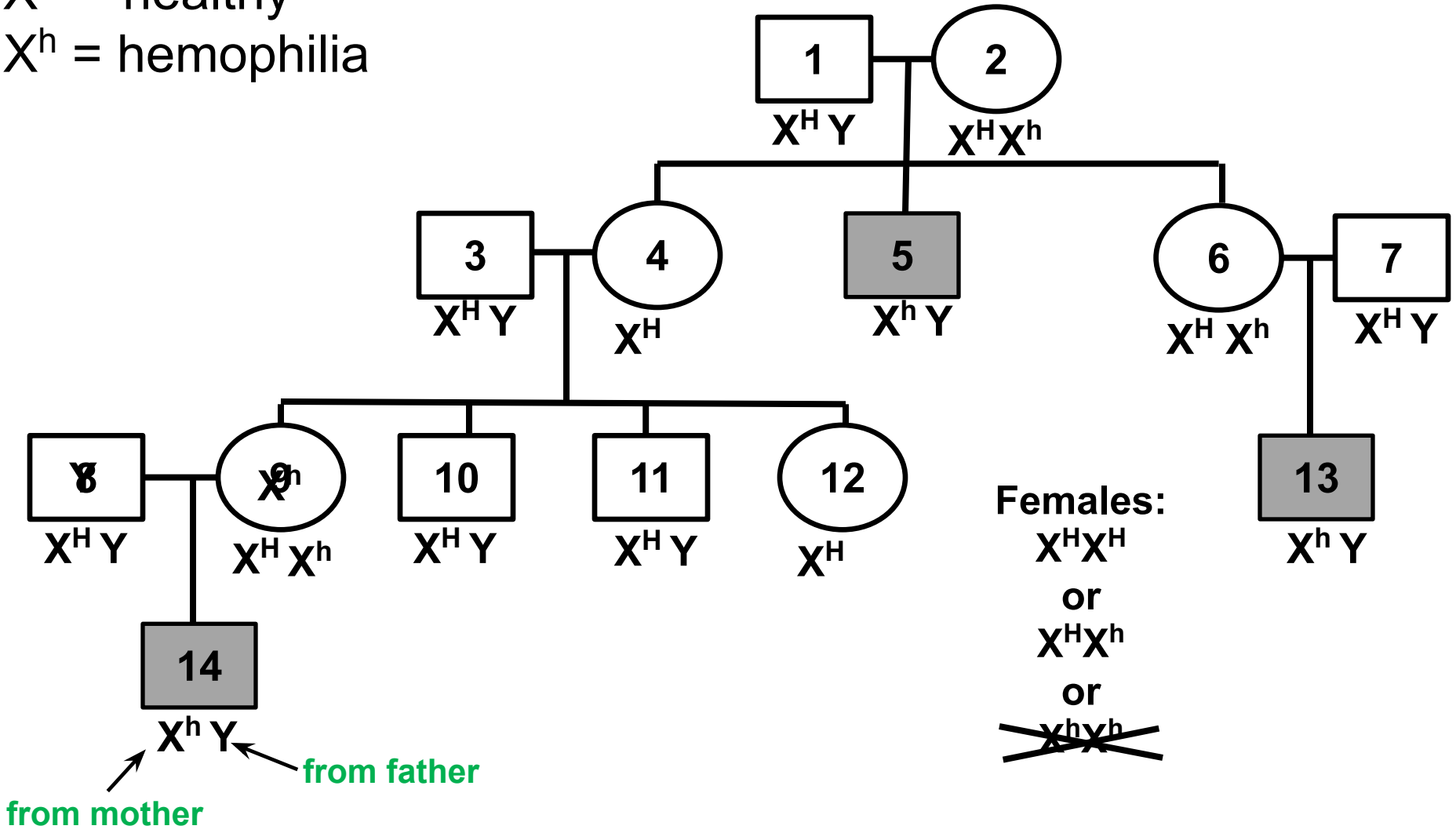

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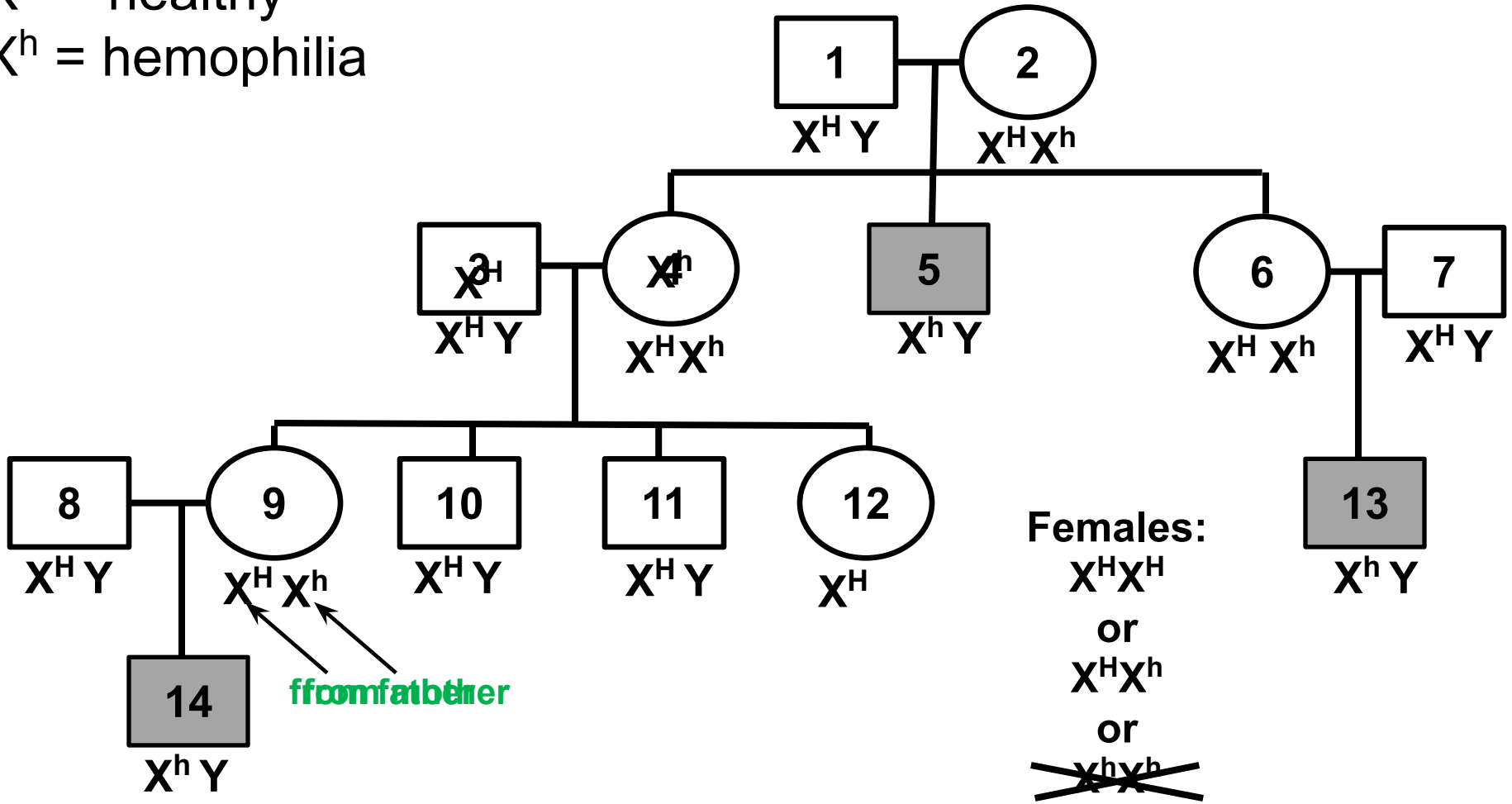

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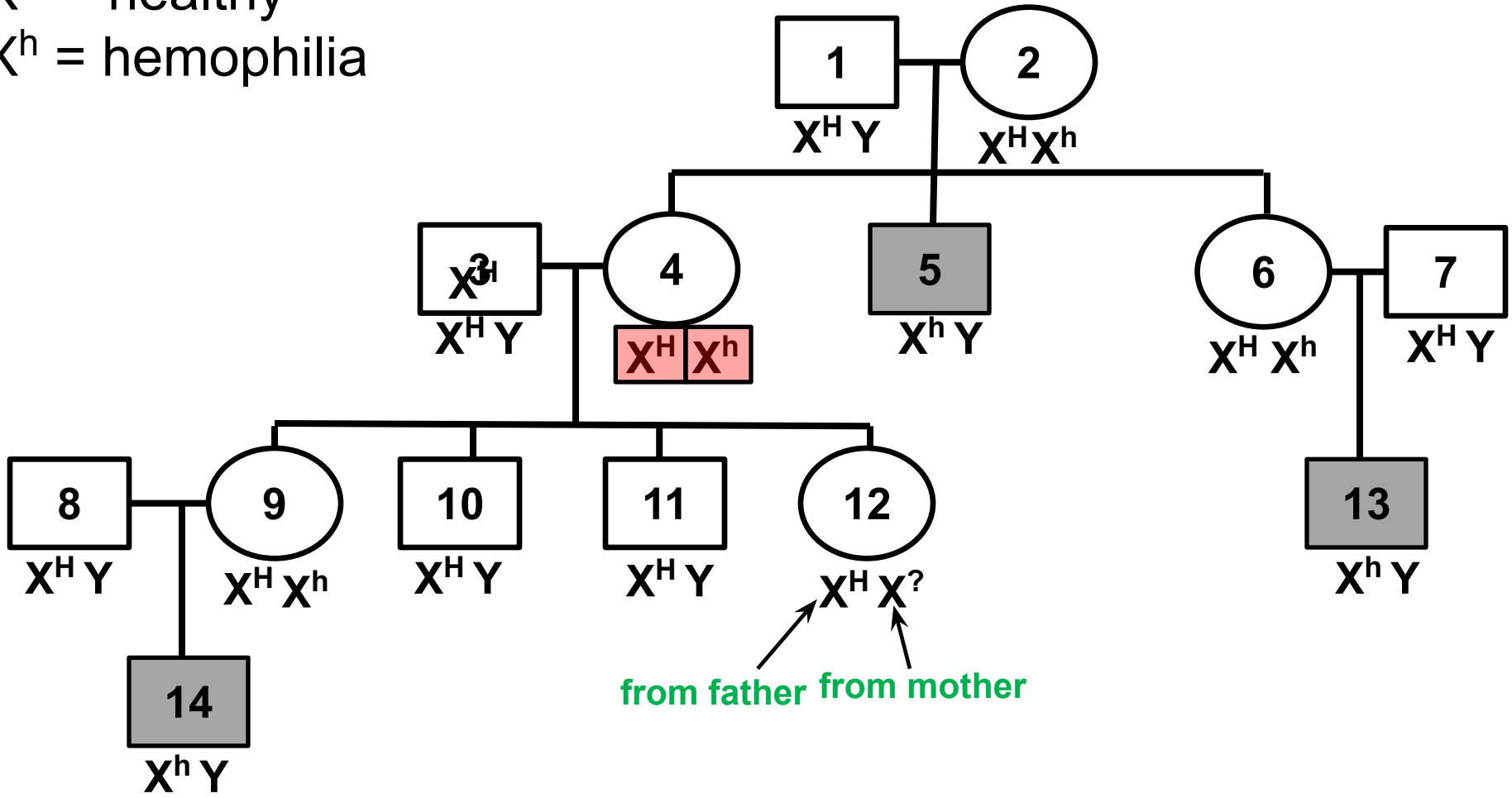
Sex linked recessive: Hemophilia



Hint: Only 1 person is unknown.

Practice Questions

1) How are sex-linked disorders different from autosome disorders?
2) Why are sex-linked disorders more common in males?
3) Write the genotype of a heterozygous female.
4) Write the genotype of a carrier female.
5) Examine Kelly and Jim's Punnett square. What are the chances they would have three children, all of whom are healthy?