SEX-LINKED INHERITANCE

- The inheritance of a trait (phenotype) that is determined by a gene located on one of the sex chromosomes is called sex linked inheritance.
- The genes controlled by genes located on the sex chromosome is called sex- linked inheritance.
- It was discovered by T. H. Morgan in 1910.

- The genes controlling body characters located on X chromosomes are called X-linked genes.
- The inheritance of X-linked genes is called X-linked inheritance.
- The characters controlled by X-linked genes are called X-linked characters.
- Eg: Haemophilia, color blindness etc.

- The genes controlling body characters located on Y chromosome are called Y-linked genes.
- The inheritance Y-linked genes is called Y-linked inheritance.
- The characters controlled by Y-linked genes is called Y-linked characters.
- Eg: Hyperterichosis, Ichthyosis hysterix.

- The genes controlling body characters of both and X and Y chromosome is called XY linked genes.
- The inheritance of XY linked genes is called XY linked inheritance.
- The characters controlling the XY linked genes are called XY linked characters.
- Eg: Nephritis, Xeroderma pigmentosum etc.

- Most of the sex linked genes follow the criss-cross inheritance (zig zag).
- The inheritance of a character from the father to his grandson through his daughter is called criss-cross inheritance.

X-LINKED INHERITANCE

- Certain sex linked genes are located only on X chromosomes and their alleles are absent from Y chromosome.
- These genes are called X linked genes, the characters controlled by these genes are called X linked characters and their mode of inheritance is called X linked inheritance.
- Eg: Colour blindness, Haemophilia etc.

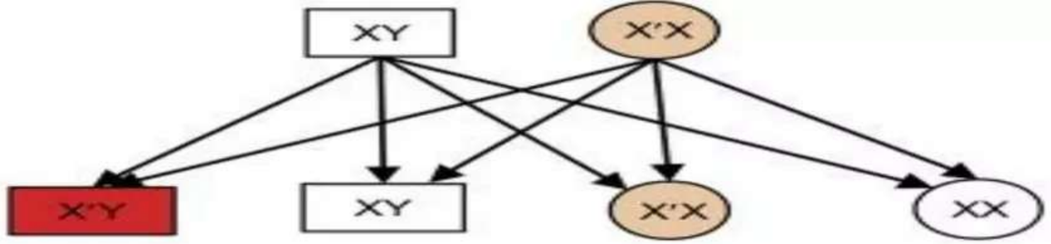
COLOUR BLINDNESS

- Colour blindness is a sex linked character discovered by Wilson in 1911.
- Hereditary disease and the affected person cannot distinguish between red and green colour.
- Red blindness is called protonopia and green blindness is called deutronopia.
- Colour blindness is a recessive character.

- Caused by recessive genes represented by cc.
- Normal person contain genes CC or Cc or C alone (in man).
- The genes for colour blindness are located on the X chromosome, their alleles are not present on Y chromosome.
- So man has only one gene. The presence of only one gene for a character is called hemizygous. So man is hemizygote for colour blindness.

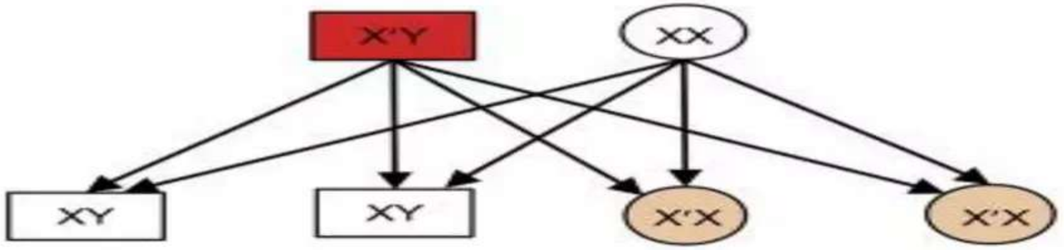
- This character is common in man then in woman.
- Follows criss-cross inheritance.
- Never transmitted to son from father.
- Daughter carrying one recessive gene for colour blindness is called carrier.

(a)



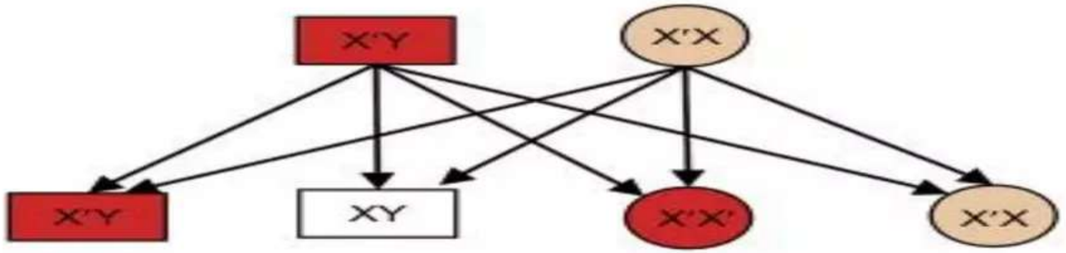
50% chance of sons having abnormal color vision.
50% chance of daughters being carriers.

(b)



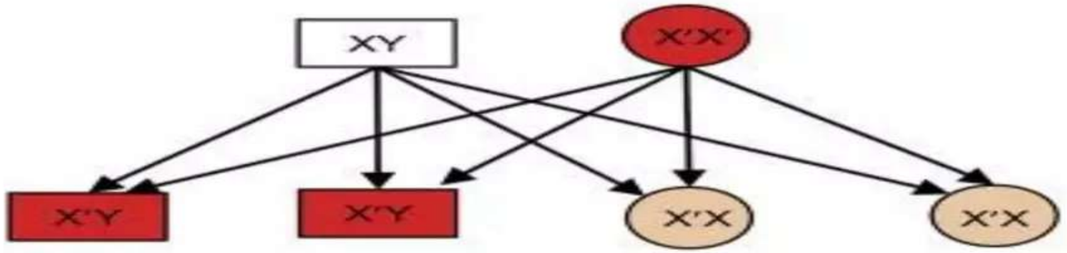
100% chance of sons having normal color vision.
100% chance of daughters being carriers.

(c)



50% chance of sons being color blind.
50% chance of daughters being color blind or being carriers.

(d)



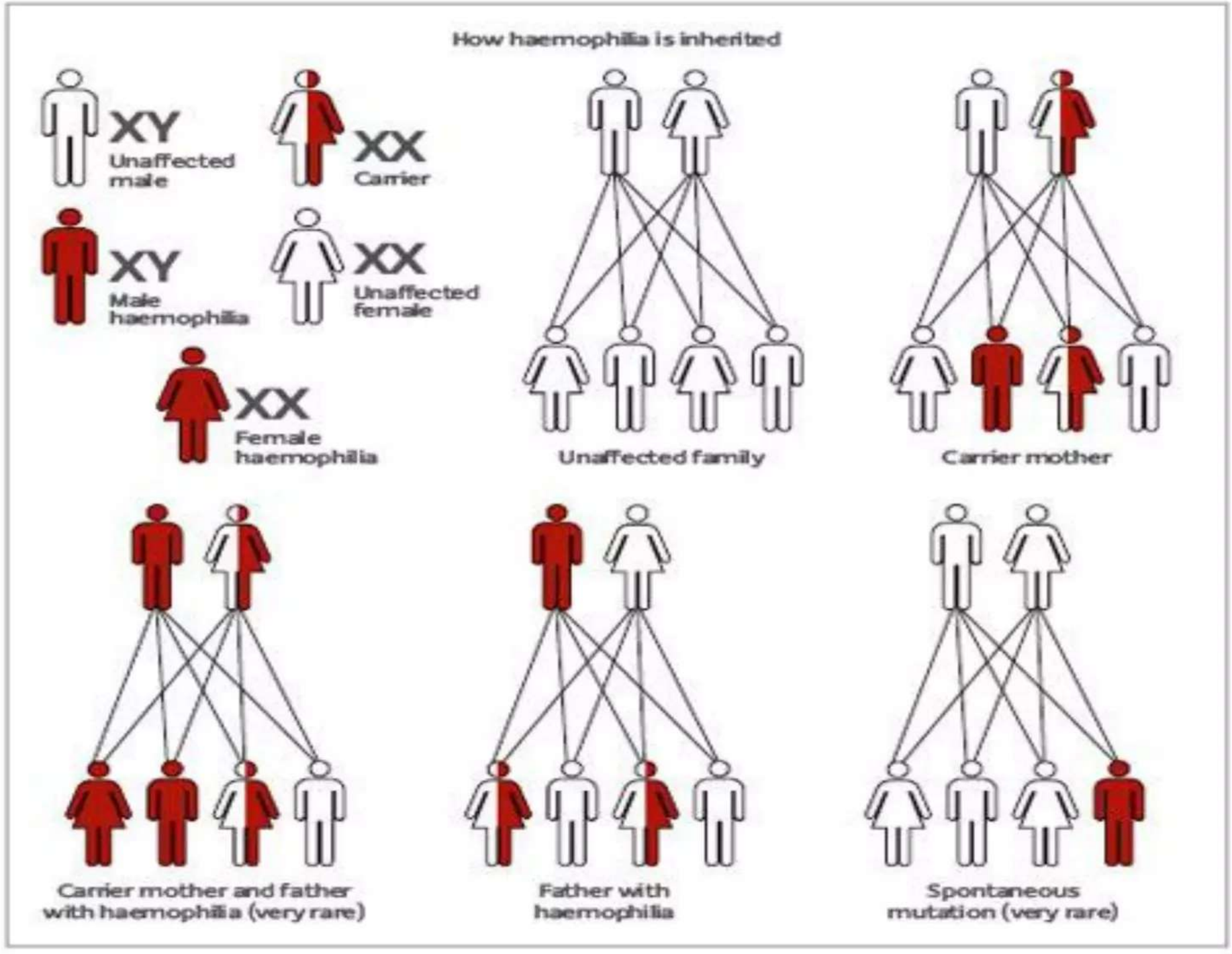
100% chance of sons being color blind.
100% chance of daughters being carriers.

HAEMOPHILIA

- Also called as Bleeder`s disease.
- Characterized by delayed blood clotting.
- This is because of the absence of antihaemophilic globubin which plays an important role in blood clotting.
- In normal person, blood clots in 2 to 8 minutes but in haemophilic patients, clotting is delayed for 20 minutes to 24 hours. Hence they bleed continuously from the wound.

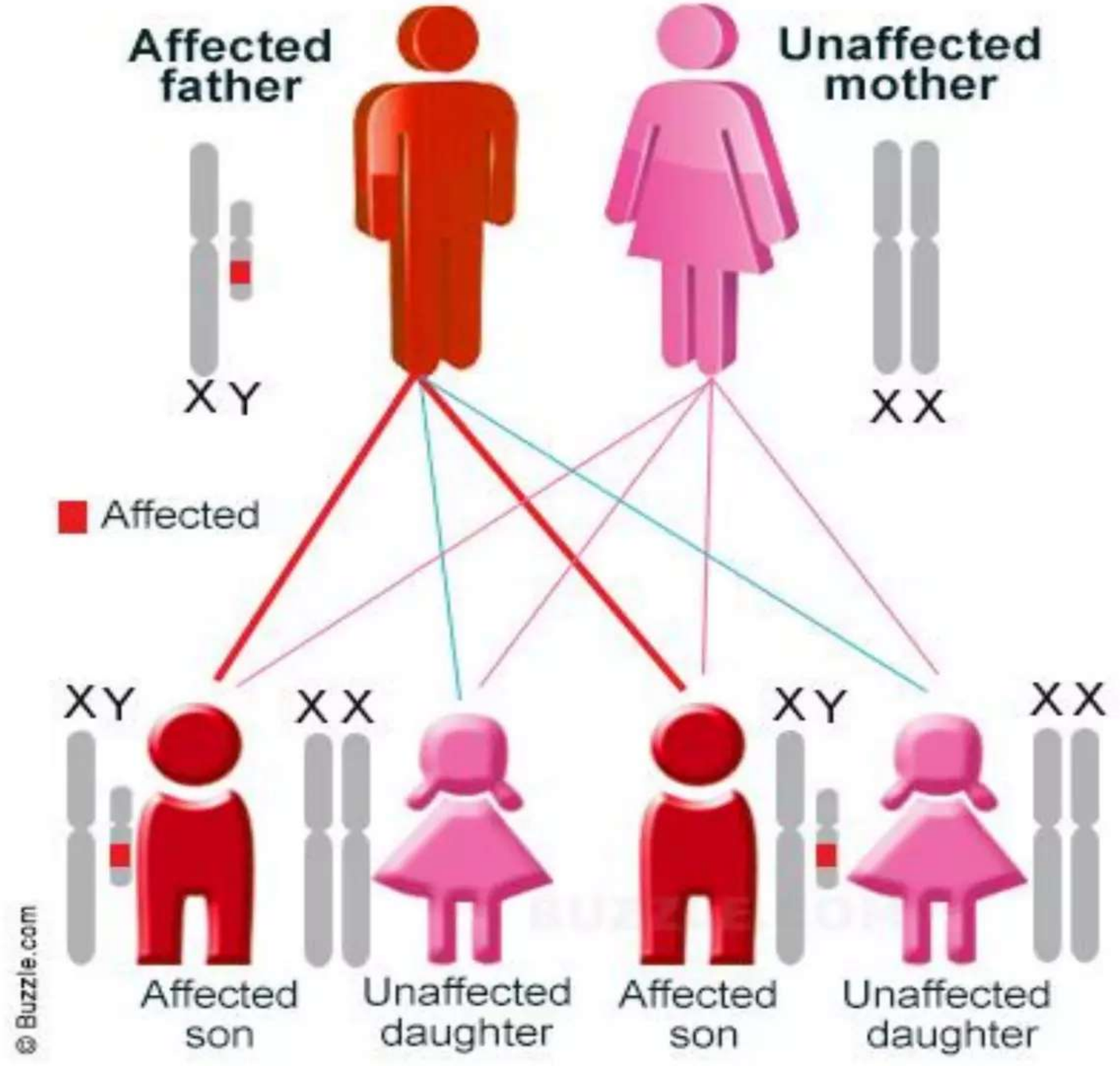
- Queen Victoria was also affected by this disease and it was transmitted to her descendants.
- Hence this disease is common among the Royal Family Of Queen Victoria and so it is also called as Royal disease.
- It is a sex linked recessive character.
- Cause by recessive gene represented as hh and normal condition is due to dominant gene H.

- The genes are located on X chromosome.
- Male is homozygote.
- Disease is common in male then in female.
- Follows criss-cross inheritance.
- Generally Haemophilic patients will die before reaching reproductive stage.


How haemophilia is inherited
XY
Unaffected male
XX
Carrier
XY
Male haemophilia
XX
Unaffected female
XX
Female haemophilia
Unaffected family
Carrier mother
Carrier mother and father with haemophilia (very rare)
Father with haemophilia
Spontaneous mutation (very rare)

Y-LINKED INHERITANCE

- The sex linked genes located on Y chromosomes are called Y linked genes.
- The Y linked genes are confined to males only.
- Hence they are called Holandric genes (Holos-whole; andros-male).
- These genes are transmitted directly from father to the son.
- Their mode of inheritance is called Y linked inheritance.
- Eg: Hyperterichosis, Ichthyosis hysterix etc.


Affected father
Unaffected mother
X Y
X X
Affected
X Y
X X
X Y
X X
Affected son
Unaffected daughter
Affected son
Unaffected daughter
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XY LINKED INHERITANCE

- Certain sex linked genes are located on both X and Y chromosomes.
- They are called XY linked genes and their mode of inheritance is called XY linked inheritance.
- Eg: Xeroderma pigmentosum, nephritis, retinitis pigmentosa etc.

COMPLETELY SEX-LINKED INHERITANCE

- The X and Y chromosomes are not similar.
- X chromosome is larger then Y chromosome.
- The lower part of both the chromosomes are similar. These two parts are called homologous regions. They have same type of genes.
- The remaining part is not similar. They are called non-homologous regions. Do not contain similar type of genes.

- The genes located on non-homologous regions inherit together because crossing over does not occur in these regions.
- The genes located on non-homologous regions are called completely sex linked genes and their inheritance is called completely sex linked inheritance.
- Eg: Haemophilia, colour blindness etc.

INCOMPLETELY SEX LINKED INHERITANCE

- The genes located on homologous regions of sex chromosomes do not inherit together because crossing over may occur in these regions.
- So these genes are called incompletely sex linked genes and their mode of inheritance is called incompletely sex linked inheritance.
- Eg: Retinitis pigmentosa, nephritis etc.

THANK YOU…