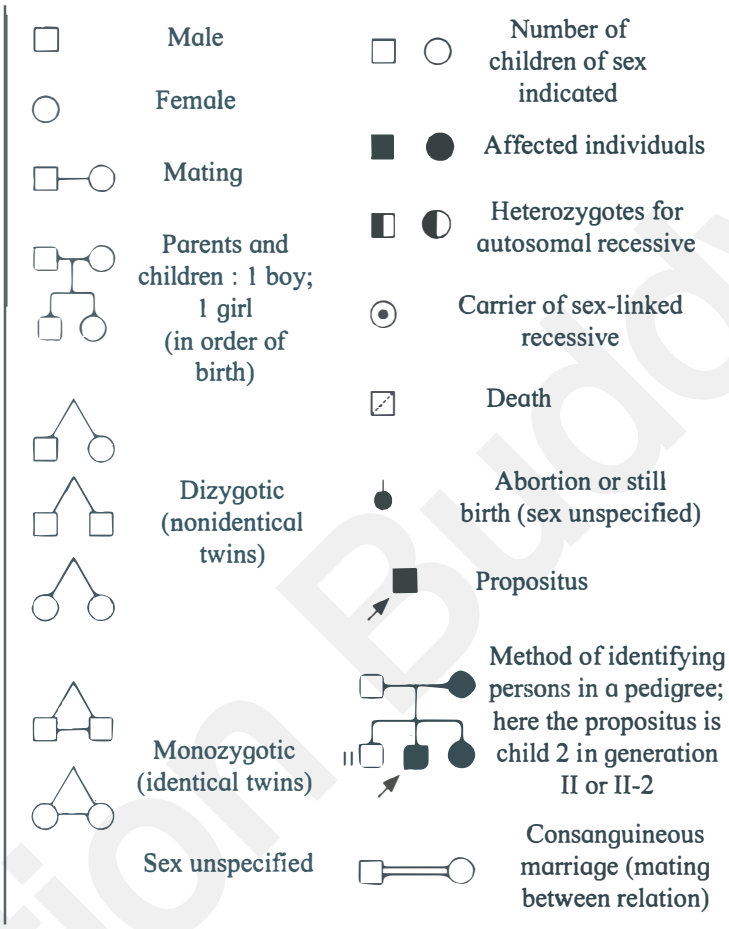
10. To study the prepared pedigree charts of genetic traits such as rolling of tongue, widow's peak, blood groups and colour blindness.

Date : / /

Introduction :

A pedigree is a list of ancesteors showing genetic relationships between members of a family.

A record of inheritance of certain genetic traits for two or more generations presented in the form of family tree or a diagram, is called pedigree chart. Study of pedigree chart provides a strong tool, which is used to trace the inheritance of a specific trait, abnormality or disease in a family. In a pedigree charts specific symbols that are used, are indicated below :



Aim : To Study the prepared pedigree charts of genetic traits such as rolling of tongue, widow's peak, blood groups and colour blindness.

Requirements : Prepared pedigree charts of genetic traits.

Procedure :

Observe the given pedigree chart and write comments on it.

1. Inability to roll the tongue :

The rolling of tongue is the ability of a person to roll the tongue inwards in ' U' shaped as shown in the following figure. The inability to roll the tongue, is caused by autosomal recessive allele 'a'. Both homozygous dominants (AA) and heterozygous (Aa) individuals are able to roll the tongue while homozygous recessive (aa) individuals are unable to roll the tongue.

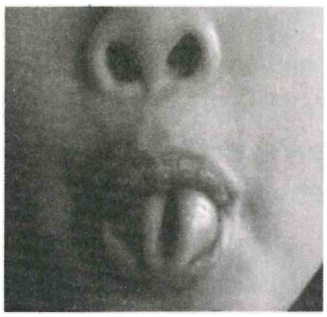


Fig. 1. Rolling of tongue (AA/Aa)

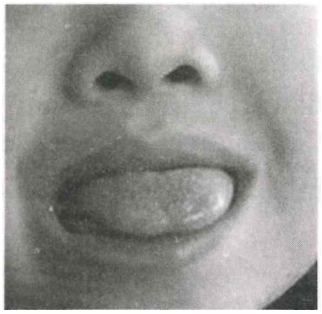
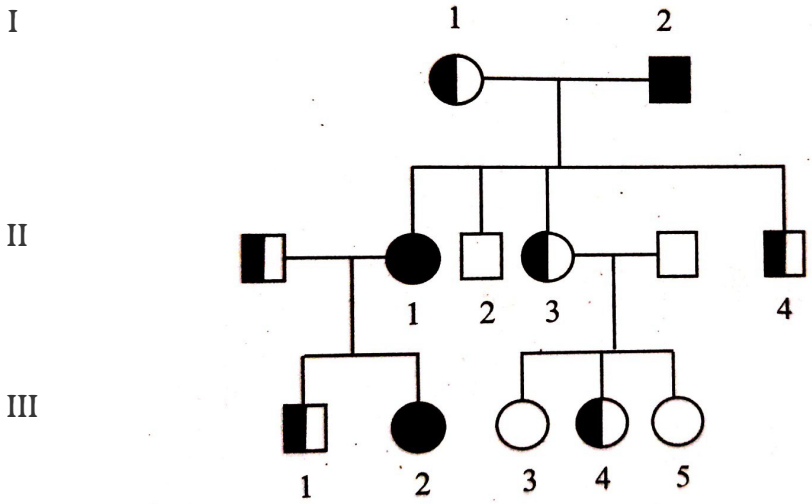
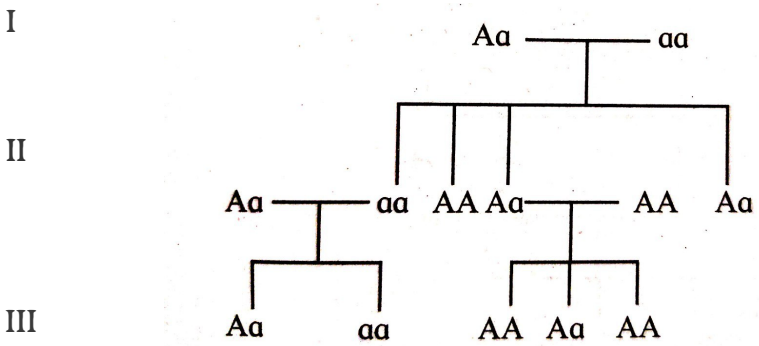


Fig. 2. Non-tongue roller (aa)

Pedigree chart for inability to roll the tongue :



Solution :-



Comment on the given pedigree chart with respect to :

1. Inheritance of trait

Rolling of the tongue.

2. Number of normal, carriers and affected progeny

normal- 9
carriers- 5
affected- 2

3. Linkage - sex linked or autosomal

autosomal recessive allelic linkage.

2. Widow's Peak

Widow's peak is a V- shaped hair line across the forehead. It is a dominant autosomal trait. The gene responsible for widow's peak is dominant 'W'. Therefore, both homozygous dominant (WW) and heterozygous (Ww) individuals have widow's peak, while homozygous recessive (ww) individuals have straight hair line. This feature is observed with both men and women.

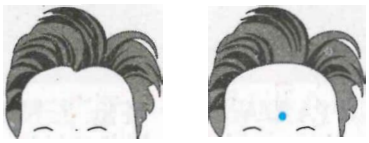
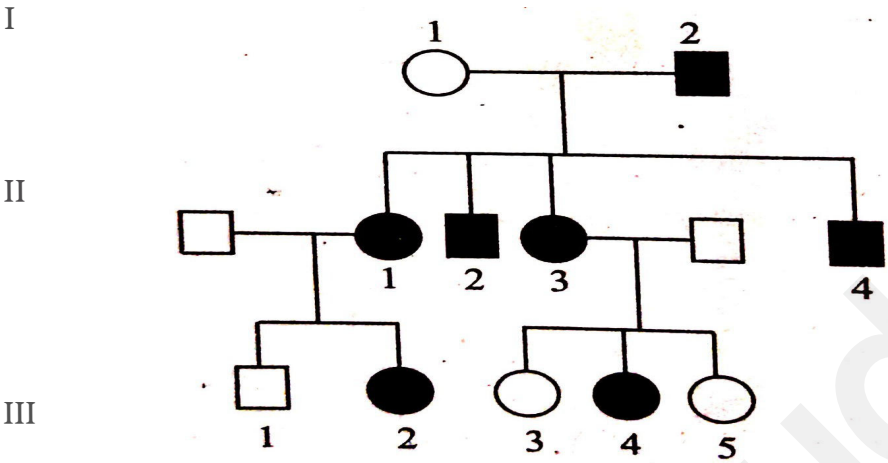
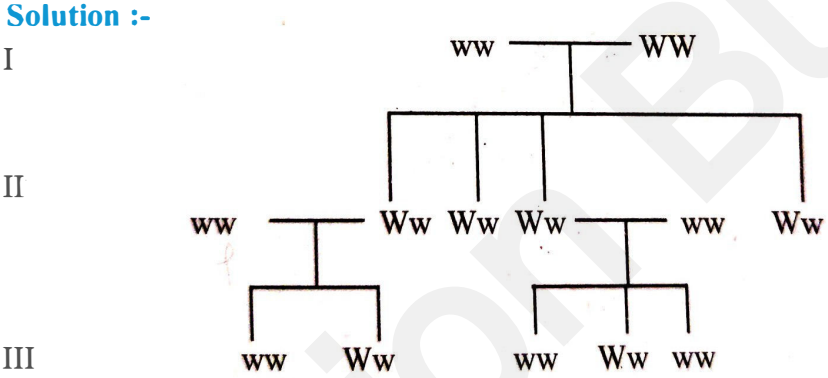


Fig. Widow's peak and straight hairline.

Pedigree chart for Widow' peak :-



Solution :-



Comment on the given pedigree chart with respect to :

1. Inheritance of trait

   Widow's Peak

2. Number of normal, carriers and affected progeny

   normal - 5,
   carriers- 0
   affected -6

3. Linkage - sex linked or autosomal

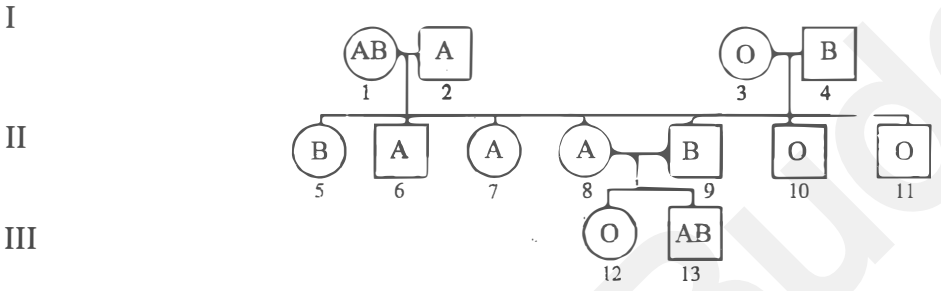
   dominant autosomal trait

3. Human blood groups :

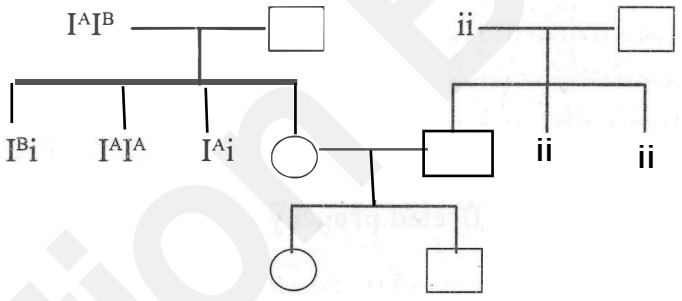
1. The blood groups in human beings are described as per ABO system of classification.
2. The gene I (isoagglutinogen) controls the ABO blood groups.
3. It has three alleles; I^A, I^B, and i (recessive).
4. The alleles I^A and I^B produce a slightly different form of antigen and allele i (recessive), does not produce any surface antigen on R.B.Cs.
5. Each individual possesses only two alleles out of three.
6. Alleles I^A and I^B are co- dominant. Individually they are completely dominant over allele i.
7. There are six different genotypes and four different phenotypes with blood groups which are seen as follows:-

Phenotype	Genotype
Blood Group A	I^AI^A or I^Ai
Blood Group B	I^BI^B or I^Bi
Blood Group AB	I^AI^B
Blood Group O	ii

Pedigree chart for blood groups :



Solution :



Comment on the given pedigree chart and give the genotypes of the blood groups of individuals marked in blank box numbers - 2, 4, 8, 9, 12, 13. :-

2 - I^Ai
4 - I^Bi
8 - I^Ai
9 - I^Bi
12 - ii
13 - I^AI^B

4. Colour blindness :

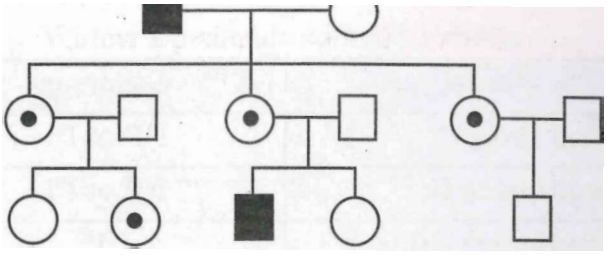
1. Colour blindness is a sex / X linked recessive disorder of humans.
2. Due to recessive gene present on X chromosomes, colour sensitive cone cells are not formed. This results in red-green colour blindness.
3. It is more common in male than female.
4. It follows criss-cross inheritance as this trait is transmitted from the father to the grandson through his carrier daughter.

Pedigree chart for colour blindness

I

II

III



Solution :-

I X^cY X^CX^C

II X^CX^c — X^CY X^CX^c — X^CY X^CX^c — X^CY

III X^CX^C X^CX^c X^cY X^CX^C X^CY

Comment on the given pedigree chart with respect to :

1. Inheritance of trait

Colour blindness

2. Number of normal, carrier and affected progeny

normal - 6

carrier - 4

affected- 1

3. Linkage - sex linked or auto omal

X sex linked recessive disorder of humans.

Questions

1. What is pedigree ?

A pedigree is a list of ancesteors showing genetic relationships between members of a family.

2. Why x-linked disorder are more common in male than in the female?

This is because the X chromosome is large and contains many more genes than the smaller Y chromosome. In a sex-linked disease, it is usually males who are affected because they have a single copy of X chromosome that carries the mutation

3. What are holandric traits?

These are the genes that are carried on the Y chromosome. They mainly code for testes, which secrete testosterone and are responsible for making an organism male. There are only a handful of genes on the Ychromosome; holandric traits can only be passed from father to son, and holandric diseases are rare

4. Give an example of autosomal recesssive disorder in humans.

Examples of autosomal recessive disorders include cystic fibrosis, sickle cell anemia, and Tay-Sachs disease.

Q. 5. Explain the concept of co-dominance with respect to ABO system in humans.

Codominance means that neither allele can mask the expression of the other allele. An example in humans would be the ABO blood group, where alleles A and alleles B are both expressed. So if an individual inherits allele A from their mother and allele B from their father, they have blood type AB.

Remark and Signature of Teacher .....