8. Heredity

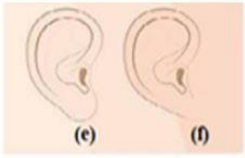
1) Figures (a) to (d) given below represent the type of ear lobes present in a family consisting of 2 children – Rahul, Nisha and their parents.


a) Rahul's Father


b) Rahul


c) Rahul's Mother


d) Rahul's sister Nisha



Type of ear lobes

Excited by his observation of different types of ear lobes present in his family, Rahul conducted a survey of the type of ear lobes found {Figure (e) and (f)} in his classmates. He found two types of ear lobes in his classmates as per the frequency given below:

Sex	Free	Attached
Male	36	14
Female	31	19

On the basis of above data answer the following questions.
a) Which of the two characteristics - 'free ear lobe' or 'attached ear lobe' appears to be dominant in this case? Why?
b) Is the inheritance of the free ear lobe linked with sex of the individual? Give reason for your answer.
c) What type of ear lobe is present in father, mother, Rahul and his sister Nisha? Write the genetic constitution of each of these family members which explains the inheritance of this character in this family? (Gene for Free ear lobe is represented by F and gene for attached ear lobe is represented by f for writing the genetic constitution).
Answer.
a) Free ear lobe is dominant because it is found in a large majority of the population.
b) No. It is not sex linked. As per the data of the family as well as the class, it is indicated that free ear lobe is present in males as well as in females.
c) Father – Ff (free ear lobe), Mother – Ff (free ear lobe), Rahul – ff (attached ear lobe) and Nisha – Ff (free ear lobe)

2) Pooja has green eyes while her parents and brother have black eyes. Pooja's husband Ravi has black eyes while his mother has green eyes and father has black eyes.
(a) On the basis of the above given information, is the green eye colour a dominant or recessive trait? Justify your answer.
(b) What is the possible genetic makeup of Pooja's brother's eye colour?
(c) What is the probability that the offspring of Pooja and Ravi will have green eyes? Also, show the inheritance of eye colour in the offspring with the help of a suitable cross.
Answer.
a. Yes, green eye colour is recessive as it will express only in homozygous condition
b. BB, Bb
c. bb*Bb

	B	b
b	Bb	bb
b	Bb	bb

Genetic cross - 50% of the offsprings can have green eye colour

3. Ram and Asha were a married couple. They had four children - one of these children had sickle cell anemia whereas the other four children did not show symptoms. Ram and Asha did not show symptoms of sickle cell anaemia. The trait for sickle cell anaemia is not linked to the sex chromosomes.
(a) Is this disease caused by a dominant or recessive trait? Why?
(b) If the child that had sickle cell anaemia got married to a person without a mutation in the sickle cell anaemia gene, what percentage of their children would have sickle cell anaemia? Show the cross.
Answer.
(a) (i)
-Yes, it is recessive.
- Since the trait does not express itself in all children, it is likely to be a recessive trait.

(a) (ii)
- Yes, it is X-linked.
- Yes, since both male children received the X chromosome from the mother who is colour blind, it is likely to be linked to the X-chromosome.

(b)
Ram - XY
Asha - X^cX^c

Punnett Square

	X	Y
X^c	X^cX	X^cY
X^c	X^cX	X^cY

4. Give the basic features of mechanism of inheritance.
Answer. The basic features of mechanism of inheritance are:
(i) Every character is influenced by two factors. It's feasible that the elements are comparable or different.
(ii) When an organism possesses two unique character traits, only one of them expresses itself; the other one stays silent.
(iii)At the time of gamete production, a character's two components split apart, leaving that character with only one component.
(iv)Arrangement of two or more opposing feature pairs in a way that makes each pair stand alone from the others.

5. Answer the following questions:
(i) Who provided the evidence of DNA as genetic material?
Answer. Mendel

(ii) Why DNA is called polynucleotide?

Answer. DNA is called polynucleotide because it is made up of multiple nucleotide units.

(iii) List three important features of double helical model of DNA.
Answer. Three important features of double helical model of DNA are:
a) In helical model of DNA, both the chains run anti-parallel to each other
b) Purine (A,G) and pyrimidine are two nitrogeneous bases (T,C)
c) A will always bind to T,and C will always bind to G