



INDIAN SCHOOL AL WADI AL KABIR

Class: X	DEPARTMENT: SCIENCE 2023 -2024 SUBJECT: BIOLOGY	Date of completion: 10. 11. 2023
Worksheet No: 5 With Answers	Chapter: HEREDITY AND EVOLUTION	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

OBJECTIVE TYPE QUESTIONS

MULTIPLE CHOICE QUESTIONS

1. Which section of DNA provides information for one protein?
(a) Nucleus (b) Chromosomes (c) Trait (d) Gene
2. Who have a perfect pair of Sex chromosomes?
a) Boys b) Girls c) Both boys & girls d) It depends on many factors
3. What determines the sex of a child?
a) Chromosome content of the ovum b) Chromosome content of sperm c) Number of days between ovulation and fertilisation d) Number of days between fertilisation and implantation
4. If a round, green seeded pea plant (RRyy) is crossed with wrinkled, yellow seeded pea plant (rrYY), the seeds produced in F1 generation are
a) round and yellow b) round and green
c) wrinkled and green d) wrinkled and yellow
5. In garden peas, a pure tall plant (TT) is crossed with a short plant (tt) The ratio of pure tall plants to short plants in F2 generation is –
a) 1:3 b) 3:1 c) 1:1 d) 2:1

ASSERTION-REASONING QUESTIONS

For the following questions, two statements are given-one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the options (i) , (ii), (iii) and (iv) as given below:

- (i) Both A and R are true and R is the correct explanation of the Assertion.
- (ii) Both A and R are true but R is not the correct explanation of the Assertion.

(iii) A is true but R is false.

(iv) A is false but R is true.

1. Assertion: Height in garden pea plants is controlled by efficiency of enzymes and is thus genetically controlled.
Reason: Cellular DNA is the information source for making proteins in the cell.
2. Assertion: Sex determination in humans is genetical.
Reason: Sex chromosomes are the similar in all human ovum.
3. Assertion: Dominant allele is an allele whose phenotype expresses even in the presence of another allele of that gene.
Reason: It is represented by a capital letter, e.g. T.
4. Assertion: A geneticist crossed a pea plant having violet flowers with a pea plant with white flowers, he got all violet flowers in first generation.
Reason: White colour gene is not passed on to next generation.
5. Assertion: The sex of a child in human beings will be determined by the type of chromosome he/she inherits from the father.
Reason: A child who inherits 'X' chromosome from his father would be a girl (XX), while a child who inherits a 'Y' chromosome from the father would be a boy (XY).

Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.

1. Why is variation favourable for the species, but not requisite for an individual?
2. What are dominant traits and recessive traits?
3. How is equal genetic contribution of male and female parents ensured in the progeny?

Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.

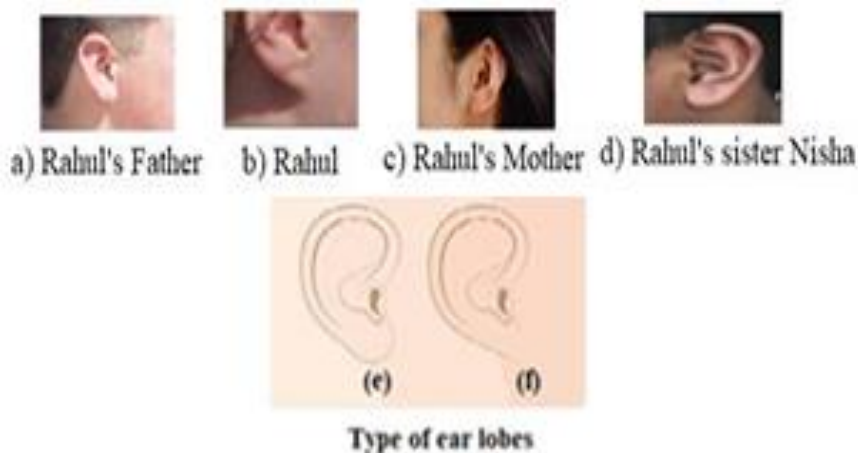
1. A Mendelian experiment consisted of breeding pea plants VV, bearing violet flowers with pea plants vv, bearing white flowers. What will be the result in F1 and F2 progeny? What will be the percentage of white flowers in F2 generation?
2. With the help of an example, explain how traits get expressed.
3. How did Mendel explain that it is possible that a trait is inherited but not expressed in an organism?

Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.

- How many pairs of chromosomes are present in human beings? Out of these how many are sex chromosomes? How many types of sex chromosomes are found in human beings? “The sex of a new born child is a matter of chance and none of the parents may be considered responsible for it”. Draw a flow chart showing determination of sex of a new born to justify this statement.
- A pea plant with purple flowers when crossed with pink flowered plant produced all purple coloured flowers in F1 generation. On selfing, the plants produced 150 purple flowered and 50 pink flowered plants.
 - Give the genotypes of the parental plants and the F1 generation plants.
 - What is the phenotypic ratio obtained in F2 generation?
 - Explain the genetic mechanism responsible for the above result.
- How do Mendel’s experiments show that the
 - traits may be dominant or recessive,
 - traits are inherited independently?

Case-based/data -based questions

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.



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.

- 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).

OR

Suresh's parents have attached ear lobes. What type of ear lobe can be seen in Suresh and his sister Siya? Explain by giving the genetic composition of all.

PREVIOUS YEAR BOARD QUESTIONS

1. When an 'X' bearing sperm fertilises the egg, the resulting zygote has the following combination of chromosomes:
(a) 44 + XX (b) 44 + XY (c) 22 + XX (d) 22 + XY
2. Assertion (A) : When a bacterium divides into two, and the resultant two bacteria divide again, the four bacteria produced would be almost similar.
Reason (R) : DNA copying involves small inaccuracies in the reproduction process.
3. Mendel crossed a pure tall pea plant (TT) with a pure short pea plant (tt) and obtained all tall plants in F1 generation?
 - (a) What is the gene combination present in the plants of F1 generation?
 - (b) Give reason why only tall plants are observed in F1 progeny.
 - (c) What will be the ratio of the plants obtained in the F2 generation when F1 plants are self-pollinated? (2)

ANSWERS FOR THE WORKSHEET QUESTIONS

OBJECTIVE TYPE QUESTIONS MULTIPLE CHOICE QUESTIONS

1. (d) Gene
2. b) Girls
3. b) Chromosome content of sperm
4. a) round and yellow
5. c) 1:1

ASSERTION-REASONING QUESTIONS

- 1.i) 2.ii) 3. ii) 4. (iii) 5. i)

TWO MARK QUESTIONS

1. Accumulation of variation in a species enables them to adapt according to the changes in the environment. This provides survival benefits to the species. Variations may prove to be advantageous or disadvantageous to the individual as the life span of the individual is so small. Variations acquired by the individual are not easily acceptable. Individual with variations is not easily accepted into the group.

2. Dominant traits are traits which express themselves in F1 generation after crossing contrasting traits.
Recessive traits are traits which are not expressed in F1 generation after crossing contrasting traits.

3. During sexual reproduction, a female gamete or egg cell fuses with the male gamete or sperm cell which are haploid (carrying half the number of chromosomes) to form a zygote. Zygote is diploid which contains 23 chromosomes from mother and 23 chromosomes from the father. In this way, an equal contribution from male and female parents is ensured.

THREE MARK QUESTIONS

1.

Violet flowers		white flowers
VV	x	vv

gametes	V	V
v	Vv	Vv
v	Vv	Vv

All the F1 plants will be heterozygous violet flowered

F1 selfed to get F2

Violet flower Violet flower
Vv x Vv

gametes	V	v
V	VV	Vv
v	Vv	vv

In F2 generation There will be:

Phenotype ratio - 3 Violet flowers: 1 white flower

Percentage of white flowered plant is 25% (1/4)

2. Gene is the segment of DNA which provides information for synthesis of a protein and this protein is responsible for a trait. For example: The height in plants

Plant hormones control the height in plants. If the gene is dominant, more enzyme will be produced which in turn will help in increasing the hormone production. As a result, the plant will be tall. If the gene changes, protein(enzyme) is formed in less quantity, hormone will be less and in turn the plant will be short.

In this way, genes control traits in organisms.

3. Mendel took pea plants with different characteristics – a tall plant and a short plant, produced progeny from them. In this first generation, or F1 progeny – All plants were tall. He allowed the F1 tall plants to reproduce by self-pollination. The second-generation, or F2, progeny of the F1 tall plants are not all tall. Instead, one quarter of them are short. This indicates that both the tallness and shortness traits were inherited in the F1 plants, but only the tallness trait was expressed.

FIVE MARK QUESTIONS

1. There are 23 pairs of chromosomes present in human beings.

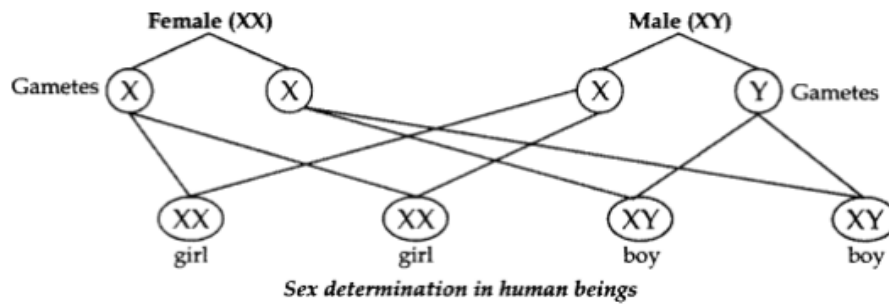
There is 1 pair of sex chromosomes present in human beings.

The chromosomes which determine the sex of a person are called sex chromosomes. There are two types of sex chromosomes, one is called X chromosome and the other is called Y chromosome. Males contain one X chromosome and one Y chromosome (XY), while females contain two X chromosomes (XX).

A male has one X-chromosome and one Y-chromosome. Thus, half the male gametes have X- chromosomes and the other half have Y-chromosomes.

- A female has two X-chromosomes. Thus, all female gametes have only X-chromosomes.
- If a sperm carrying Y-chromosome fertilises an ovum carrying X-chromosome, then the child born will be a boy.

- If a sperm carrying X-chromosome fertilises an ovum carrying X-chromosome, then the child born will be a girl.

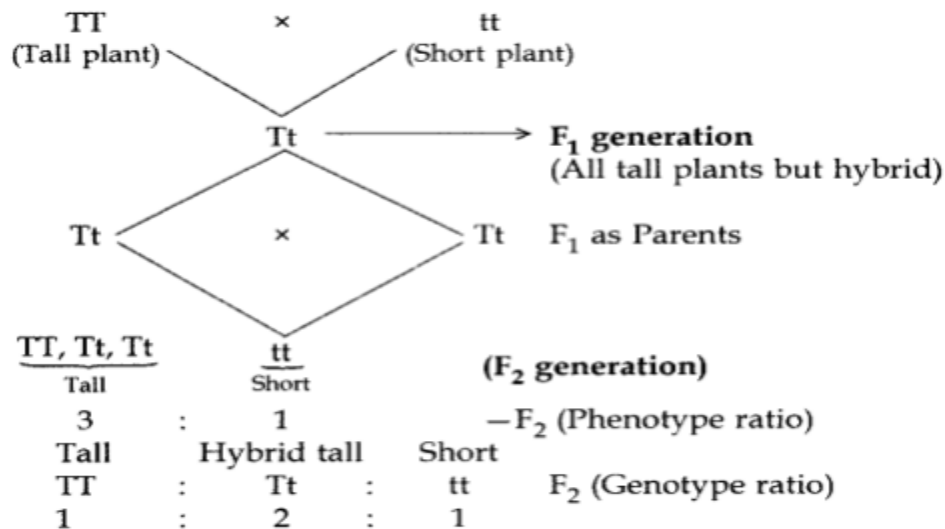


2. i) Parental plants are – purple is PP and white is pp.
F1 all are heterozygous purple. Pp (can use any letter)
- ii) The ratio is 150:50 ie, 3:1.
- iii) As the F2 ratio is 3:1, it is a Mendelian monohybrid cross. F1 is represented only by Purple flowered plants and so it indicates purple is dominant over pink.

3. (a) Mendel's experiments show that:

- In Mendel's experiment with pea plants, when he crossbred a pure tall pea plant with a pure dwarf pea plant, he found that the first generation F₁ was of only tall plants. Tallness is the dominant trait.
- Then he produced F₂ generation by selfing of hybrids F₁
- In the F₁ progeny, no dwarf plants were obtained. However in F₂ generation, both tall and dwarf plants were obtained in the ratio 3 : 2 respectively.
- The trait which remains hidden in F₁ generation, i.e., dwarfness is the recessive trait.
- He observed that even when not expressed in the first generation, alternate forms of a trait could retain their identity in the hybrid and could re-emerge in the next generation.

Flow Chart:



(b) Traits are inherited independently. Mendel cross-bred pea plants showing two different characteristics, rather than just one. When he cross-bred pea plants of round green seeds with wrinkled yellow seeds, he got F₁ generation with all such seeds which were yellow and round. So, it was concluded that round and yellow character of seeds were dominant traits in the pea plant. On selfing of F₁ progeny, different types of F₂ progeny were obtained.

F₂ progeny along with their ratios obtained in F₂ generation:

9	:	3	:	3	:	1
Round Yellow		Round Green		Wrinkled Yellow		Wrinkled Green
(both dominating traits)						(both recessive traits)

So traits of two different characters were inherited independent of each other and made new combination characteristics independent of their previous combinations.

Case-based/data -based questions

- Free ear lobe is dominant because it is found in a large majority of the population. (1)
- 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. (1)
- Father – Ff (free ear lobe), Mother – Ff (free ear lobe), Rahul – ff (attached ear lobe) and Nisha – Ff (free ear lobe) ($\frac{1}{2} \times 4 = 2$)

OR

Suresh's father – ff (attached ear lobe), mother – ff (attached ear lobe), Suresh - ff (attached ear lobe), Siya – ff (attached ear lobe). If both parents have recessive character, then all the children can have recessive character only.

PREVIOUS YEAR BOARD QUESTIONS

- (a) 44 + XX
- (i) Both A and R are true and R is the correct explanation of the Assertion.
- (a) (Tt)

(b) Law of Dominance

(c) Phenotype ratio is 3:1
Genotype ratio 1:2:1

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